



# **SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE**

(An Autonomous Institution)

(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)  
(Accredited by NBA-AICTE, New Delhi, Accredited by NAAC with "A" Grade)  
Madagadipet, Puducherry - 605 107



## **DEPARTMENT OF COMPUTER APPLICATIONS (MCA Programme)**

### **MINUTES OF SIXTH MEETING OF BOARD OF STUDIES**

#### **Venue:**

Department of MCA,  
Sri Manakula Vinayagar Engineering College  
Madagadipet, Puducherry – 605 107

#### **Date & Time**

26<sup>th</sup> July 2023 at 3.00 P.M

2, C. 2





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## Department of Master of Computer Applications

10.08.2023

### Minutes of Board of Studies

The Sixth Board of Studies meeting of Department of Master of Computer Applications was held on 26<sup>th</sup> July 2023 at 3:00 P.M in the Department of MCA, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

Sl. No.	Name of the Member with Designation and official Address	Designation
1	Dr. A. RAMALINGAM M.Tech, Ph.D, Professor and Head, Department of Computer Applications (MCA), Sri Manakula Vinayagar Engineering College, Puducherry.	Chairman
<b>External Members</b>		
2	Dr. B. RAMADOSS M.Tech, Ph.D Professor (HAG), Department of Computer Applications, NIT, Trichy, Tamil Nadu.	Subject Expert (Pondicherry University Nominee)
3	Dr. S. SENDHILKUAMAR, ME, Ph.D Associate Professor, Department of Information Science and Technology, College of Engineering, Guindy, Anna University, Chennai - 600 025.	Subject Expert (Academic Council Nominee)
4	Dr.A.MUTHUKUMARAVEL Ph.D, Professor, DEAN- Arts and Science, Bharath Institute of Higher Education and Research, Bharath University, Chennai.	Subject Expert (Academic Council Nominee)
5	Dr.J. UDAYAKUMAR, MCA, Ph.D Proprietor, Genesys Academy of Computer Science, Puducherry.	Representative from Industry
6	Mr. A. MONTFORT LAWRENCE, Admin cum Teacher, Petit Seminaire CBSE School, Moolakulam, Puducherry-605010..	Postgraduate Alumnus (Nominated by the Principal)
<b>Internal Members</b>		
7	Dr. T. AMALRAJ VICTOIRE, Ph.D, Professor, Department of Computer Applications (MCA), Sri Manakula Vinayagar Engineering College, Puducherry.	Member
8	Mr. R. RAMAKRISHNAN M.Tech., (Ph.D) Associate Professor, Department of Computer Applications (MCA), Sri Manakula Vinayagar Engineering College, Puducherry.	Member
9	Mrs. M.VASUKI M.Tech., (Ph.D) Associate Professor, Department of Computer Applications (MCA), Sri Manakula Vinayagar Engineering College, Puducherry.	Member
10	Dr. A. KARUNAMURTHY M.Tech., Ph.D Associate Professor, Department of Computer Applications (MCA), Sri Manakula Vinayagar Engineering College, Puducherry	Member

Department of M.C.A – 6<sup>th</sup> Meeting of BoS

2, C, 3

Co-opted Members		
11	Dr. T. GAYATHRI Ph.D Professor, Department of Mathematics, Sri Manakula Vinayagar Engineering College	Member
12	Mrs. G. NAMITHA (Ph.D) Assistant Professor, Department of English. Sri Manakula Vinayagar Engineering College	Member
13	Ms. S. VISALAKSHI MBA Assistant Professor, Department of Management Studies, Sri Manakula Vinayagar Engineering College	Member

Agenda of the Meeting	
Agenda 1/BoS/6/2023/MCA/PG	
	Welcome Address and to confirm the minutes of the Fifth Board of Studies meeting held on 28.09.2022.
Agenda 2/BoS/6/2023/MCA/PG	
	To discuss and approve the MCA Regulations (R-2023), Curriculum and syllabi of first and second Semester for the Master of Computer Applications students to be admitted from the academic year 2023-24.
Agenda 3/BoS/6/2023/MCA/PG	
	To discuss about the uniqueness of the Curriculum (R-2023).
Agenda 4/BoS/6/2023/MCA/PG	
	To discuss and approve the Evaluation Systems for R-2023 Regulation.
Agenda 5/BoS/6/2023/MCA/PG	
	To apprise about the Professional Electives / Ability Enhancement Courses / Skill Enhancement Courses under R-2023 for the students admitted from the academic Year 2023-24.
Agenda 6/BoS/6/2023/MCA/PG	
	To apprise about the Industry Institute Interactions of the department of Computer Applications (MCA Programme) <ul style="list-style-type: none"> <li>• Guest Lectures</li> <li>• MOUs</li> <li>• Value Added Courses</li> </ul>
Agenda 7/BoS/6/2023/MCA/PG	
	To apprise the End Semester Results of the students admitted in the Academic Year 2021-2022 (III sem), 2022-2023 (I sem) and to discuss about Extra-Curricular and Co-Curricular activities.
Agenda 8/BoS/6/2023/MCA/PG	
	To discuss and recommend the panel of examiners to the Academic Council.
Agenda 9/BoS/6/2023/MCA/PG	
	Any other item with the permission of chair.



### Minutes of the Meeting

Dr. A. Ramalingam, Chairman, BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for accepting to become the member of the Board of Studies and the meeting thereafter deliberated on agenda items that had been approved by the Chairman.

#### Item 1: BoS/6/2023/MCA/PG

Welcome Address and to confirm the minutes of the Fifth meeting of Board of Studies held on 28<sup>th</sup> September 2022.

Chairman, BoS, apprised the minutes of 6<sup>th</sup> meeting of BoS, its implementation and then it is confirmed with the approval in 5<sup>th</sup> meeting of BoS. Members suggested during the fifth meeting that collect the feedback through Google link from the students of 2020-2022 batch, stakeholders, and alumni's for further revision or enhancements required in the curriculum and syllabi of R-2020

1. The feedback through Google form link given in the announcement home page of official website of SMVEC. The 2020-2022 batch student's feedbacks are collected, evaluated and report is given in the Annexure I. [SMVEC Web site: [https://smvec.ac.in / announcement/ IQAC/ Feedback Link](https://smvec.ac.in/announcement/IQAC/FeedbackLink): <https://forms.gle/FelSwrJYQYQWzLo67> ]

2. The feedback through Google form link given in the announcement home page of official website of SMVEC. The stake holders' feedbacks are collected, evaluated and the report is given in the Annexure II. [SMVEC Web site: [https://smvec.ac.in / , announcement/ Feedback Link](https://smvec.ac.in/announcement/FeedbackLink): <https://forms.gle/nABZpawQfnlnKLvu8>]

**The suggestion was incorporated and approved by BoS members in 5<sup>th</sup> meeting of BoS, and the details were appraised in the meeting.**

#### Item 2: BoS/6/2023/MCA/PG

To discuss and approve the MCA Regulations (R-2023), Curriculum and syllabi of first and second semester for the Master of Computer Applications students to be admitted from the academic year 2023-24

The Regulations, Curriculum and Syllabi of I and II semesters under Autonomous Regulations 2023 for the MCA Programme and the students to be admitted from the Academic Year 2023-24 were discussed and recommended to the experts. It was approved by BoS members were given in Annexure I and II.

#### Item 3: BoS/6/2023/MCA/PG

To discuss about the uniqueness of the Curriculum (R-2023).

The uniqueness of the curriculum R-2023 with existing curriculum was discussed and it was appraised and approved by experts.

#### Item 4: BoS/6/2023/MCA/PG

To discuss and approve the Evaluation Systems for R-2023 Regulation.

The internal and external evaluation system for R-2023 regulation was discussed and it was appraised and approved by experts.

#### Item 5: BoS/6/2023/MCA/PG

To apprise about the Professional Electives / Ability Enhancement Courses / Skill Enhancement Courses under R-2023 for the students admitted from the academic Year 2023-24.

Department of M.C.A – 6<sup>th</sup> Meeting of BoS

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The details of Professional Electives, Ability Enhancement Courses and Skill Enhancement Courses under R-2023 for the students to be admitted from the academic Year 2023-24 was discussed and it was appraised and approved by experts are enclosed in Annexure-III.

**Item 6: BoS/6/2023/MCA/PG**

To apprise about the Industry Institute Interactions of the department of Computer Applications (MCA Programme)

- Guest Lectures
- MOUs.
- Value Added Courses

**Guest Lectures**

The guest lectures held in the MCA programme were appraised.

**MOUs Signed**

The MOUs signed with the industries was appraised.

**Value Added Courses**

The value added courses provided to the students was appraised and approved.

**Item 7: BoS/6/2023/MCA/PG**

To apprise the End Semester Results of the students admitted in the Academic Year 2021-2022 (III sem), 2022-2023 (I sem) and to discuss about Extra-Curricular and Co-Curricular activities.

The details of End semester Results and the student's participation in Extra-Curricular and Co-Curricular activities was appraised in the meeting. The members advised to concentrate on the End semester results.

**Item 8: BoS/6/2023/MCA/PG**

To discuss and recommend the panel of examiners to the Academic Council is enclosed in Annexure-IV.

The list of question paper setters and Evaluators was presented and recommended by the BoS members to the academic council and the details are enclosed in Annexure-IV.

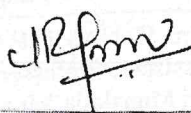


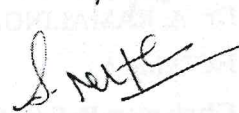
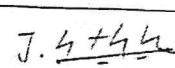
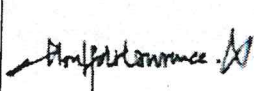


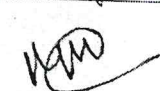
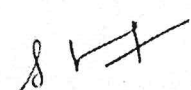
**Item 9: BoS/6/2023/MCA/PG**

Any other item with the permission of chair.

- The BoS members suggested measuring the attainment of course outcomes and program outcomes to identify gaps and take corrective measures in designing a new curriculum.
- Members also suggested apply for NBA accreditation because of the programme is strong graduate outcomes and admissions.
- The BoS Chairman accepted these valuable suggestions and conveyed that the department is in the process of applying for accreditation in the 2023-2024 academic year.



The following members were present for the BoS meeting.

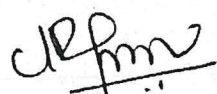
Sl. No.	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	Dr. A. RAMALINGAM M.Tech, Ph.D, Professor and Head, Department of Computer Applications (MCA), Sri Manakula Vinayagar Engineering College, Puducherry.	Chairman	
<b>External Members</b>			
2	Dr. B. RAMADOSS M.Tech, Ph.D Professor (HAG), Department of Computer Applications, NIT, Trichy, Tamil Nadu.	Subject Expert (Pondicherry University Nominee)	
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8	Mr. R. RAMAKRISHNAN M.Tech., (Ph.D) Associate Professor, Department of Computer Applications (MCA), Sri Manakula Vinayagar Engineering College, Puducherry.	Member	
9	Mrs. M. VASUKI M.Tech., (Ph.D) Associate Professor, Department of Computer Applications (MCA), Sri Manakula Vinayagar Engineering College, Puducherry.	Member	
10	Dr. A. KARUNAMURTHY M.Tech., Ph.D Associate Professor, Department of Computer Applications (MCA), Sri Manakula Vinayagar Engineering College, Puducherry	Member	

Department of M.C.A – 6<sup>th</sup> Meeting of BoS

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Co-opted Members			
11	Dr. T. GAYATHRI Ph.D Professor, Department of Mathematics, Sri Manakula Vinayagar Engineering College, Puducherry.	Member	T. Gay
12	Mrs. G. NAMITHA (Ph.D) Assistant Professor, Department of English. Sri Manakula Vinayagar Engineering College, Puducherry.	Member	N. Namitha
13	Ms. S. VISALAKSHI MBA Assistant Professor, Department of Management Studies, Sri Manakula Vinayagar Engineering College, Puducherry.	Member	S. Visalakshi

The meeting was concluded at 4.30 P.M with vote of thanks by Dr.A.Ramalingam, Head of the Department, Master of Computer Applications.



Dr. A. RAMALINGAM

HOD/MCA

Chairman-BoS (MCA)

**Annexure – I**

**Regulations R-2023**

**Department of Computer Applications (MCA Programme)**

Department of Computer Applications (MCA Program)

Page No. \_\_\_\_\_

2.0.10





**SRI MANAKULA VINAYAGAR**  
**ENGINEERING COLLEGE**  
**(An Autonomous Institution)**

Puducherry

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**ACADEMIC REGULATIONS 2023**  
**(R-2023)**

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**MASTER OF COMPUTER APPLICATIONS**

Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry

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## VISION

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

## MISSION

**M1: Quality Education:** To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

**M2: Research and Innovation:** To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

**M3: Employability and Entrepreneurship:** To inculcate the employability and entrepreneurial skills through value and skill based training.

**M4: Ethical Values:** To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

2.C.12

## TABLE OF CONTENTS

1. Introduction .....	4
2. Preliminary Definitions and Nomenclature.....	5
3. Eligibility for Admission.....	7
4. Academic Structure.....	7
5. Curriculum Structure .....	8
6. Course Enrolment and Registration.....	11
7. Assessment Procedures for Awarding Marks.....	11
8. Eligibility for appearing End Semester Examination .....	17
9. Requirements for Passing the Examination.....	18
10. Grievance Redressal Mechanism in Evaluation.....	19
11. Letter Grade and Grade Sheet.....	19
12. Eligibility and Classification for the Award of Degree .....	20
13. Temporary Break of Study from the Programme.....	21
14. Termination from the Programme.....	21
15. Discipline and Conduct.....	22
16. Academic Calendar.....	23
17. Various Committees and its Functions.....	24
18. Revision of Regulations and Curriculum.....	30

2. C. 13





**SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE**  
(An Autonomous Institution)

POSTGRADUATE PROGRAMME IN  
MASTER OF COMPUTER APPLICATIONS  
(Four Semesters)

**REGULATIONS 2023 (R-2023)**

**CHOICE BASED CREDIT SYSTEMS (CBCS)**

**1. INTRODUCTION**

- 1.1 Sri Manakula Vinayagar Engineering College (SMVEC) envisions to foster knowledge, skills, attitude and values of the aspiring youth to enable them to become global citizens. To achieve this process, the institution has evolved a flexible integrated academic curriculum designed in accordance with the Outcome Based Education (OBE) which is acquired by the learners of a programme under 'Learner Centric' Model.
- 1.2 The Post Graduate Programme in Master of Computer Applications (MCA) shall be governed by the rules and regulations provided in this version of Academic Regulations (R-2023). The curriculum of the Programme provides broad based knowledge, quality content of courses, academic flexibility and scope for multi-disciplinary learning activities and opportunity for industry-oriented projects.
- 1.3 The provisions made in this document shall govern the policies, procedures, curriculum, conduct of the examinations and evaluation systems.
- 1.4 The semester system shall be adopted for academic activities in the college. Normally, all odd semesters of MCA Programme shall start in third week of June and even semester starts in third week of December.
- 1.5 Stringent evaluation norms shall be followed to maintain the quality of education. The examination system shall be transparent and governed by the rules and regulations with time bounded activities.

**Objectives of CBCS**

- ❖ To shift focus from the teacher-centric to student-centric education.
- ❖ To make education broad-based on par with global standards

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- ❖ To help students to earn credits by choosing unique combination of courses.
  - ❖ To create an international exposure to students by providing International Certificate Courses.
  - ❖ To provide necessary flexibility to students to gain the vital life skills.
  - ❖ To equip students to keep abreast of industrial requirements and societal needs.
- 1.6** The rules and regulations shall be subjected to amendment made by the Academic Council (AC) from time to time based on the recommendations of the Board of Studies (BoS).

## 2. PRELIMINARY DEFINITIONS AND NOMENCLATURE

College	:	Sri Manakula Vinayagar Engineering College
University	:	Pondicherry University
Programme	:	MCA Degree
Discipline/ Department	:	Computer Applications
Course	:	Theory /Practical course that is normally studied in a semester.
Professional Core Course	:	Compulsory course in the curriculum
Professional Elective Course	:	A course that can be chosen from the listed courses by a student based on his/her interest which is not covered in professional core courses.
Head of the Institution	:	The Director cum Principal
Controller of Examinations (CoE)	:	The authority who is responsible for all Examination related activities of the institution
L – T – P – PW – C	:	<b>L</b> - Lecture, <b>T</b> - Tutorial, <b>P</b> - Practical, <b>PW</b> –Project Work and <b>C</b> - Credits respectively
Curriculum	:	The various components / courses studied in the programme that provides an appropriate outcome in the chosen branch of study.
Semester Grade Point Average (SGPA)	:	Weightage of average grade points of courses in a semester.
Cumulative Grade Point Average (CGPA)	:	Weightage of average grade points of all courses in all semesters completed by a student.
Odd semester	:	The semester that is typically from June to November
Even semester	:	The semester that is typically from December to May

Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry

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Period	:	50 minutes duration of a theory / practical class
Day	:	8 periods in a calendar day
Enrolment	:	Enlistment of a student on roll in an academic year
Arrear	:	A course in which a student has not fulfilled the examination passing criteria in the end semester examination.
CAT	:	Continuous Assessment Test
CAM	:	Continuous Assessment Marks
ESE	:	End Semester Examination
ESM	:	End Semester Examination Marks
AEC	:	Ability Enhancement Course
Regular Examination	:	End semester examination conducted for the courses prescribed in the curriculum of that semester
Arrear Examination	:	End Semester examination conducted for the students who have not fulfilled the examination passing criteria in the previous attempt(s).
Supplementary Examination	:	An additional examination exclusively conducted in the fourth semester for the students with a maximum of two arrears.
First Attempt	:	Appearing for the end semester examination of a course in a semester for which the students have registered. If a student failed to appear for the end semester examination after registration, it is also treated as first attempt
Academic Council (AC)	:	An Apex academic body having the power to scrutinize and approve the proposals with or without modification of the Board of Studies with regard to programme of study, academic regulations, curricula, syllabi and modifications thereof, instructional and evaluation arrangements, methods and procedures relevant thereto etc.,
Board of Studies (BoS)	:	An Apex academic body having the powers to approve the various courses, suggest teaching methodologies, coordinate research and other academic activities keeping in view the objectives of the college.
Academic Standing Committee (ASC)	:	ASC shall perform the functions under emergent situations which are subject to ratification by the Academic Council (AC)
Academic Appeal Board (AAB)	:	If a student finds some anomaly in the award of marks in the Continuous Assessment Test / End Semester examination, he/she can make an appeal to the <i>Academic Appeals Board</i> for review of marks awarded.

Department Advisory Committee (DAC)	: The Committee that formulates a process to review the post implementation effects of curriculum and suggest various measures to ensure academic standard and its excellency of the course offered by the department.
Department Consultative Committee (DCC)	: Review, revises and prepares curriculum structure based on the institutional policy and suggests improvements in syllabus of a course(s) prepared by course teacher(s) and forwarded the curriculum to BoS for further recommendations. It monitors the academic progress and conduct of classes throughout the semester and takes appropriate corrective measures to improve the quality of curriculum delivery.
Programme Academic Coordinator (PAC)	: Coordinates all the academic activities of the department viz. Curriculum revision, framing of syllabus, time table, re-registration of course(s), display and submission of attendance status and BoS meeting as a member secretary.
QCM	: Quality Circle Meeting
AICTE	: All India Council for Technical Education
UGC	: University Grants Commission
NBA	: National Board of Accreditation
NAAC	: National Assessment and Accreditation Council
CRC	: Complaint Redressal Committee

### 3. ELIGIBILITY FOR ADMISSION

All candidates seeking admission to the first year MCA degree and direct admission to the second year of MCA degree under the lateral entry scheme shall be required to satisfy the eligibility rules prescribed by All India Council for Technical Education (AICTE) and Pondicherry University, as notified from time to time.

#### 3.1 Age Limit

There is no age limit for the MCA programme.

### 4. ACADEMIC STRUCTURE

#### 4.1 Duration of the Programme

A student after securing admission for two years shall pursue MCA programme for a minimum period of 2 academic years (4 semesters), if not he / she has to complete the degree within the maximum period of 4 years (8 semesters) starting from the commencement of the first semester. For a student admitted in lateral entry mode, the minimum and maximum period of study shall be one year (2 semesters) and 2 years (4 semesters) respectively.

#### 4.2 Medium of Instruction

The medium of instruction for the entire MCA degree programme shall be only in English.

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## 5. CURRICULUM STRUCTURE

According to the National Board of Accreditation (NBA), the curriculum has to be evolved after finalizing the Programme Educational Objectives (PEOs) and the corresponding Programme Outcomes (POs). The Programme Specific Outcomes (PSOs) are to be evolved based on the knowledge and skills to be developed over the duration of programme. The curriculum that evolves should broadly ensure the achievement of the POs and PSOs, and thus the PEOs of the programme.

### 5.1 Bridge Courses

The students are expected to undergo the bridge courses for two weeks before the commencement of regular first semester programme.

### 5.2 Category of Courses and its Credit Distribution

Course work is measured in units called credit hours or simply credits. The number of hours of a course per week is the number of credits for that course. One credit per lecture/ Tutorial hour per week is assigned for each theory course. Practical courses are assigned for an hour with 0.5 credits per week. The credits details of courses are shown in Table 1.

Table 1 Credits details of courses

Nature of Course	Number of hours/week			Credits
	L	T	P	
Theory	3	0	0	3
Theory with Tutorial	3	1	0	4
Practical	0	0	4	2
Micro / Mini Project	0	0	4	2
Project work and Viva-voce				12
Total number of Credits	–	–	Regular	82
			Lateral Entry	36
Number of credits per Semester			Between 12 to 24	

### 5.3 Course Numbering Scheme

Each course is denoted by a unique code consisting of 9 alphanumeric characters. The details of the numbering scheme are shown in Fig. 1



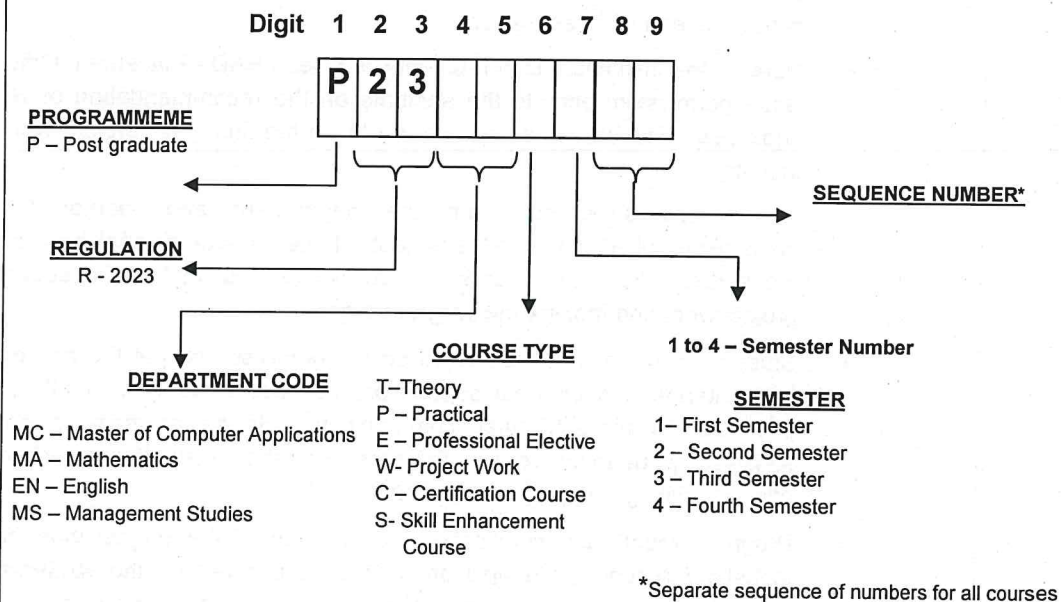


Fig. 1: Course code formation

**5.4 Professional Electives**

Professional Elective courses will be offered by the department in the second and third semesters. An Elective course is offered only if thirty or more number of students register for the course.

**5.5 Project Work****5.5.1 Micro and Mini Project**

There shall be a Micro and Mini Project, which the student shall pursue as a team consists of maximum 3 students during the second and third semester respectively. The aim of the micro and mini project is that the student has to understand the real time software applications. The student should gain a thorough knowledge in the problem he/she has selected and in the software he/she using in the Project. The Micro and Mini-project is an application that should be formally initiated and should be developed and to be implemented by the respective team.

**5.5.2 Project Work & Viva-Voce**

Project work will be assigned to a single student under the supervision of project supervisor. Each student shall be required to undertake a suitable project in industry / research organization / department in consultation with the Head of the Department and the project Supervisor. A student shall register for the Project & Viva-voce in 4th semester.

**1. The process and guidelines for industry / Research organization projects**

- Students opting for industry/research organization project should decide, identify and interact with relevant industry / research organization in 3<sup>rd</sup> semester itself. Training and Placement cell shall help to establish contact with industries. Students shall take necessary help from their department for exact plan of action and apply to the industry / research organization through proper channel. The project coordinator shall decide the schedule appropriately.

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2. C. 19

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- Students shall submit the application attached with relevant details viz. correspondence with industry, area and nature of project to the department before the end of 3<sup>rd</sup> semester.
- Head of the Institution/ Dean Academics / Dean R&D / Placement Officer shall issue permission letter to the students on the recommendation of HoD and supervisor. Students shall be allowed to do the final year project work in the industry.
- An internal supervisor from the department and mentor from the industry/organization where the project is to be undertaken shall be allocated to the student. Both supervisors should discuss and finalize the scope of the project work and monitor the progress together.
- Student should maintain a record on the progress and get the approval from both internal and external supervisors at least twice in a month either by physically or through email communication. If the progress is not found satisfactory due to any reason, the supervisor should take the corrective action, after consulting with project coordinator and HoD.
- Progress report and certificate of completion of the project work from the industry / research organization shall be submitted by the students to the respective supervisor. The mode of evaluation shall be same as that of the in-house project.
- The project work carried out in industry in the fourth semester is not to be treated as internship.

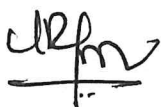
## **2. The Process and guidelines for in-house project**

- Students execute their in-house project in the Department with proper approval from the HoD through the respective supervisor.
- Students should maintain a record on the progress and get the approval from supervisor at least once in a week. If the progress is not found satisfactory due to any reason, the supervisor should take the corrective action, after consulting with project coordinator and HoD.

## **5.6 Ability Enhancement Courses**

**5.6.1 Certification Courses:** Students shall choose a National/International certification course of 40-50 hours duration specified in the curriculum, which will be offered through Centre of Excellence. These courses carry no credit and will not be considered for CGPA calculation.

**5.6.2 Skill Enhancement Courses:** Skill enhancement courses are non-credit courses, provided to enhance the knowledge and skill set of the students. It is mandatory for every student to register online courses like MOOC / SWAYAM / NPTEL etc., approved by the Department committee comprising of HoD, Programme Academic Coordinator and Subject Experts. Students have to complete relevant online courses successfully. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the marks secured in online examinations.



2. C. 20





## 6 COURSE ENROLMENT AND REGISTRATION

**6.1** All the students in the MCA programme shall register for the course during a specified period in the beginning of the semester provided he/she fulfills the eligibility criteria prescribed for enrollment and for registration of course in that particular semester. List of students enrolled in a particular semester of the programme shall also include

- i. Students who rejoin the programme after temporary break.
- ii. Students who rejoin the programme after having been stopped from moving to next higher semester due to non-fulfillment of attendance requirement.
- iii. After registering for all the courses, the student must attend the classes, satisfy the attendance requirements, earn Continuous Assessment Marks (CAM) and appear for the End Semester Examinations (ESE).

### 6.2 Arrear Course Registration

- (i) In the first attempt of writing the End Semester Examination of a course if a student fails, He / She can retain the existing CAM and proceeds to write the End Semester Examinations / Supplementary exams as and when it is conducted.
- (ii) The students will be allowed to write their arrear courses as per their Regulations till its existence and also the CAM will be valid till the existence of their Regulations. There after students will be assessed for 100 marks. If a Student fails to get a pass in the arrear courses, then he/she has to register only for the equivalent paper(s) prescribed by the respective board as per the Regulations in-force.

### 6.3 Rejoining

- (i) The candidate at the time of rejoining should follow the regulations which exists in-force.
- (ii) The candidate rejoining in new Regulations shall apply to the Head of the Institution in the prescribed procedure through the Head of the Department at the beginning of the readmitted semester itself for prescribing additional/equivalent courses in the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.

### 6.4 Re-earn the Continuous Assessment Marks (CAM)

If a student wishes to re-earn the Continuous Assessment Marks (CAM), He / She has to re-register by paying the prescribed fee for the course in the subsequent semester. The student has to re-earn the CAM by taking-up all the internal tests, assignments and presentation as per the norms of regulations. However, the higher marks scored by the students in his/her attempts for CAM shall be considered.

## 7. ASSESSMENT PROCEDURES FOR AWARDING MARKS

The total marks for each course (Theory, Practical, Micro and Mini Project) will be 100 and Project work and viva-voce will be 500, comprising of two components namely Continuous Assessment Marks (CAM) and End Semester Examination Marks (ESM). However, Micro / Mini project, Ability Enhancement Courses (certification course and skill enhancement course) have only continuous assessment for 100 marks without an End Semester Examination. The Assessment Components for each course is as illustrated in Table 2.

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Table 2: Assessment Components

Sl. No	Category of Course	Continuous Assessment Marks (CAM)	End Semester Examination Marks (ESM)
1	Theory Courses	40	60
2	Practical Courses	50	50
3	Micro / Mini Project	100	-
4	Project work and Viva-voce	250	250
5	Technical Seminar and Report Writing	100	-
6	Ability Enhancement Courses (AEC)	100	-

### 7.1 Theory Courses

All theory courses shall be assessed as per Table 3

Table 3: Assessment method for Theory Courses

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	15	10	5	60	100

\* Application oriented / Problem solving in content beyond the syllabus

#### (i) Continuous Assessment:

Continuous Assessment shall be based on attendance, Continuous Assessment tests and assignments.

##### a. Attendance:

Attendance carries 5 marks and the distribution of marks is as follows:

- marks for 95% and above
- marks for 90% and above but below 95%
- marks for 85% and above but below 90%
- 2marks for 80% and above but below 85%
- 1 mark for 75% and above but below 80%

##### b. Continuous Assessment tests:

Continuous Assessment test carries 25 marks. Performance in three tests will be taken for assessment as given in Table 4.



Table 4: Weightage of Assessment for Theory Courses

S. No	Test	Portion for Test	Test Marks	Duration of Test	Weightage for Internal Marks
1	CAT – 1	2 Units	40	1 hour 30 Minutes	10
2	CAT – 2	2 Units	40	1 hour 30 Minutes	
3	Model Exam	5 units (Unit – 1 to 5)	60	3 hours	15
Continuous Assessment Tests Marks for Theory courses					25

**c. Assignments:**

- Assignments carries 10 marks.

The assignment should be in the form of Application oriented / Problem solving / Analytical in content beyond the syllabus.

**ii) End Semester Examination:**

The duration of examination shall be 3 hours with a maximum of 60 marks.

**iii) Question Paper Pattern for Theory courses**

The question paper pattern of CAT, Model and End Semester Examination for Theory courses as per the table 5 and 6 shall be followed.

Table 5: Question Paper pattern for CAT 1 and 2

2 Mark Questions	10 Mark Questions	Total Marks
5 ( 5 Questions)	3 (out of 5 Questions)	40

Table 6: Model and End Semester Examination Question Paper pattern

2 Mark Questions	10 Mark Questions	Total Marks
5 (At least one question from each unit)	5 (5 Questions in either or type from each unit)	60

**7.2 Practical Courses:**

All practical courses shall be assessed as per Table 7.

Table 7: Assessment method for practical courses

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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**i) Continuous Assessment:**

Continuous Assessment shall be based on attendance, regular performance of the student in practical classes and a model practical examination conducted at the end of the semester.

**a. Attendance:**

Attendance carries 10 marks and the distribution of marks is as follows:

- 10 marks for 95% and above
- 8 marks for 90% and above but below 95%
- 6 marks for 85% and above but below 90%
- 4 marks for 80% and above but below 85%
- 2 marks for 75% and above but below 80%

**b. Performance in practical classes**

The regular performance in the practical class (conduction of practical (15 marks), Record work (5 marks) and viva (5 marks)) will be evaluated for 25 marks.

**c. Performance in the Model practical examination**

Performance in the Model practical examination will be evaluated for 15 marks. The pattern of Model Practical Examination will be similar to the End Semester practical Examination.

**ii) End Semester Examination:**

The End Semester Examination of the practical courses will be evaluated for 50 marks by a panel of examiners comprising of an internal examiner and an external examiner. The Break-up of marks is as follows:

Algorithm	: 10 marks
Practical Execution	: 20 marks
Output :	: 10 marks
Viva-Voce	: 10 marks

**7.3 Project work:****7.3.1 Micro and Mini Project**

The Micro and Mini Project shall be submitted in a report form along with the software developed and duly approved by the departmental internal evaluation committee. It shall be evaluated for 100 marks as Continuous Assessment. The departmental internal evaluation committee consists of faculty coordinator, supervisor of the project and a senior faculty member of the department.

There shall be two reviews considered for assessing a Micro and Mini Project work with weightage as indicated in Table 8.

**Table 8: Assessment method for Micro and Mini Project**

Assessment	Review 1		Review 2				Attendance	Total Marks
	Novelty	Presentation	Presentation	Demonstration	Viva	Report		
Marks	10	20	20	20	10	10	10	100



2. C. 24



### 7.3.2 Final year Project Work and Viva-Voce

The Project work carried out in fourth semester shall be assessed as follows:

**Table 9:** Assessment method for Project work

Assessment Method	Marks
Continuous Assessment (Internal Evaluation)	250
End Semester Examination (External Evaluation)	250
Total	500

#### Criteria for Assessment of Project Work

- Interim project report shall be submitted before the project reviews with the approval of the supervisor. The Project Report prepared according to the approved guidelines and duly signed by the supervisor and the Head of the Department shall be submitted as per the timeline announced by the department.
- The End Semester Examination for the project work shall consist of an evaluation of the final project report by an external examiner, followed by a viva-voce examination conducted by a committee consisting of the external examiner and an internal examiner. The Controller of Examinations (CoE) shall appoint Internal and External Examiners for the End Semester Examination of the Project Work.
- The Continuous Assessment Marks (CAM) and End Semester Examinations marks (ESM) distribution for the Project Work is given in Table 10.

**Table 10:** CAM and ESM break-up for Project Work and Viva-voce

Sl. No	Description			Weightage
1	<b>Continuous Assessment Marks (CAM)</b>			
a	Review 1	Review Comment <sup>#</sup>	10	20
		Supervisor	10	
b	Review 2	Review Comment <sup>#</sup>	30	40
		Supervisor	10	
c	Review 3	Review Comment <sup>#</sup>	30	50
		Supervisor	20	
d	Review 4	Review Comment <sup>#</sup>	50	70
		Supervisor	20	
e	Viva-voce			50
f	Expected Outcome from the project <sup>##</sup>	Publication/ communication of papers / prototypes/patents etc		20
	<b>Total CAM</b>			250
2	<b>End Semester Marks (ESM)</b>			
a	Evaluation of final project report and Viva-voce	Report	100	250
		Novelty of the work	50	
		Presentaion and Viva-voce	100	
	<b>Total ESM</b>			250
	<b>Total Marks</b>			500

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# Review committee consists of internal faculty members nominated by the Head of the Department. The Supervisor of the student being examined shall not be part of the committee.

## Expected outcome from the project, in terms of paper publication, patents, product development and industry projects shall be awarded based on the document proof submitted by the student concerned.

## 7.4 Ability Enhancement Courses

### 7.4.1 Skill Enhancement Courses

- The evaluation of 'Skill Enhancement Courses' is through internal assessment only (continuous assessment) as per Table 11(a).
- The faculty In-charge will assess the Skill Enhancement Course for 100 marks, by evaluating the report and adopting any one of the methods like Project Demonstration / presentation / any evaluation method which assess student's specific skill set as relevant to the course.
- The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Table 11(a): Assessment method for Skill Enhancement courses

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	Report	Presentation/Demo/Skill Test	
Marks	10	40	50	100

### 7.4.2 Certification Courses

- Certification Courses are required to be completed to fulfill the degree requirements. All Certification courses are assessed internally for 100 marks as per Table 11(b).
- The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as "pass" on satisfactory completion. A letter grade "P" is awarded to declare pass.
- The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Table 11(b): Assessment method for Certification courses

Assessment	Continuous Assessment Marks (CAM)		Total Marks
	Attendance	MCQ Test	
Marks	10	90	100

## 7.5 Technical Seminar and Report Writing

- The evaluation of 'Seminar' is through internal assessment only. Technical Seminar and Report Writing will be assessed internally for 100 marks as per Table 11(c).
- A committee comprising of two faculty members will coordinate the conduct and assessment of seminar. The Head of the Department shall constitute this committee and take the approval of the Controller of Examinations.

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**Table 11(c): Assessment method for Technical Seminar and Report Writing**

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Report	Presentation and viva	Attendance	
Marks	40	50	10	100

**8. ELIGIBILITY FOR APPEARING END SEMESTER EXAMINATION****Requirements for Appearing End Semester Examination**

A student is expected to maintain 100% attendance in all courses as attendance also carries internal marks. A student will be qualified to appear for end semester examinations in a particular course of a semester only if he/she satisfies the below mentioned requirements.

- 8.1** The student is permitted to appear for End Semester Examinations, only if he/she maintains minimum 75% of attendance. If he/she secured attendance greater than or equal to 60 % and less than 75% in the current semester can be considered in case of the following reasons:

- Medical reasons (hospitalization / accident and or illness)
- Due to participation in sports events or any competitions or NSS activities with prior written permission from the Head of the Institution / Dean Academics through the Head of the Department.

He/she has to pay the necessary condonation fee prescribed by the college authority with necessary supporting documents for his/her absence.

- 8.2** The student shall be considered for exemption from the prescribed attendance requirement for the reasons stated above and if exempted, the student shall be permitted to appear for the end semester examination of that course. In all such cases, the students should have submitted the required documents on joining after the absence, to the Head of the Department through Programme Academic Coordinator

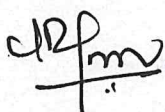
- 8.2.1** If any student is suspended for any reason during the semester, the days of suspension of a student on disciplinary grounds will be considered as days of absence for calculating the percentage of attendance for each individual course.

**8.3 Movement to Next Higher Semesters**

- 8.3.1** A student can move to the next semester provided only if he/she fulfills the minimum attendance requirement for appearing in the end semester examination.
- 8.3.2** The student who has failed to fulfill the above conditions will not be permitted to move to the higher semester, and shall rejoin the programme in the next academic year in the same semester after fulfilling all the requirements as per the regulations.
- 8.3.3** A student who rejoins the programme after the temporary break shall be governed only by the rules, regulations, course of study and syllabi in force, at the time of rejoining the course.

**8.4 Provision for Withdrawal from Examination**

- 8.4.1 Complete Withdrawal (applicable only for nil arrear students):** A student, who is eligible to appear for the semester examinations, will be permitted to withdraw from appearing for the entire End Semester Examinations as one unit (*Complete Withdrawal*) for valid reasons and on the recommendation of the Head of the



2. C. 27



Department and with the approval of the Dean Academics. Complete Withdrawal application shall be made before the commencement of the first examination pertaining to the semester. Such withdrawal shall be permitted **only once** during the entire programme.

**8.4.2** A student who has completely withdrawn from appearing for end semester examinations in a particular semester should appear for the examinations of all the withdrawn subjects in the next semester itself.

**8.4.3** If all other conditions are satisfactory, the candidate who withdraws is also eligible to be awarded DISTINCTION whereas he/she is not eligible to be awarded a rank.

#### **8.5 Scribe for End Semester Examination**

**8.5.1** If any student is not in a position to write end semester examination on account of temporary physical disability or injury due to accident and applies for a scribe (writer) with a medical certificate obtained from a medical officer not below the rank of Assistant Director level, then a scribe shall be allowed / assigned by CoE to such student. Normally, such scribe shall neither be a student nor a degree holder of any technical programme having similar competency. The student shall, however, apply in a prescribed proforma to CoE requesting permission for using the scribe well in advance, not on the day of examination, to make necessary arrangements (Scriber, Separate Examination Hall etc.). CoE shall take the undertaking from the scribe in a prescribed proforma. Such student shall produce the permission letter from the CoE for using scribe to the invigilator. He/She should pay the TA/DA and other charges to the scribe. Scribe shall be allowed extra time as per the norms specified by the Controller of Examinations.

**8.5.2** Student admitted with differently abled category and those who can write, but at much slower speed as compared to normal student, he/she may be allowed an extra time of 30 minutes for 50 marks paper and 45 minutes for 60 marks paper to write the examination for all the courses. He/She shall seek permission from CoE for the extra time on account of his/her percentage of disability by producing necessary medical certificate from medical officer not below the rank of Assistant Director.

#### **8.6 Supplementary Examinations**

Supplementary Examination is an additional examination which will be conducted after declaration of the end semester examination / revaluation results. This examination will be conducted in fourth semester for the students who are having a maximum of two arrears only. For supplementary examination, the continuous assessment marks of the last attempt will be considered.

#### **8.7 Malpractice in Examinations**

If any student caught red-handed due to malpractices in examinations then he/she shall be punished as per the recommendations of the Complaint Redressal Committee (CRC) constituted by CoE with the approval of Head of the Institution. The CRC shall inquire and decide the punishment for the unfair means as specified in the Examination manual.

### **9. REQUIREMENTS FOR PASSING THE EXAMINATION**

**9.1 A student is declared to have successfully passed a theory based course if he/she has secured:**

- A minimum of 50% marks in the End Semester Examinations and a minimum of 50% marks on combining both Continuous Assessment Marks (CAM) and End Semester Examination Marks (ESM).

**9.2 A student is declared to have successfully passed a practical / project based course if he/she has secured:**

- A minimum of 50% marks in the End Semester Examinations and a minimum of 50% marks on combining both Continuous Assessment Marks (CAM) and End Semester Examination Marks (ESM).

**9.3 For AEC Courses, the pass mark is 50% and the marks scored will not be taken into consideration for the SGPA / CGPA calculations.**

**10. GRIEVANCE REDRESSAL MECHANISM IN EVALUATION**

**10.1** Grievances related to the entire process of Continuous Assessment shall be addressed to Academic Appeal Board as given in Regulations under Clause 17.4.

**10.2** Grievances related to End Semester Examination of Theory Courses for regular and arrear examinations can be redressed as follows:

**10.2.1 Photocopy of the Answer Script:**

After declaration of results, photocopy of valued answer scripts with the marks awarded to individual answers shall be made available to the students on submission of an application along with the prescribed fees to the Controller of Examinations.

**10.2.2 Revaluation:**

Students can apply for revaluation by submitting an application along with the prescribed fees to the Controller of Examinations. The revaluation is extended to the students those who have maximum of two arrears in theory papers.

**11. LETTER GRADE AND GRADE SHEET**

All assessments of a course will be evaluated exactly based on the marks. However, for the purpose of reporting the performance of a candidate, letter grade with grade points will be awarded as per the range given in Table 12, based on the percentage of marks obtained by the candidate in each course.

**Table 12: Letter Grade with grade points**

S.No	Range of total marks	Letter Grade	Grade Points
1	90 to 100	S	10
2	80 to 89	A	9
3	70 to 79	B	8
4	60 to 69	C	7
5	55 to 59	D	6
6	50 to 54	E	5
7	0 to 49	F	0
8	Absent	FA	0
9	Withdrawal from examination	W	0
10	Pass in AEC course	P	0

F – denotes Failure of the course and FA – Failure due to Absent

**11.1 Grade Sheet**

After declaration of results, grade sheets will be issued to each student, which will contain the following details:

- The College Name and Affiliating University.

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- The list of courses registered during the semester and the grades scored.
- The Semester Grade Point Average (SGPA) for the semester.
- The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.
- On completion of a semester, each student is assigned a Semester Grade Point Average which is computed for all the courses registered by the student during that semester.

$$\text{Semester Grade Point Average (SGPA)} = \frac{\sum_i (C_i \times GP_i)}{\sum_i C_i} \quad i = 1 \text{ to } n;$$

Where n = Number of credit courses in that semester.

$C_i$  is the Credit of  $i^{\text{th}}$  course in that semester and  $GP_i$  is the Grade Point earned by the student for that  $i^{\text{th}}$  course. The SGPA is rounded off to two decimals.

- The overall performance of a student at any stage of the Degree programme is evaluated by the Cumulative Grade Point Average (CGPA) up to that point of time.

$$\text{Cumulative Grade Point Average (CGPA)} = \frac{\sum_i (C_i \times GP_i)}{\sum_i C_i} \quad i = 1 \text{ to } m;$$

Where m = Number of credit courses from 1<sup>st</sup> semester to the completed semesters,  $C_i$  is the Credit of  $i^{\text{th}}$  course of the completed semesters at that stage and  $GP_i$  is the Grade Point earned by the student for that  $i^{\text{th}}$  course.

#### **Scheme for conversion of CGPA to Percentage (%) marks:**

A scheme to convert the Cumulative Grade Point Average (CGPA) to Percentage (%) of marks is shown below:

$$\text{Percentage (\% ) marks} = \text{CGPA} \times 10$$

## **12. ELIGIBILITY AND CLASSIFICATION FOR THE AWARD OF DEGREE**

A student shall be declared to be eligible for the award of MCA Degree provided the student has Successfully completed the course requirements and has passed all the prescribed end semester examinations in all the four semesters within a maximum period of 4 years (2 years for lateral-entry) calculated from the commencement of the first semester to regular entry students and third semester for lateral entry students.

### **12.1 Classification of Degree**

After successful completion of the programme, degree will be awarded as per the following classifications based on the final CGPA

#### **1. First class with Distinction**

Student who satisfies the following conditions shall be declared to have passed the end semester examinations in *First class with Distinction*:

- Students who have successfully completed the programme within four consecutive semesters and obtained a final CGPA of 7.5 or above by passing the end semester examination in all the courses from first to fourth semester in the *first attempt* will be declared to have passed in **First Class with Distinction**.
- Students who have secured a final CGPA of 7.5 or above but failed to clear the courses offered from first to fourth semester in the first attempt are not eligible for **First Class with Distinction** classification. However, the students who have opted for authorized complete withdrawal (only one time) from examination will also be eligible for **First Class with Distinction** classification but it will not be considered for Ranking.

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**2. First class**

A student who satisfies all the following conditions shall be declared to have passed end semester examinations in First class:

- a) Should have passed the examination in all the courses of all four semesters within two years
- b) Should have obtained a final CGPA of not less than **6.0**, shall be declared to have passed in **First Class**.
- c) Students who have lost the eligibility for **First Class with Distinction** classification by failing to clear the courses offered from first to fourth semester in the first attempt but securing a final CGPA of 7.5 or above shall also be declared to have passed in **First Class**.

**3. Second class**

All other students (not covered in S.No.1 and 2 under Clause 12.1) who qualify for the award of the degree shall be declared to have passed the examination in Second Class.

**12.2 Gold Medals and Ranks**

For the Award of Gold Medal and ranks for the programme of study, the CGPA secured from 1<sup>st</sup> to 4<sup>th</sup> semester should be considered and it is mandatory that the candidate should have passed all the subjects from 1<sup>st</sup> to 4<sup>th</sup> semester in the first attempt. Rank certificates would be issued to the first five candidates.

**13. TEMPORARY BREAK OF STUDY FROM THE PROGRAMME**

A student shall be permitted to withdraw temporarily from the college for the reason beyond his/her control. The applicable rules are:

- i. After withdrawal, the student shall rejoin next year in the same semester during which the student has withdrawn.
- ii. The student shall apply to Dean Academics through HoD stating the reasons for withdrawal, along with supporting documents, consent letter from his/her parent/guardian and clearance/no due from all the concerned departments.
- iii. Dean Academics shall examine the case and recommend for the approval/ratification from Academic Council (AC) /Academic Standing Committee (ASC).
- iv. A student availing temporary withdrawal from the college under the above provision shall be required to pay such fees and/or charges as may be fixed by the AC/ASC for his/her name to be enrolled. However, it may be noted that the fees/charges once paid shall not be refundable.
- v. The total period of completion of the course reckoned from the commencement of the first semester to which the candidate was admitted shall not exceed 4 years in any case including of the period of discontinuance.

**14. TERMINATION FROM THE PROGRAMME**

A student shall be terminated from the program in the following cases:

- i. Involved in ragging and not obeying disciplinary rules structured by college.
- ii. Not completing the programme in prescribed period; Students shall have to complete MCA programme in the maximum period of 4 years (8 semesters) from the date of admission. If not completed, such student will be declared as Failed to Complete Technical Education (FCTE). However, genuine cases with proper justification may be referred to AC for extending programme completion period.

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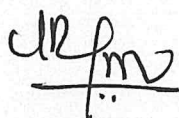
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**15. DISCIPLINE AND CONDUCT**

**15.1** Any act of misconduct committed by a student inside or outside the campus shall be an act of violation of discipline of the college. Violations of the discipline shall include:

- (a). Interference to teaching, examination, administrative work, curricular or extra-curricular activities and any act likely to cause such disruption.
- (b). Damaging or defacing the property inside or outside the college campus.
- (c). Engaging in any attempt at wrongful confinement of teachers, employees and students of the college.
- (d). Use of abusive and derogatory slogans or intimidators' language or incitement of hatred and violence.
- (e). Ragging in any form ("Ragging means causing, inducing, compelling or forcing a student whether by way of a practical joke or otherwise to do any act that detracts from human dignity or violates his person or exposes him to ridicule or to forbear from doing lawful act, by intimidating, wrongfully re-straining wrongfully confining or injuring him or by using criminal force to him or by holding out to him any threat of such intimidation, wrongful restraint, wrongful confinement, injury or the use of criminal offense), as per the directions of Supreme Court of India, is a criminal offence.
- (f). Eve teasing or disrespectful behavior to a student.
- (g). An assault upon or intimidation of, or insulting behavior towards a teacher, officer, employee or student or any other person.
- (h). Getting enrolled in more than one programme /course of study simultaneously.
- (i). Committing forgery, tampering the documents or records, identity cards, furnishing false certificate or false information.
- (j). Organizing instant agitation/meetings without prior permission in the campus.
- (k). Viewing/downloading obscene information/data, images and executable files, sending obscene mails/messages via Facebook/twitter/ other social sites using college servers/personal electronic gadgets in the college premises.
- (l). Sharing the login and password and other details of IT facilities provided to other outside students.
- (m). Refusing to provide an identity card when demanded by any teacher / college authority.
- (n). Consuming or possessing alcoholic drinks, dangerous drugs or other intoxicants in the college campus.
- (o). Possessing or using any weapons and fire arms in the college campus.
- (p). Encroachment of hostel, accommodating guests or other persons in hostels without permission.
- (q). Malpractice in examination
- (r). Indulging in anti-national activities contrary to the provisions of acts and laws enforced by Government.
- (s). Any other act which may be considered by the Head of the Institution or the Discipline Committee to be an act of violation of discipline.



2. C. 32

- 15.2** Any act of indiscipline of a student reported to the Head of the Institution shall be referred to Disciplinary Committee of the college. The Committee shall enquire into the charges and recommend suitable punishment if the charges are substantiated. The penalties / punishment / actions may include:
- Written warning and information to the parents/guardian.
  - Imposition of fine.
  - Suspension from the College/Hostel/Mess/Library or availing of any other facility.
  - Suspension or cancellation of scholarship/fellowship / studentship or any financial assistance from any source.
  - Recover of loss caused to college property.
  - Debarring from participation in sports/NSS/student club activities.
  - Disqualifying from holding any representative position in the Class / College / Hostel Mess / Sports / Clubs and in similar other bodies.
  - Disqualifying from appearing in placement and receiving any awards.
  - Expulsion from the Hostel / Mess/Library / Club / College for a specified period by forfeiting fees.
  - Debarring from appearing for an end semester examination.
- 15.3** Student(s) involved in any act of indiscipline /malpractice in examination shall be issued notice to him/her, asked to be present before the Complaint Redressal Committee (CRC) on the day at specified time and venue with his/her parents/guardian. He/She shall give written reply /oral explanation to the charges levied against him/her for consideration. If the implicated student(s) fails to appear before the committee, then decision shall be taken as absent, on the basis of available evidence/documents which shall be binding on the concerned student.
- 15.4** Every admitted student shall be issued photo identification (ID) card which must be worn by the students when he/she is inside in the college campus / college bus.

## 16. ACADEMIC CALENDAR

- 16.1** The academic activities of the college shall be governed by the academic calendar prepared for each academic semesterr and approved by the AC/ASC. It shall be notified at the beginning of each academic semester. Academic calendar shall incorporate schedule of admission, course registration, course delivery, examination/evaluation, course feedback, course/graduate exit survey, co-curricular activities.
- 16.2** The curriculum shall be typically delivered in two semesters in an academic year. Each semester shall be of 20 weeks (approximately 100 working days) duration, including evaluation, grade moderation and result declaration. Generally, 13-14 weeks for course content delivery and 4-6 weeks for examination / evaluation shall be assigned in each semester. The academic session in each semester shall provide at least 75 teaching days with 40 hours per week. The odd and even semesters of an academic year normally begin from second week of June and second week of December respectively.
- 16.3** The academic calendar should be strictly adhered to all other activities including co-curricular and extra-curricular activities that should be scheduled so as not to interfere with the curricular activities as stipulated in the academic calendar.

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**17. VARIOUS COMMITTEES AND ITS FUNCTIONS****17.1 Academic Council (AC)****COMPOSITION OF ACADEMIC COUNCIL:**

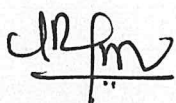
1. The Principal (Chairman)
2. All the Heads of Departments in the Autonomous College
3. Four teachers of the Autonomous College representing different categories of teaching staff by rotation on the basis of seniority of service in the College.
4. Not less than four experts/academicians from outside the Autonomous College representing such areas as Industry, Commerce, Law, Education, Medicine, Engineering, Sciences, etc., are to be nominated by the Governing Body.
5. Three nominees of the University, not less than Professors.
6. The Controller of Examination of the Autonomous College
7. A faculty member nominated by the Principal (Member Secretary).

**Term:** The term of the nominated members shall be three years.

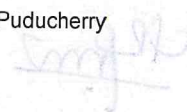
**Meetings:** Meetings of the Academic Council shall be held at least once every six months.

**Functions of the Academic Council:**

- (a) To scrutinize and approve the proposals with or without modification of the Board of Studies with regard to courses of study, academic regulations, curricula, syllabi and modifications thereof, instructional and evaluation arrangements, methods, procedures relevant thereto, etc., provided that where the Academic Council differs on any proposal, it shall have the right to return the matter for reconsideration to the Board of Studies concerned or reject it, after giving reasons to do so.
- (b) To make regulations regarding the admission of students to different programmes of study in the Autonomous College, keeping in view the policy of the Government.
- (c) To make regulations for sports, extra-curricular activities, and proper maintenance and functioning of the playgrounds and hostels.
- (d) To recommend to the Governing Body proposals for the institution of new programmes of study.
- (e) To recommend to the Governing Body institution of scholarships, studentships, fellowships, prizes, and medals, and to frame regulations for the award of the same.
- (f) To advise the Governing Body on suggestions(s) pertaining to academic affairs.
- (g) To perform such other functions as may be assigned by the Governing Body.



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**17.2 Board of Studies (BoS)**

Composition of Board of Studies:

1. Head of the Department concerned (Chairperson).
2. All faculty members of the Department.
3. Two subject experts from outside the parent University are to be nominated by the Academic Council.
4. One expert is to be nominated by the Vice-Chancellor from a panel of six recommended by the Autonomous College Principal.
5. One representative from industry/corporate sector/allied areas to be nominated by the Principal.
6. One member of the College alumni to be nominated by the Principal.
7. Experts from outside the Autonomous College, whenever special courses of studies are to be formulated, to be nominated by the Principal.

**Term:** The term of the nominated members shall be three years.

**Meetings:** Meetings of the Board of Studies shall be held at least once every six months.

**Functions:**

The Board of Studies shall recommend the following to the Academic Council:

1. Courses of studies
2. Measures for the improvement of the standards of teaching and research
3. Any other academic matter.

**17.3 Academic Standing Committee (ASC)**

Composition of Academic Standing Committee is same as that of AC, except external members. ASC shall perform the functions under emergent situations subject to ratification by the AC.

**17.4 Academic Appeal Board (AAB)**

The Academic Appeal Board is constituted with Dean Academics as convener and two senior level professors as members, and the concerned Head of the Department and Class Advisor as co-opted members. The board will receive the grievances/complaints in writing from the aggrieved student regarding anomaly in award of marks. The board will examine the complaints and recommend appropriate measures to the Head of the Institution, for necessary action.

The entire process of Continuous Assessment shall be made transparent, in which students can get the explanation of marks being awarded from the course instructor, if and when required. However, if a student finds some anomaly in the award of marks in the continuous assessment, he/she can make an appeal to the *Academic Appeal Board* for review of marks awarded. Before appealing for such review, a student shall first approach the concerned Course Instructor and then the concerned Head of the Department, with a request to do the needful. Only after exhausting the above options and in situations where satisfactory actions / remedial measures have not been taken, the student may appeal to the Academic Appeal Board.

Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry

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**17.5 Department Advisory Committee (DAC)**

DAC is another basic constituent of the academic system of an autonomous college. The composition and functions of the DAC are given below

1. Chairperson : Head of the concerned Department
2. Internal Members : Two senior faculty members of the department
3. Industry Representative : One representative from industry/corporate sector / is related to the placement
4. One academician from other Institution
5. One meritorious alumnus
6. One parent
7. One student
8. Member secretary : Programme Academic Coordinator

**Term:** The term of the nominated members shall be three years.

**Meetings:** The meeting may be scheduled as and when necessary, but at least twice a year.

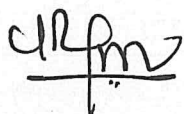
**Functions of DAC**

The DAC of a department in the college shall

- a) Formulate a process to review post implementation effects of curriculum
- b) Suggest measures to ensure academic standard and excellence of the course offered by the department.
- c) Suggest the methodologies for innovative teaching and evaluation techniques; enhancement of industry institute interaction
- d) Identify and recommend the record of new programme
- e) Review target set for attainment of course outcomes and programme outcomes
- f) Guide and provide support to department for enhancing interaction with outside world.
- g) Plan strategically to enhance the academic quality of department.
- h) Address concerns of stakeholders expressed through feedback.
- i) Defining and redefining the Programme Educational Objectives (PEOs) and Programme Outcomes (POs) based on the recommendations by departmental academic committee.
- j) Study the achievement of PEOs and POs reported by department evaluation committee and suggest measures for improvement.

**17.6 Board of Examinations (BoE)****Composition**

1. Head of the Institution (Chairperson)
2. Dean Academic.
3. Controller of Examination(CoE): Member Secretary
4. One expert possessing ten years of industrial/ field experience nominated by the Chairman
5. Coordinators (Examinations, Assessment, Results and Tabulation)



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**Functions of BoE:**

- (a). The BoE shall
  - i. Ensure proper performance of the various duties in conducting examinations via paper setting, time table preparation, assessment and declaration of results.
  - ii. Recommend examination reforms and shall implement after the approval of academic council.
  - iii. Prepare the detailed time table of examinations as per the schedule approved by academic council.
  - iv. Arrange for strict vigilance during the conduct of examination so as to avoid use of unfair means by the students, faculty and invigilators.
- (b). Chairman, BoE shall constitute Complaint Redressal Committee (CRC) consisting of three members as and when required to deal with the complaints related to the conduct of examinations.
- (c). The recommendations of the CRC shall be approved by Chairman for the BoE to take appropriate disciplinary actions in the concerned matter. The disciplinary actions shall be endorsed by the BoE.
- (d). The BoE shall perform duties and responsibilities that are assigned by Academic Council of the institute from time to time.

**17.7 Department Consultative Committee (DCC)****Composition**

1. Head of Department (Chairperson)
2. Five faculty members (at least one from each specialization) nominated by HOD
3. Member Secretary: Programme Academic Coordinator / Programme Evaluation Coordinator

**Functions of DCC**

- (a). Review, revise and prepare curriculum structure based on institutional policy, suggest improvements in syllabus of a course/s prepared by course teacher/s and forward the curriculum to BoS for further recommendations.
- (b). Check appropriateness of course objectives, course outcomes, and mapping of COs with POs and suggest necessary improvements/modifications.
- (c). Monitor the academic progress throughout the semester, conduct of classes and take appropriate corrective measures to improve the quality of curriculum delivery.
- (d). Review academic performance of students.
- (e). Counsel the concerned course teachers for improvement based on student feedback, academic and question paper audit reports.
- (f). Verify the attainment level of course outcomes and programme outcomes.
- (g). Formulate strategy to collect feedback from stake holders, analyze the collected feedback and forward the analysis to DAC.
- (h). Contribute to maintain academic standard as well as improving the quality of the courses offered by the department and enhance industry-institute interaction.
- (i). Suggest open and professional electives considering societal needs.

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- (j). Recommend methodologies for innovative teaching and evaluation techniques to BoS.
- (k). Coordinate research, teaching, extension and other academic activities in the department/college.
- (l). Carry out preparatory work for defining /redefining the Programme Educational Objectives (PEOs) and Programme Outcomes (POs) periodically.
- (m). Monitor evaluation of course attainments leading to achievement of programme outcomes and report the results of assessment to BoS.

#### 17.8 Programme Academic Coordinator (PAC)

The functions and duties of PAC are:

- (a). Coordinating all academic activities of the department viz Curriculum revision, framing of syllabus, time table, member secretary for BoS meeting, re-registration of course/s, display and submission of attendance status.
- (b). Conducting internal academic audit and departmental advisory committee meeting as a member secretary.
- (c). Monitoring the academic activities and conduct of classes.
- (d). Extending necessary help to departmental academic and evaluation committee.
- (e). Recording and forwarding all academic related documents to Dean Academics.
- (f). Working in association with Dean Academics.

#### 17.9 Departmental Evaluation Coordinator (DEC)

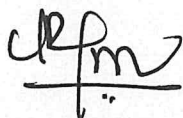
Functions and duties of DEC are:

- (a). Conduct course and graduate exit survey, make arrangements for feedback from stakeholders (industry/employer/alumni/student) and feedback analysis.
- (b). Monitor the assessment of course outcome.
- (c). Compute / assess / evaluate the achievement of PEOs and POs as per NBA/NAAC requirements.
- (d). Compile the information required for the preparation of Annual Quality Assurance Report (AQAR) by the Internal Quality Assurance Cell (IQAC).
- (e). Extend necessary help to departmental academic and evaluation committee.

#### 17.10 Class Advisor

Head of the Department will allot one faculty member to be the class advisor for a particular batch of students throughout their period of study. The role of class advisors is as follows:

- i. To motivate and closely monitor the performance of the students.
- ii. To maintain all important documents of the students for reference/inspection by all committees.
- iii. To work closely with the student counselors on matters related to students and update the details from time to time in student's profile for further reference.
- iv. To build a strong alumni base for the institution by maintaining a possible rapport with students and parents.



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**17.11 Student Counselor (Mentor)**

By guiding and counseling students, faculty can create a greater sense of belongingness amongst the student community. To help the students in planning their courses and for general guidance on the academic programme, the Head of the Department will allot a certain number of students to a teacher of the department who shall function as student counselor throughout the period of study.

The student counselor will guide / monitor the courses chosen by the students, check attendance and progress of the students and counsel them periodically. The student counselors should ensure that each student is made aware of the various options for progress. Students are monitored and guided to become overall performers. Students can select and work for career choices of their interest. The student counselors shall update and maintain the student counselor record of each student under his guidance attached to them. The student counselors shall also help the class advisors to update the students details attached to them.

The student counselor may also discuss with the class advisor, HoD and parents about the progress of the students.

**17.12 Quality Circle Meeting (QCM)**

Every class will have a class committee constituted by the HoD to discuss about the various Academic activities through Quality Circle Meeting (QCM). The members of the class committee will be as follows:

1. Chairperson (a senior faculty who is preferably not teaching any course for the class)
2. All the course handling staff of the class
3. Students (a minimum of 6 consisting of 3 boys and 3 girls on pro-rata basis)

**Functions**

The functions of the QCM shall include the following: -

- (a). Clarify the regulations of the programme and the details of rules therein.
- (b). Inform the student representatives about the academic schedule including the dates of assessments and the syllabus coverage for each assessment.
- (c). Inform the student representatives about the details of Regulations regarding marks assigned for each assessment. In the case of practical courses (laboratory/ drawing / project work / seminar etc.) the breakup marks for each experiment / exercise / module of work, should be clearly discussed in the class committee meeting and informed to the students
- (d). Analyze the performance of the students of the class after each assessment test and initiate steps for improvement.
- (e). Identify slow learners, if any, and request the faculty concerned to provide additional help / guidance / coaching to such students.
- (f). Discuss and sort out problems experienced by students in the classroom and in the laboratories.
- (g). The class committee shall be constituted within the first week of the commencement of any semester.
- (h). The chairperson of the class committee may invite the class advisor / student counselor and the Head of the Department to the meeting of the class committee.

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- (i). The Head of the Institution may participate in any class committee meeting.
- (j). The chairperson is required to prepare the minutes of every meeting, submit the same through the Head of the Department to the Principal within two days of the meeting and arrange to circulate the same among the students and faculty concerned. Points requiring action by the management shall be brought to the notice of the management by the Principal.

### Meetings

Quality Circle Meeting (QCM) are to be conducted as scheduled below.

Meeting 1	One week before the 1 <sup>st</sup> assessment test
Meeting 2	One week before the 2 <sup>nd</sup> assessment test
Meeting 3	One week before the 3 <sup>rd</sup> assessment test

During the first meeting of the class committee, the students are to be informed about the assessment procedure as per the framework of the Regulations. During these meetings the student representatives shall meaningfully interact and express opinions and suggestions of the students of the class to improve the effectiveness of the teaching-learning process.

## 18. REVISION OF REGULATIONS AND CURRICULUM

The college may revise, amend or change the regulations of curriculum and syllabi from time to time as and when found necessary.

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## **Annexure – II**

### **Curriculum and Syllabus**

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# **SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE**

An Autonomous Institution

(As per UGC -2018 Regulations, Affiliated to Pondicherry University)

**PUDUCHERRY – 605107**

## **MASTER OF COMPUTER APPLICATIONS [MCA]**

**(REGULATIONS - 2023)**

### **CURRICULUM AND SYLLABI**



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## COLLEGE VISION AND MISSION

### VISION

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

### MISSION

**M1:Quality Education:** To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

**M2: Research and Innovation:** To foster value-based research and innovation in collaboration with Industries and institutions globally for creating intellectuals with new avenues.

**M3: Employability and Entrepreneurship :** To inculcate the employability and entrepreneurial skills through value and skill based training.

**M4: Ethical Values:** To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

## DEPARTMENT VISION AND MISSION

### VISION

To excel in transforming the graduates to be proficient in Computer Applications that generates competent IT professionals, researchers and entrepreneurs globally.

### MISSION

**M1- Excellence in Education:** To impart quality education by instilling confidence towards taking up various challenges in the ever-growing Industrial sectors.

**M2-Research and Modernization:** To indoctrinate innovative research programs through enhancing technical competencies to balance the upgrading industrial and societal needs.

**M3-Placement and Entrepreneurship:** To be recognized as experts by creating extensive global opportunities in placements and cultivating entrepreneurship skills for effective dissemination of creative ideas in business ventures.

**M4: Moral Ethics:** To produce ethically strong professionals by infusing optimistic approach for the significant contribution to the society.

Dr. C. H. H.



## PROGRAMME OUTCOMES (POs)

**P01. Mathematical Computation knowledge:** Apply the knowledge of mathematics, science, computing fundamentals to the solution of complex application-oriented problems.

**P02. Problem analysis:** Identify, formulate, research literature, and analyze logical oriented problems to arrive at substantiated conclusions using first principles of mathematics and natural sciences.

**P03. Design/development of solutions:** Design, Develop and evaluate efficient software solutions for complex problems in various domain like Animation, Banking, Insurance, Healthcare, societal, and environmental considerations.

**P04. Conduct investigations of complex problems:** Use research-based knowledge and methodologies, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**P05. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex computational activities with an understanding of the limitations.

**P06. The Social responsibilities:** Understand and follow the responsibilities and consequences based on societal, environment, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional computational practice.

**P07. Environment and sustainability:** Understand the impact of the professional Computing solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

**P08. Professional Ethics:** Understand and Apply professional ethical principles and responsibilities, Cyber regulation and norms of the professional Computing practice.

**P09. Individual and Team Work:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

**P010. Communication Efficiency:** Communicate effectively with the computing society in both verbal and written form. Be able to comprehend and write effective report documentation, make effective presentations, and give and receive clear instructions.

**P011. Project Management and Finance:** Demonstrate knowledge and understand computing and management principles and apply them in resource management and economics to provide better services in the field of Software development and manage projects in multidisciplinary environments.

**P012. Continuous Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## **PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

**PEO1.Proficiency:** To provide widespread knowledge in Computer Science, Computer Application and Applied mathematics.

**PEO2.Brace:** To formulate the students with basic and adequate knowledge in computer programming languages and software application development.

**PEO3.Provide:** To equip the student for the understanding of the society-oriented projects, complexity in the technological subjects and empower them to do their higher studies.

**PEO4. Bestow:** To equip the students as professionals by providing opportunities to augment their problem-solving ability, communication skills along with organizing facilities.

## **PROGRAM SPECIFIC OUTCOMES (PSOs)**

**PSO1:** Formation of Mathematical and computer systems to apply mathematical and system concepts to resolve all kinds of problems using applicable mathematical analysis, programming concepts on various computing process.

**PSO2:** Development of Communication, information and technical concepts to train with sound knowledge to apply and strengthen informatics and technologies.

**PSO3:** Creation of Occupational, Scientific concepts to interpret and respond to professional dexterity with communication skills and carry out innovative designs in research.

**Note:** Bridge course has to be conducted to the students before admitting into the 1<sup>st</sup> semester MCA Programme.

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## MCA CURRICULUM

BRIDGE COURSES			
Sl. No.	Course Code	Course Title	Hours
1	P20MCB001	Fundamentals of Mathematics	30
2	P20MCB002	Fundamentals of Computer	30
3	P20MCB003	Introduction to Problem Solving	30
4	P20MCB004	Introduction to Computer Programming	30
5	P20MCB005	Fundamentals of Computer Organization and Operating Systems	30

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESE	Total
Theory										
1	P23MAT107	Mathematical Foundation of Computer Applications	PC	3	1	-	4	40	60	100
2	P23MCT101	Problem Solving using C	PC	3	-	-	3	40	60	100
3	P23MCT102	Advanced Data Base Management Systems	PC	3	-	-	3	40	60	100
4	P23MCT103	Advanced Operating System	PC	3	-	-	3	40	60	100
5	P23MST115	Accounting and Financial Management	PC	3	-	-	3	40	60	100
Practical										
6	P23MCP101	Advanced C Programming Lab	PC	-	-	3	2	50	50	100
7	P23MCP102	Advanced Data Base Management Systems Lab	PC	-	-	4	2	50	50	100
8	P23MCP103	Operating System Lab	PC	-	-	3	2	50	50	100
Ability Enhancement Course										
9	P23XXCXXX	Certificate Course-I	AEC	-	-	4	-	100	-	100
10	P23ENS101	Skill Enhancement Course-I	AEC	-	-	4	-	100	-	100
11	P23MCS104	Skill Enhancement Course-I (Aptitude)	AEC	-	-	4	-	100	-	100
I Semester Total Credits/Marks							22	650	450	1100

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SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESE	Total
Theory										
1	P23MCT201	Advanced Data Structures and Algorithms	PC	3	1	-	4	40	60	100
2	P23MCT202	Cyber Security of IoT	PC	3	-	-	3	40	60	100
3	P23MCT203	Object Oriented Programming In C++	PC	3	-	-	3	40	60	100
4	P23MCT204	Web Application Development	PC	3	-	-	3	40	60	100
5	P23MCE2XX	<b>Professional Elective-1:</b> Modern Tools, Languages and Framework	PE	3	-	-	3	40	60	100
Practical										
6	P23MCP201	Advanced Data Structures and Algorithms Lab	PC	-	-	4	2	50	50	100
7	P23MCP202	Object Oriented Programming Lab In C++	PC	-	-	4	2	50	50	100
8	P23MCP203	Web Application Development Lab	PC	-	-	4	2	50	50	100
9	P23MCP201	Micro Project Lab	PC	-	-	4	2	50	50	100
Ability Enhancement Course										
9	P23MCC2XX	Certificate Course-II	AEC	-	-	4	-	100	-	100
10	P23MCS201	Skill Development Course-II (NPTEL / MOOC / SWAYAM)	AEC	-	-	4	-	100	-	100
II Semester Total Credits/Marks							22	600	500	1100

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESE	Total
Theory										
1	P23MCT301	Advanced Java Programming	PC	3	-	-	3	40	60	100
2	P23MCT302	Machine Learning	PC	3	-	-	3	40	60	100
3	P23MCT303	Mobile Application Development	PC	3	-	-	3	40	60	100
4	P23MCT304	Blockchain Technology	PC	3	-	-	3	40	60	100
5	P23MCE3XX	Professional Elective-2: Big Data	PE	3	-	-	3	40	60	100
Practical										
6	P23MCP301	Advanced Java Programming Lab	PC	-	-	4	2	50	50	100

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7	P23MCP302	Mobile Application Development Lab	PC	-	-	4	2	50	50	100
8	P23MCP303	Mini Project Lab	PC	-	2	4	3	50	50	100
9	P23MCP304	Technical Seminar and Report writing	PC	-	-	4	2	100	-	100
<b>Ability Enhancement Course</b>										
10	P23MCC3XX	Certificate Course-III	AEC	-	-	4	-	100	-	100
<b>III Semester Total Credits/Marks</b>							<b>24</b>	<b>550</b>	<b>450</b>	<b>1000</b>

SEMESTER – IV										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESE	Total
Project Work										
1	P23MCW403	Project Work and Viva-Voce	PW	-	-	-	12	250	250	500
Ability Enhancement Course										
2	P23MCC4XX	Certificate Course-IV	AEC	-	-	4	-	100	-	100
IV Semester Total Credits/Marks							12	350	250	600

#### SEMESTER WISE CREDIT DISTRIBUTION

Semester	I	II	III	IV	Total Credits
Credits	22	22	24	12	80

*\*AEC courses are not included for CGPA calculation*

**Total number of credits required to complete Master of Computer Applications: 80credits**

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**ANNEXURE-A**  
**PROFESSIONAL ELECTIVE COURSES**

Sl. No.	Course Code	Course Title
<b>Professional Elective-1 : Modern Tools, Languages and Frameworks (Offered in Semester II)</b>		
1	P23MCE201	Spring Boot
2	P23MCE202	Selenium
3	P23MCE203	R Language
4	P23MCE204	Ruby
5	P23MCE205	GitHub

<b>Professional Elective-2: Big Data (Offered in Semester III)</b>		
6	P23MCE301	Data Science in Big Data
7	P23MCE302	Big Data Analytics and Applications
8	P23MCE303	Artificial Intelligence and Deep Learning
9	P23MCE304	Cloud Computing and Big Data
10	P23MCE305	Big Data tools and Techniques

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**ANNEXURE –B**  
**ABILITY ENHANCEMENT COURSES**

S. No	Course Code	Course Title	Certified By
1	P23XXCX01	Adobe Photoshop	Adobe
2	P23XXCX13	Cloud Security Foundations	AWS
3	P23XXCX14	Cloud Computing Architecture	AWS
4	P23XXCX15	Cloud Foundation	AWS
5	P23XXCX16	Cloud Practitioner	AWS
6	P23XXCX17	Cloud Solution Architect	AWS
7	P23XXCX18	Data Engineering	AWS
8	P23XXCX19	Machine Learning Foundation	AWS
9	P23XXCX21	Advance Programming Using C	CISCO
10	P23XXCX22	Advance Programming Using C ++	CISCO
11	P23XXCX23	C Programming	CISCO
12	P23XXCX24	C++ Programming	CISCO
13	P23XXCX25	CCNP Enterprise: Advanced Routing	CISCO
14	P23XXCX26	CCNP Enterprise: Core Networking	CISCO
15	P23XXCX27	Cisco Certified Network Associate - Level 2	CISCO
16	P23XXCX28	Cisco Certified Network Associate- Level 1	CISCO
17	P23XXCX29	Cisco Certified Network Associate- Level 3	CISCO
18	P23XXCX30	Fundamentals Of Internet of Things	CISCO
19	P23XXCX31	Internet Of Things / Solar and Smart Energy System with IoT	CISCO
20	P23XXCX32	Java Script Programming	CISCO
21	P23XXCX33	NGD Linux Essentials	CISCO
22	P23XXCX34	NGD Linux I	CISCO
23	P23XXCX35	NGD Linux II	CISCO
24	P23XXCX36	Advance Java Programming	Ethnotech
25	P23XXCX37	Android Programming / Android Medical App Development	Ethnotech
26	P23XXCX38	Angular JS	Ethnotech
27	P23XXCX41	Corel Draw	Ethnotech
28	P23XXCX42	Data Science Using R	Ethnotech
29	P23XXCX43	Digital Marketing	Ethnotech
30	P23XXCX44	Embedded System Using C	Ethnotech
31	P23XXCX45	Embedded System with IOT / Arduino	Ethnotech
32	P23XXCX51	Machine Learning / Machine Learning for Medical Diagnosis	Ethnotech

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33	P23XXCX52	IOT Using Python	Ethnotech
34	P23XXCX53	Creo (Modelling & Simulation)	Ethnotech
35	P23XXCX55	Software Testing	Ethnotech
36	P23XXCX64	Agile Methodologies	IBM
37	P23XXCX65	Block Chain	IBM
38	P23XXCX66	Devops	IBM
39	P23XXCX67	Artificial Intelligence	ITS
40	P23XXCX68	Cloud Computing	ITS
41	P23XXCX69	Computational Thinking	ITS
42	P23XXCX70	Cyber Security	ITS
43	P23XXCX71	Data Analytics	ITS
44	P23XXCX72	Databases	ITS
45	P23XXCX73	Java Programming	ITS
46	P23XXCX74	Networking	ITS
47	P23XXCX75	Python Programming	ITS
48	P23XXCX76	Web Application Development (HTML, CSS, JS)	ITS
49	P23XXCX77	Network Security	ITS & Palo alto
50	P23XXCX78	MATLAB	MathWorks
51	P23XXCX79	Azure Fundamentals	Microsoft
52	P23XXCX80	Azure AI (AI-900)	Microsoft
53	P23XXCX81	Azure Data (DP -900)	Microsoft
54	P23XXCX82	Microsoft 365 Fundamentals (SS-900)	Microsoft
55	P23XXCX83	Microsoft Security, Compliance and Identity (SC-900)	Microsoft
56	P23XXCX84	Microsoft Power Platform (PI-900)	Microsoft
57	P23XXCX85	Microsoft Dynamics Fundamentals 365 – CRM	Microsoft
58	P23XXCX86	Microsoft Excel	Microsoft
59	P23XXCX87	Microsoft Excel Expert	Microsoft
60	P23XXCX90	Research Analyst	NISM
61	P23XXCX92	Cyber Security	Palo alto
62	P23XXCX93	Cloud Security	Palo alto
63	P23XXCX97	Associate Artist	Unity
64	P23XXCX98	Certified Unity Programming	Unity
65	P23XXCX99	VR Development	Unity

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Sl. No.	Course Code	Course Title
Skill Enhancement Course-I:		
1.	P23MCS101	1.Communication Skills Lab
		2.Foreign Language/ IELTS-1
		3.Exploring Photoshop
		4.Office Automation Tools
Skill Enhancement Course-II:		
1.	P23MCS102	1.Aptitude

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**ANNEXURE – C**  
**BRIDGE COURSES**

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# BRIDGE COURSE FOR MCA

## SYLLABUS

P20MCB001	FUNDAMENTALS OF MATHEMATICES	L	T	P	C	Hrs
		0	30	0	0	30
Course Objectives						
<ul style="list-style-type: none"><li>To Improve the basic mathematical, logical skills and concepts.</li></ul>						
<ul style="list-style-type: none"><li>It includes computation using Integers, fractions and decimals.</li></ul>						
<ul style="list-style-type: none"><li>To overview of Set Theory, Matrices, Logics and Combinations.</li></ul>						
Course Outcomes						
After completion of the course, the students will be able to						
CO1- To learn fundamental properties and set theory.						
CO2- To learn method for Solving Logical Skills and Matrices.						
CO3- To learn the Mathematical Logics and Combinations.						
UNIT-I SET THEORY						
Introduction – Basic concepts and Notation – Cartesian products – Set operations – Relation – Types of relations – Equivalence class – De Morgan’s Law – Functions.						
UNIT- II MATRICES						
Introduction – Types of Matrices - Rank of a matrix – Characteristic equation of a matrix – Eigen value and Eigen vectors of a matrix – Properties of Eigen value and Eigen vectors- Cayley - Hamilton theorem.						
UNIT- III MATHEMATICAL LOGIC AND COMBINATORICS						
Introduction – propositional logic – propositional equivalence – Tautology implications – NAND and NOR Connectives.						
Permutation and combination – Pigeonhole principle – Mathematical induction.						
Text book						
1. David Makinson, “Sets, Logic and Maths for computing”, Springer Indian reprint, 2011.						
References						
2. Venkataraman. M. K. “Engineering Mathematics”,2 <sup>nd</sup> Edition, Volume-II, National Publishing Company.						
3. T. Veerarajan “Discrete Mathematics with Graph theory & Combinatorics”, Tata McGraw-Hill, New Delhi.						

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P20MCB002	FUNDAMENTALS OF COMPUTERS	L	T	P	C	Hrs
		0	30	0	0	30
Course Objectives						
<ul style="list-style-type: none"><li>To get familiar with the fundamental concepts of Computers.</li><li>To learn fundamentals of Computer network.</li><li>To study benefit and basic of DBMS.</li></ul>						
Course Outcomes						
After completion of the course, the students will be able to						
CO1- Understand the basic knowledge on computer.						
CO2- Understand the basic concepts of Database.						
CO3- Learn the fundamentals of Networks.						
UNIT- I INTRODUCTION TO COMPUTERS						
History of Computers – Block diagram of a Computer – Components of a Computer system –Classification ofcomputers - Hardware – Software – Categories of Software – Operating System – Applications of Computers – Network structure – Internet and its services – Intranet – Study of word processor – Preparation of worksheets.						
UNIT-II INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS:						
Data base Architecture - ACID properties-Data models -ER model-database schema-normalization-types of normalizations, Transaction Management, SQL:DDL,DML,DCL,TCL.						
UNIT- III FUNDAMENTALS OF COMPUTER NETWORKS						
Introduction to Network- Network topology-OSI layer-protocol-Transmission media -Network Device-IP address-port, sockets-TCP, UDP, DNS.						
Text Books						
<ol style="list-style-type: none"><li>V.Rajaram, Neeharika Adabala: Fundamentals of computers, Prentice Hall India Learning Private Limited: 6<sup>th</sup> Revision Edition, 2014.</li><li>Silberschatz, Korth, Sudarshan, Database System Concepts, 4<sup>th</sup> Edition McGraw-Hill Higher Education, International Edition, 2002.</li><li>Andrews S. Tanenbaum, Computer Networks, Prentice Hall of India Private Limited. (4<sup>th</sup> Edition), 2003.</li></ol>						

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P20MCB003	INTRODUCTION TO PROBLEM SOLVING	L	T	P	C	Hrs
		0	30	0	0	30
Course Objectives						
<ul style="list-style-type: none"><li>To get familiar with various problem solving techniques.</li><li>To impart the basic concepts of data structures and its terminologies.</li><li>To understand concepts about stack and queue operations.</li><li>To understand basic concepts about linked list and its various operations.</li></ul>						
Course Outcomes						
After completion of the course, the students will be able to						
CO1 – State the fundamentals of data structures and complexity analysis.						
CO2 – Relate the operations involved in stack, queue and linked list.						
CO3 – Categorize the different sorting searching and merging algorithms.						
UNIT-I INTRODUCTION TO PROBLEM SOLVING						
Problem solving techniques – Program – Program development cycle – Algorithm design – Flowchart - Pseudo code - Top-down design – program verification – Algorithms: Definition, Pseudocode Representation – Time complexity and space complexity - efficiency & analysis of algorithms.						
UNIT -II DATA STRUCTURES: BASIC TERMINOLOGIES						
Arrays: one dimensional & multidimensional array – Searching: Linear, Binary Sorting: General sort, Bubble sort, Insertion sort - Merging.						
UNIT -III INTRODUCTION TO STACK AND QUEUE						
Stacks: Representation - Operations – Applications. Queues: Representation – Operations – Applications. Linked List: Single Linked List, Double Linked List, Circular Linked List.						
Text Books						
<ol style="list-style-type: none"><li>R. G. Dromey, How to Solve it by Computer, Pearson Education India; 1<sup>st</sup> Edition, 2006.</li><li>Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Illustrated Edition, Computer Science Press, 2018.</li><li>Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.</li></ol>						

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P20MCB004	INTRODUCTION TO COMPUTER PROGRAMMING	L	T	P	C	Hrs
		0	30	0	0	30
Course Objectives						
<ul style="list-style-type: none"><li>Students will gain a thorough understanding of the fundamentals of C programming</li><li>Students will be able to code, compile and test C programs.</li><li>Students be able to take up Application oriented C programming.</li></ul>						
Course Outcomes						
After completion of the course, the students will be able to						
CO1- Exhibit the various types of control flow in C language						
CO2- Illustrate the effective usage of arrays, Strings and functions in C.						
CO3- Demonstrate the implementation of structures pointers and file access methods.						
UNIT - I INTRODUCTION TO PROGRAMMING PARADIGMS						
Structure of C program - C programming: Data, Data name, Data Types — Storage classes - Constants - Keywords — Operators - Expressions - Input/output statements — Decision making statements - Switch statement - Looping statement.						
UNIT - II INTRODUCTION TO ARRAYS, STRINGS AND FUNCTION:						
Declaration, Initialization – One dimensional array – Two dimensional arrays – String operations: length, compare, concatenate and copy – Introduction to functions: Function prototype, function definition, function call,Built-in functions (string functions, math functions) – Recursive function.						
UNIT – III USER DEFINED DATA TYPES AND FILES						
Structure - Nested structures – Array of structures – typedef, Union, Pointer – Files – Create, Open, Close, and Processing of file content.						
Text Books						
<ol style="list-style-type: none"><li>E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill Publishing, Eighth Edition, 2019.</li><li>Reema Thareja, Programming in C, Oxford University Press, Second Edition, 2016.</li><li>Kernighan, B.W and Ritchie, D.M., The C Programming Language, Pearson Education, Second Edition,2006.</li></ol>						

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P20MCB005	FUNDAMENTALS OF COMPUTER ORGANIZATION AND OPERATING SYSTEMS	L	T	P	C	Hrs
		0	30	0	0	30

### Course Objectives

- To get familiar with the fundamental concepts of Computer Organization.
- To learn the fundamentals of Computer Architecture.
- To study the fundamentals of Operating Systems.

### Course Outcomes

After completion of the course, the students will be able to

CO1- Gain basic knowledge on Computer Organization.

CO2- Understand the basic concepts of Computer Architecture.

CO3- Learn the fundamentals of Operating Systems.

### UNIT I

**Basic Structures of Computer organization:** Functional Units- Multiprocessors and Multicomputer- Memory Locations and Addresses- Memory operations- Instructions and Instruction Sequencing- Addressing modes- Assembly Language- Basic Input/output operations- Stacks and Queues- Subroutines- Shift and rotate Instructions- Byte-Sorting program.

### UNIT II

**Memory Organization and Processor Architecture:** Memory hierarchy – main memory – auxiliary memory – Associate memory – Cache memory – Virtual memory. I/O organization-Advanced processor Architecture.

### UNIT III:

**Operating Systems:** Introduction- Mainframe Systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems - Real Time Systems – Hardware Protection – System Components – Handheld Systems - Operating System Services – System Calls – System Programs - Process Concept –Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication.

**Threads:** Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - The Critical-Section Problem–Semaphores

### TEXT BOOKS

1. M. Morris Mano, "Computer System Architecture", Prentice-Hall of India, Pvt. Ltd., Third edition, 2007.
2. V.Rajaraman and T. Radhakrishnan, "Computer Organization and Architecture", 4<sup>th</sup> Edition, PHI Learning Pvt. Ltd., 2011.
3. William Stallings "Computer Organization and Architecture", Prentice-Hall of India, Pvt. Ltd., Seventh edition, 2005.
4. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", fifth edition, Tata McGrawHill Education, 2011.
5. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons (ASIA) Pvt. Ltd, Seventh edition, 2005.
6. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, "Operating Systems", Prentice Hall, Third edition, 2003

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# SEMESTER - I

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Department	MCA			Programme: MCA							
Semester	I			Course Category Code: PC		*End Semester Exam Type: TE					
Course Code	P23MAT107			Periods / Week		Credit	Maximum Marks				
Course Name	MATHEMATICAL FOUNDATION OF COMPUTER APPLICATIONS			L	T	P	C	CAM	ESE	TM	
	(Common to MCA Branches)			3	1	0	4	40	60	100	
Prerequisite	Knowledge in Basic Mathematics										
Course Outcome	On completion of the course, the students will be able to									BT Mapping (Highest Level)	
	CO1	Understand the basic concept of Matrices.									K2
	CO2	Know the Applications of Set Theory									K2
	CO3	Understand and apply the basic concepts of logics.									K3
	CO4	Determine the different types of grammars in Automata.									K3
	CO5	Gain knowledge in testing the logic of a DFA, NFA.									K3
UNIT-I	MATRICES										
Matrices – Rank of a Matrix – Solving systems of Equations – Eigen values and Eigen vecrtors – Cayley – Hamilton Theorem – Inverse of a matrix.										Periods: 12	CO1
UNIT-II	BASIC SET THEORY										
Basic definition – Venn diagrams and set operations – Laws of set theory – Principle of inclusion and exclusion- Partitions – Permutation and Combination – Relations – Properties of relations – Matrices of relations- Closure operations on relations – Functions – Injective, surjective and objectives function.										Periods: 12	CO2
UNIT-III	MATHEMATICAL LOGIC										
Propositions and logical operations - Truth table – propositions generated by a set – Equivalence and implication – Basic laws – Some more connectives – Functionally complete set of connectives – Normal forms- Proofs in propositional calculus – predicate calculus.										Periods: 12	CO3
UNIT-IV	FORMAL LANGUAGES										
Language and Grammars – Phrase structure, grammar- Classification of grammars – Pumping lemma for regular languages – Context free languages.										Periods: 12	CO4
UNIT-V	FINITE STATE AUTOMATA										
Finite State Automata – Deterministic Finite State Automata(DFA) – Nondeterministic Finite State Automata (NFA) – Equivalence of DFA and NFA – Equivalence of NFA and Regular Languages.										Periods: 12	CO5
Lecture Periods: 45		Tutorial Periods:15		Practical Periods: -		Total Periods: 60					
Text Books											
1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw Hill, 4th Edition,2002											
2. Sengadir, "Discrete Mathematics and Combinatorics" Pearson Education, New Delhi 2009											
3. Trembly, J.P and Manohar. R, "Discrete Mathematical Structures with Applications to computer Science" ,2017											
4. Venkatraman. M.K, "Engineering Mathematics", 2nd edition, National Publication Company, 1989											
Reference Books											
1. David Makinson, "Sets, Logic and Maths for Computing", Springer IndianReprint, 2011.											
2. Grimaldi, R.P and Ramana, B.V. "Discrete and Combinatorial Mathematics" ,5th Edition, Pearson Education, 2006											
3. Hopcroft J. Eand Ullaman, J.D, "Introduction to Automata Theory, languages and Computation", Narosa Publishing House, Delhi,2002.											
Web References											
1. <a href="https://www.coursera.org/specializations/discrete-mathematics">https://www.coursera.org/specializations/discrete-mathematics</a>											
2. <a href="https://en.wikipedia.org/wiki/Discrete_mathematics">https://en.wikipedia.org/wiki/Discrete_mathematics</a>											
3. <a href="https://www.tutorialspoint.com/discrete_mathematics/index.htm">https://www.tutorialspoint.com/discrete_mathematics/index.htm</a>											

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### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	1	-	-	-	-	-	-	-	-	1	-	-
2	3	3	2	1	-	-	-	-	-	-	-	1	1	-	-
3	3	3	2	1	-	-	-	-	-	-	-	-	1	-	-
4	3	3	2	1	1	-	-	-	-	-	-	-	1	-	-
5	3	3	2	1	1	-	-	-	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA			Programme: MCA							
Semester	I			Course Category Code: PC		*End Semester Exam Type: TE					
Course Code	P23MCT101			Periods / Week		Credit	Maximum Marks				
				L	T	P	C	CAM	ESE	TM	
Course Name	Problem Solving Using C			3	0	0	3	40	60	100	
(Common to _____ MCA _____ Branches)											
Prerequisite	Basic programming concepts and logic										
Course Outcome	On completion of the course, the students will be able to								BT Mapping (Highest Level)		
	CO1	Understand the fundamental concepts of problem-solving and its relevance in computer programming using the C language.								K1	
	CO2	Demonstrate proficiency in writing C programs to solve a variety of real-world and abstract problems, employing decision-making structures and looping constructs.								K2	
	CO3	Apply knowledge of arrays and functions in C to implement data structures and algorithms for efficient problem-solving.								K2	
	CO4	Utilize pointers and dynamic memory allocation to manage complex data structures and optimize memory usage in C programs.								K3	
	CO5	Collaborate with peers to work on team-based problem-solving exercises, fostering effective communication and teamwork.								K3	
UNIT-I	Introduction to Problem Solving and C Basics						Periods: 9				
Logic-Solving Problems- Limits of Computation-, Fundamental Algorithms - Algorithmic Thinking - Algorithms – Software and Programming Languages - Pseudocode & Flow Chart - Understanding the problem-solving process, Overview of the C programming language-Basic syntax - Data types in C-Operators - Input and output operations-Writing C programs to solve basic problems									CO1		
UNIT-II	Decision Making and Looping						Periods: 9				
Control Statement - Conditional statements (if, else if, else), Switch-case-Break-Continue-go to-while loop-do-while loop, -for loop, Nested loops and loop control statements- Problem Solving Exercises using Pseudocode and C code.									CO2		
UNIT-III	Arrays and Functions						Periods: 9				
Introduction to arrays-One-dimensional-Multi-dimensional arrays, Functions-Build In Function- User Defined Function: Declaration-Definition-Invocation-Passing arguments to functions (by value and by reference), Recursive functions - Applications Programs in problem solving									CO3		
UNIT-IV	Strings, Structure, Pointers and Dynamic Memory Allocation						Periods: 9				
String Processing – String Functions – Structure – Structure array - Typedef – Pointers – Union - Dynamic Memory Allocation – Applications using String, Structure and Pointers-Problem Solving with Program.									CO4		
UNIT-V	File Handling and Preprocessor						Periods: 9				
File handling in C: reading and writing files, Command-line arguments in C, Preprocessor directives and macros, Enumerations and structures, Advanced Problem-Solving exercises combining different File I/O Operations.									CO5		
Lecture Periods: 45		Tutorial Periods:		Practical Periods: -			Total Periods: 45				
Text Books											
1. "Programming in Ansi C" by Balagurusamy, 8 <sup>th</sup> Edition – McGrawHill Publication - 2019											
2. "C Programming Absolute Beginner's Guide" by Perry and Miller , Latest Edition: 3rd Edition, Year of Publication: 2014											
3. YashvantKanetkar, "Let us C", BPB Publications, 16th Edition, 2017											
4. Herbert Schildt," C: The Complete Reference", McGraw Hill, FourthEdition,2014											
5. "C Programming for the Absolute Beginner" by Vine , Latest Edition: 3rd Edition ,Year of Publication: 2008											
6. "How to Solve It by Computer- by R.G. Dromey - Prentice-Hall International - 2008											
Reference Books											
1. "C How to Program" by Deitel and Deitel, Latest Edition: 8th Edition Year of Publication: 2015											
2. "Programming in C" by Kochan ,Latest Edition: 4th Edition Year of Publication: 2014											
3. "Understanding and Using C Pointers" by Reese Latest Edition: 1st Edition Year of Publication: 2013											
Web References											
<a href="https://www.geeksforgeeks.org/">https://www.geeksforgeeks.org/</a>											
<a href="https://www.studocu.com/in/document/bengaluru-north-university/bca/problem-solving-techniques-using-c/16264070">https://www.studocu.com/in/document/bengaluru-north-university/bca/problem-solving-techniques-using-c/16264070</a>											
<a href="https://www.learn-c.org/">https://www.learn-c.org/</a>											
<a href="https://www.tutorialspoint.com/cprogramming/index.htm">https://www.tutorialspoint.com/cprogramming/index.htm</a>											
<a href="https://www.codecademy.com/learn/learn-c">https://www.codecademy.com/learn/learn-c</a>											
<a href="https://stackoverflow.com/">https://stackoverflow.com/</a>											

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### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	1	-	-	2	-	-	-	-	-	-	-	1	-	1
3	3	2	1	1	3	-	-	-	-	-	-	-	2	1	2
4	3	2	1	1	3	1	1	2	2	2	1	-	2	2	2
5	3	2	1	1	3	2	-	2	2	2	2	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA					Programme : MCA							
Semester	I					Course Category Code: PC		*End Semester Exam Type: TE					
Course Code	P23MCT102					Periods / Week		Credit	Maximum Marks				
						L	T	P	C	CAM	ESE	TM	
Course Name	Advanced Data Base Management Systems					3	0	0	3	40	60	100	
(Common to MCA Branches)													
Prerequisite	Basic Knowledge in Database												
Course Outcome	On completion of the course, the students will be able to										BT Mapping		
											(Highest Level)		
	CO1	Create conceptual data model using Entity Relationship Diagram.										K2	
	CO2	Design conceptual and logical database models for an application.										K1	
	CO3	Normalize relational database design of an application.										K2	
	CO4	Explain the need for Indexing, Hashing and Transactions in the database.										K3	
CO5	Understand the strategies for providing security, privacy, and recovery of data.										K2		
UNIT-I	Introduction												
Database System Application, Purpose of Database Systems, View of Data, Database Languages, Relational Database, Database Design, System Structure, Database Architecture. Database Design and E-R Model: Overview of the Design Process, E-R Model, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R features, Reduction to Relational Schemas, Other aspects of Database Design.										Periods: 9			
										CO1			
UNIT-II	Relational Model												
Structure of Relational Database, Fundamental Relational Algebra Operations, Extended Relational Algebra Operations, Modification of the Database. Structured Query Language: Introduction, Basic Structure of SQL Queries, Set Operations, Additional Basic Operations, Aggregate Functions, Null Values, Nested Sub queries, Views, Join Expression.										Periods: 9			
										CO2			
UNIT-III	Relational Database Design												
Features of Good Relational Designs, 1NF, 2NF, 3NF and 4NF with Examples. Atomic Domains and first Normal form, Decomposition using Functional Dependencies, Functional Dependency Theory, Algorithm for Decomposition, Decomposition using Multivalued Dependencies.										Periods: 9			
										CO3			
UNIT-IV	Indexing, Hashing And Transaction Management												
Basic Concepts, Ordered Indices, B+ Tree Index Files, B-Tree Files, Multiples – Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing , Bitmap Indices. Transaction Management: Transaction concept, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation and Atomicity, Serializability, Recoverability, Transaction Isolation Levels, Implementation of Isolation Levels.										Periods: 9			
										CO4			
UNIT-V	Query Processing and Concurrency Control												
Query Processing: Measures of Query Cost- Selection Operation- Sorting-Join Operation- Other Operations- Evaluation of Expressions.Query optimization: Overview -Transformation of Relational Expressions- Estimating Statistics of Expression Results- Choice of Evaluation PlanConcurrency Control: Lock Based Protocols, Timestamp Based Protocols -Validation Based Protocols.Recovery System: Failure Classification, Remote Backup Systems.										Periods: 9			
										CO5			
Lecture Periods: 45			Tutorial Periods: 15			Practical Periods: -			Total Periods: 45				
Text Books													
1. Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts 7th Edition, McGraw-Hill International Edition, 2019.													
2. RamezElmasri and ShamkantNavathe, Durvasula V L N Somayajulu, Shyam K Gupta, "Fundamentals of Database Systems", Pearson Education, United States of America, 2018.													
Reference Books													
1. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System, 8th Edition, Pearson Education-2006.													
2. Raghu Ramakrishna, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill, 2014.													
3. RamezElmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, 7th Edition, Pearson Education, 2016.													
Web References													
1. <a href="https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm">https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm</a> MySQL Online Documentation													
2. <a href="http://dev.mysql.com/doc/">http://dev.mysql.com/doc/</a>													
3. <a href="http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf">http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf</a>													

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### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	2	-	-	-	-	-	-	-	-	2	-	-
2	2	2	2	2	-	-	-	-	-	-	-	-	2	-	-
3	2	2	2	2	-	-	-	-	-	-	-	-	2	-	-
4	2	2	2	2	-	-	2	1	-	1	-	-	2	2	2
5	2	3	3	2	-	-	2	1	-	1	-	2	2	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA		Programme: MCA							
Semester	II		Course Category Code: PC		*End Semester Exam Type: TE					
Course Code	P23MCT103		Periods / Week			Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM	
Course Name	Advanced Operating Systems		3	0	0	3	40	60	100	
(Common to _____ MCA _____ Branches)										
Prerequisite	Fundamentals of Basic Operating Systems									
Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)		
	CO1	Understand the fundamental concepts and functions of modern operating systems.							K1	
	CO2	Analyze and compare different process scheduling algorithms, explaining their advantages and disadvantages in various scenarios.							K2	
	CO3	Analyze real-world operating systems and identify their key components and architectural designs.							K2	
	CO4	Evaluate the design and organization of file systems, discussing their performance and security implications.							K2	
	CO5	Understand the challenges and solutions in distributed systems and virtualization technologies.							K2	
UNIT-I	Introduction to Operating Systems					Periods: 9				
Definition and purpose of an operating system, Functions and components of an operating system, History and evolution of operating systems, Types of operating systems (real-time, batch, multi-user, etc.), Operating system architectures								CO1		
UNIT-II	Process and Thread Management					Periods: 9				
Process concept and process control block, Process scheduling algorithms (e.g., FCFS, SJF, Round Robin), Multithreading and thread management, Thread synchronization and communication, Inter process communication (IPC) mechanisms								CO2		
UNIT-III	Memory Management					Periods: 9				
Virtual memory and address translation, Paging and segmentation, Memory allocation techniques (e.g., buddy system, slab allocation), Memory protection and sharing, Memory management in multiprocessor systems.								CO3		
UNIT-IV	File Systems and Storage					Periods: 9				
File system concepts and organization, File system implementation and data structures, Disk management and storage technologies, File system security and access control, Introduction to solid-state drives (SSDs) and storage virtualization								CO4		
UNIT-V	Distributed Systems and Virtualization					Periods: 9				
Distributed operating systems and their challenges, Communication and synchronization in distributed systems, Distributed file systems and naming, Virtual machines and hypervisors, Cloud computing and virtualization technologies								CO5		
Lecture Periods: 45		Tutorial Periods:		Practical Periods: -		Total Periods: 45				
Text Books										
1. "Operating System Concepts" by Abraham Silberschatz, Peter B. Galvin, and Greg Gagne Latest Edition: 10th Edition,Year of Publication: 2018 2. "Modern Operating Systems" by Andrew S. Tanenbaum and Herbert Bos,Latest Edition: 4th Edition,Year of Publication: 2014 3. "Operating Systems: Three Easy Pieces" by Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau,Latest Edition: update Edition (There may be newer editions available by now),Year of Publication: 2021										
Reference Books										
1. "Operating Systems Principles" by Lubomir F. Bic and Alan C. 2. William Stallings, "Operating Systems: Internals and Design Principles," 6th Ed., Pearson,Publication Year: 2008 3. Nutt G.J., "Operating Systems," 3rd Ed., Pearson Education.,Publication Year: 2004 4. Silberschatz, Galvin, & Gagne, "Operating System Concepts," 8th Ed., Wiley,Publication Year: 2008 5. Tanenbaum A.S., "Modern Operating Systems," 3rd Ed., Prentice Hall.Publication Year: 2008										

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**Web References**

1. <https://www.os-book.com/>
2. <https://www.kernel.org/>
3. <https://docs.microsoft.com/en-us/windows/>
4. <https://www.pdfdrive.com>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	-
2	3	2	1	1	3	-	-	-	-	-	-	-	2	2	-
3	2	1	-	-	3	-	-	-	-	-	-	-	2	2	1
4	3	2	1	1	3	-	-	-	-	-	-	-	2	2	1
5	2	1	-	-	3	-	-	-	-	-	-	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA			Programme : MCA							
Semester	I			Course Category Code: CC		*End Semester Exam Type: TE					
Course Code	P23MST115			Periods / Week		Credit	Maximum Marks				
Course Name	ACCOUNTING AND FINANCIAL MANAGEMENT			L	T	P	C	CAM	ESE	TM	
				3	0	0	3	40	60	100	
Prerequisite	Basic programming concepts and logic										
Course Outcome	On completion of the course, the students will be able to								BT Mapping (Highest Level)		
	CO1	Understand the fundamentals of accounting and the significance of Financial Statements							K2		
	CO2	Demonstrate knowledge and understanding of the applications of mathematics in finance							K3		
	CO3	Conduct Financial Analysis and use the outcome in making informed decisions in investing							K4		
	CO4	Appreciate various sources of procurement of funds in business and their critical evaluation							K3		
	CO5	Know how to determine the investing in long-term and short-term assets in business.							K3		
UNIT-I	UNDERSTANDING THE FUNDAMENTALS						Periods: 9				
Accounting - Meaning – Objectives- Branches of Accounting: Financial, Cost and Management Accounting. Accounting Concepts - Types of Accounts- Asset and Liability - Types - Accounting equation. Understanding Basic Accounting Records– Journal – Ledger – Trial Balance – Basics of Final accounts preparations - Income statement and Balance Sheet.										CO1	
UNIT-II	MATHEMATICS OF FINANCE						Periods: 9				
Meaning of Finance –Financial Planning and Decisions - Time Value of Money – Principles of Compounding and Discounting – Computation of Present Value and Future Value for single, annuity and uneven cash flow. Concept of Risk and Return –Trade-off – Concepts of Debt and Equity – Need for Equity in Business – Pros and Cons of Debt Capital – Concept of Tax Benefit in Debt – Concept of Inflation – Significance of factoring Inflation in Financial Decisions.										CO2	
UNIT-III	FINANCIAL ANALYSIS						Periods: 9				
Financial Analysis - Meaning and Objectives – Annual Report As an Input for Analysis - Types of Financial Analysis – Horizontal Analysis – Vertical Analysis – Trend Analysis – Ratio Analysis - Significance of Ratio Analysis in Decision-making – Computation of Key Ratios - Liquidity Ratios – Profitability Ratios – Activity ratio and Financial ratios.										CO3	
UNIT-IV	FUNDS PROCUREMENT						Periods: 9				
Meaning of Funds – Sources of Funds – Long-Term Sources – Short-Term Sources – Spontaneous sources - Capital Structure – Need and Importance of Capital Structure – Determining Optimum Capital Structure – Concept and Computation of Earnings Before Interest and Tax (EBIT), Earnings Before Tax (EBT), and Earnings After Tax (EAT) - Leverage in Finance – Types and computation of Leverages – Operating Leverage, Financial Leverage, and Combined Leverage (Simple problems).										CO4	
UNIT-V	FUNDS DEPLOYMENT						Periods: 9				
Investment Decisions – Types - Long term investment decisions- Pay-Back Period Method, Net Present Value Method and Benefit-Cost Ratio Method. Short-Term Investment Decisions –Working Capital – Need and Importance of Working Capital– Determinants of Working Capital– Working Capital Financing. Components of Working Capital – Cash, Receivables and Inventory. Dividends: Concept and Meaning – Implications of Dividend Decisions on Liquidity Management – Investing the Surplus: Principles and Methods.										CO5	
Lecture Periods: 45			Tutorial Periods: -			Practical Periods: -			Total Periods: 45		
Text Books											
1.S. Jayapandian, Accounting for Managers – Effective Techniques for Decision-making, Ane Books (3rd revised edition)											
2. R. Narayanaswamy, Financial Accounting – A managerial perspective, PHI Learning, New Delhi. (2015 or later edition)											
3. C. Paramasivan and T. Subramanian. Financial Management. New Age International, New Delhi. (2015 or later edition)											

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**Reference Books**

1. S.N. Maheswari, Sharad K. Maheswari & Suneel K. Maheswari. Accounting For Management. Vikas Publishing (2017 or later edition)
2. Varun Dawar & Narendar L. Ahuja. Financial Accounting and Analysis. Taxmann Publications. (2018 or later edition)
3. Athma. P. Financial Accounting and Analysis. Himalaya Publishing House. (2017 or later edition)
4. M.Y. Khan and P.K. Jain. Financial Management. Tata-McGraw Hill Publishers, New Delhi. (2019 or later edition)
5. I.M. Pandey. Financial Management. Vikas Publishing House, New Delhi. (2015 or later edition)
6. Prasanna Chandra. Financial Management. Tata-McGraw Hill Publishers, New Delhi. (2019 or later edition)
- S.C. Kuchhal. Financial Management. Chaitanya Publishing House, Allahabad. (2014 or later edition)

**Web References**

1. <http://www.annualreports.com/>
2. <http://www.mmachennai.org/>
3. <https://icmai.in/icmai/>
4. <https://nptel.ac.in/courses/110/107/110107144/>
5. [https://web.utk.edu/~jwachowi/wacho\\_world.html](https://web.utk.edu/~jwachowi/wacho_world.html)
6. <https://www.icai.org/indexbkb.html>
7. <https://www.icsi.edu/home/>
8. <https://www.investopedia.com/>
9. <https://www.moneycontrol.com/>
10. <https://www.rbi.org.in/>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	2	3	-	-	1	2	1	2
2	3	2	2	1	-	1	1	3	1
3	3	2	-	-	-	2	1	2	1
4	1	2	-	3	-	-	3	3	-
5	3	2	1	-	-	2	2	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA		Programme : MCA						
Semester	I		Course Category Code: PC			*End Semester Exam Type: TE			
Course Code	P23MCP101		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Advanced C Programming Lab			0	3	2	50	50	100
(Common to MCA Branches)									
Prerequisite	Basic programming concepts and logic								
Course Outcome	On completion of the course, the students will be able to							BT Mapping	
								(Highest Level)	
	CO1	Implement Basic programming with logic.							
	CO2	Develop a program with Control statement.							
	CO3	Develop a coding to gain knowledge in Array.							
	CO4	Implementation of Functions and Pointers.							
CO5	Implementation of File applications.								
List of Experiments:									
<div>1. Write a C program that checks if a given year is a leap year or not.</div> <div>2. Create a C program that prints the multiplication table of a given number.</div> <div>3. Write a C program to generate the Fibonacci series using a do-while loop.</div> <div>4. Create a C program to check if a given number is a prime number using a while loop.</div> <div>5. Create a C program that takes a number as input and prints its binary representation using a switch-case statement.</div> <div>6. Implement a C program to find the sum and average of elements in an array using a function.</div> <div>7. Write a C program that finds the largest and smallest elements in an array using functions.</div> <div>8. Create a C program that checks if a given array is sorted in ascending order using a function.</div> <div>9. Create a C program to swap two numbers using pointers.</div> <div>10. Create a C program to find the factorial of a given number using recursion.</div> <div>11. Write a C program to implement a Digit to Base Conversion.</div> <div>12. Implement a C program to find the Product of NXN Matrices.</div> <div>13. Implement a C program that reads data from a file and finds the average of the numbers.</div> <div>14. Write a C program to count the occurrences of a specific word in a text file.</div> <div>15. Implement a C program that solves the N-Queens problem using backtracking.</div>									
Lecture Periods:			Tutorial Periods:			Practical Periods: - 45		Total Periods: 45	
Reference Books									
<div>a) Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, 8thEdition,2019.</div> <div>b) YashvantKanetkar, "Let us C", BPB Publications, 16th Edition, 2017</div> <div>c) Herbert Schildt," C: The Complete Reference", McGraw Hill, FourthEdition,2014</div> <div>d) Perry and Miller "C Programming Absolute Beginner's Guide" Latest Edition: 3rd Edition, Year of Publication: 2014</div> <div>e) Vine, Latest Edition: "C Programming for the Absolute Beginner" by 3rd Edition ,Year of Publication: 2008</div> <div>f) Deitel and Deitel "C How to Program" by, Latest Edition: 8th Edition Year of Publication: 2015</div> <div>g) Reese "Understanding and Using C Pointers" by Latest Edition: 1st Edition Year of Publication: 2013</div>									
Web References									
<div>1. <a href="https://www.codechef.com/c-programming">https://www.codechef.com/c-programming</a></div> <div>2. C Tutorial - Learn C Programming Language (geeksforgeeks.org)</div> <div>3. <a href="https://www.geeksforgeeks.org/c-programming-language">https://www.geeksforgeeks.org/c-programming-language</a></div> <div>4. <a href="https://blog.feedspot.com/c_programming_blogs">https://blog.feedspot.com/c_programming_blogs</a></div>									

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### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	-	-	-	-	-	1	-	2	2	3	3
CO2	2	2	2	1	-	-	-	-	-	1	-	2	2	2	2
CO3	2	2	2	1	-	-	-	-	-	1	-	2	3	3	3
CO4	2	3	3	2	-	-	-	-	-	1	-	2	2	2	3
CO5	2	3	3	2	-	-	-	-	-	1	-	2	2	3	3

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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Department	MCA		Programme : MCA						
Semester	I		Course Category Code: PC			*End Semester Exam Type: LE			
Course Code	P20MCP103		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Operating System Lab			0	3	2	50	50	100
(Common to MCA Branches)									
Prerequisite	Basic programming concepts and logic								
Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)	
	CO1	Demonstrate the fundamental of UNIX commands & shell programs and UNIX system calls.						K3	
	CO2	Apply the scheduling algorithms for the given problem.						K3	
	CO3	Apply the process synchronous concept using semaphore and apply an algorithm to avoid dead lock.						K3	
	CO4	Apply the various methods in memory allocation and page replacement algorithm.						K3	
	CO5	Demonstrate the various operations of file system.						K3	
List of Experiments:									
1. Demonstration of UNIX Commands 2. Programs using Shell Programming 3. Implementation of UNIX System Calls 4. Simulation and Analysis of Non pre-emptive and Pre-emptive CPU Scheduling Algorithms 5. Simulation of Producer – Consumer Problem using Semaphores 6. Implementation of Dining Philosopher’s Problem to demonstrate Process Synchronization 7. Simulation of Banker’s Algorithm for Deadlock Avoidance 8. Analysis and Simulation of Memory Allocation and Management Techniques 9. Implementation of Page Replacement Techniques 10. Simulation of Disk Scheduling Algorithms									
Lecture Periods:		Tutorial Periods:		Practical Periods: - 45			Total Periods: 45		
Reference Books									
1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition, 2017. 2. Gary Nutt, “Operating Systems- A Modern Perspective”, Pearson Education Pvt. Ltd, Second Edition, 2013. 3. Andrew S. Tanenbaum, “Modern Operating Systems”, 3rd edition Prentice Hall of India Pvt. Ltd, 2015. 4. Charles Patrick Crowley, “Operating System: A Design-oriented Approach” Tata McGraw - Hill Edition 1998 21st reprint, 2009 .									
Web References									
1. <a href="https://www.geeksforgeeks.org/operating-systems/">https://www.geeksforgeeks.org/operating-systems/</a> 2. <a href="http://www.inf.ed.ac.uk/teaching/courses/os/prac/">http://www.inf.ed.ac.uk/teaching/courses/os/prac/</a> 3. <a href="http://www.scribd.com/doc/7137624/OS-Practical-File/">http://www.scribd.com/doc/7137624/OS-Practical-File/</a> 4. <a href="http://www.cl.cam.ac.uk/freshers/raspberrypi/tutorials/os/introduction.html/">http://www.cl.cam.ac.uk/freshers/raspberrypi/tutorials/os/introduction.html/</a>									

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### CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	-	-
2	3	2	1	1	3	-	-	-	-	-	-	-	2	2	-
3	3	2	1	1	3	-	-	-	-	-	-	-	2	2	1
4	3	2	1	1	3	-	-	-	-	-	-	-	2	2	1
5	3	2	1	1	3	-	-	-	-	-	-	-	2	2	1

Correlation Level: 1-Low, 2-Medium, 3- High

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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**CERTIFICATE COURSE-I**

L	T	P	C	Hrs
0	0	4	-	50

Students shall choose an international certification course offered by the reputed organizations like Google, Microsoft, IBM and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

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Department	MCA	Programme: MCA						
Semester	I	Course Category Code: AEC				*End Semester Exam Type: TE		
Course Code	P23ENS101	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Skill Enhancement Course- 1 COMMUNICATION SKILLS LAB	0	0	4	0	100	-	100
(Common to MCA Branches)								
Prerequisite	Basic Knowledge in English Communication							
Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)
	CO1	Promote efficacies in language skills to attend International standardized test						K1
	CO2	Develop LSRW skills competently to progress in professional environment						K2
	CO3	Write the descriptive essay coherently and cohesively						K3
	CO4	Express ideas with confidence and inculcate interview skills						K3
	CO5	Apply the techniques of verbal aptitude in competitive exams						K2
UNIT-I	WRITING							
Listening: Listening Comprehension (IELTS) – Speaking: Extempore, Team Presentation - Reading: Reading from technical and non-technical passages (TOEFL) - Writing: Essay writing (TOEFL)								CO1
UNIT-II	READING							
Listening: Listening and responding to Video lectures/ Talks - Speaking: Speech based on reading & listening task (TOEFL) - Reading: Reading newspaper and magazine to share one's perspectives - Writing: Letter Writing based on situation (IELTS)								CO2
UNIT-III	LISTENING AND SPEAKING							
Listening: Hearing, Speech sounds to overcome Mother Tongue Influence Speaking: Etiquettes- Definition- Types- Telephone- Dining- Workplace- Meeting Reading: Tweeting & Blogging, Writing: Narration & Description- Collocation- Intensifiers- Redundancy- Euphemism								CO3
UNIT-IV	IELTS							
Listening: Listening to Interview and Group Discussion videos Speaking: Mock Interview– Personal & Telephone Reading: Cause and Effect Writing: Describing chart/ bar diagram (IELTS)								CO4
UNIT-V	APTITUDE							
Verbal Aptitude (Specific for Competitive Exams)								CO5
Lecture Periods: -		Tutorial Periods:-		Practical Periods: - 30		Total Periods: 30		
Reference Books								
1. Cullen, Pauline, Amanda French, and Vanessa Jakeman. "The official Cambridge guide to IELTS for academic & general training".Cambridge, 2014. 2. Jeff Butterfield, —Soft Skills for Everyone, Cengage Learning, New Delhi, 2013. 3. Agarwal, R. S. "A Modern Approach to Verbal & Non Verbal Reasoning". S. Chand, 2010. 4. Loughed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008.								
Web References								
1. <a href="https://www.toppr.com/guides/business-correspondence-and-reporting/communication/barriers-in-communication/">https://www.toppr.com/guides/business-correspondence-and-reporting/communication/barriers-in-communication/</a> 2. <a href="https://www.yourarticlelibrary.com/human-resources/emotional-quotient-meaning-definition-components-and-benefits/32401">https://www.yourarticlelibrary.com/human-resources/emotional-quotient-meaning-definition-components-and-benefits/32401</a> 3. <a href="https://www.hamilton.edu/academics/centers/oralcommunication/guides/spoken-language-vs-written-language">https://www.hamilton.edu/academics/centers/oralcommunication/guides/spoken-language-vs-written-language</a> 4. <a href="https://www.toppr.com/guides/business-communication-and-ethics/intro-to-business-communication/telephone-etiquette/">https://www.toppr.com/guides/business-communication-and-ethics/intro-to-business-communication/telephone-etiquette/</a> 5. <a href="https://www.practiceaptitudetests.com/numerical-reasoning-tests/">https://www.practiceaptitudetests.com/numerical-reasoning-tests/</a>								

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# COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	3	-	1	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	1	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	1	-	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	1	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	1	-	-	-

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Department	MCA	Programme: MCA						
Semester	I	Course Category Code: AEC *End Semester Exam Type: TE						
Course Code	P20MCS102	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Skill Enhancement Course – 2 (Aptitude)	0	0	4	-	100	-	100
(Common to MCA Branches)								
Prerequisite	Basic Knowledge in Aptitude							
Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)
	CO1	Promote efficacies to attend aptitude problems						K1
	CO2	Enhance holistic development of aptitude skills and progress in employability skills						K2
	CO3	Practicing with short cut of Problem Solving						K3
	CO4	Excel in Logical Reasoning						K3
	CO5	Inculcate the improving the knowledge in All Aptitude						K3
Course Content								
1. Number System - Basics, Properties & Type of Numbers - Divisibility Rules 2. LCM & HCF - Unit Digit Concept [Cyclicity Method] 3. Decimals, Simplification. Ratio & Proportion - Compounded & Duplicate Ratio - Inverse Ratio - Shortcut to Find Ratio - Continuous Proportion - Mean & Divisibility Proportion. 4. Ages - Both Data is in Ratio or Time Format - One Data in Ratio or Time Format & Other Data in Sum, Difference or Product 5. Logical [Puzzles] Method. 6. Average - Basics & Finding Average in Complex - Replacement & Alteration Method - Average Speed Finding Problems. 7. Allegation & Mixtures 8. Ratio of Mixture - Finding the Kilogram through Ratio 9. Mean Value Method 10. Ratio Mixture [Fraction Method] - Iteration Method.								
Lecture Periods:		Tutorial Periods:		Practical Periods: - 30		Total Periods: 30		
Reference Books								
Dr.R.S.Aggarwal, “Quantitative Aptitude for Competitive Examinations”, S.Chand Publications,2022								
Web References								
1. <a href="https://www.testgorilla.com/numerical/reasoning-test">https://www.testgorilla.com/numerical/reasoning-test</a> 2. Aptitude for Placements - GeeksforGeeks								

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# SEMESTER - II

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Department	MCA			Program: MCA					
Semester	Second			Course Category Code: PC		*End Semester Exam Type: TE			
Course Code	P23MCT201			Periods / Week			Credit	Maximum Marks	
				L	T	P	C	CAM	ESE
Course Name	ADVANCED DATA STRUCTURES AND ALGORITHMS			3	1	0	4	40	60 100
(Common to _____ Branches)									
Prerequisite	Basic knowledge on Data Structure								
Course Outcome	On completion of the course, the students will be able to								BT Mapping (Highest Level)
	CO1	Define the fundamentals of data structures and its operations.							K1
	CO2	Define and describe the operations involved in stack, queue							K2
	CO3	Describe the operation related to linked lists, Trees and Graphs							K2
	CO4	Describe the different sorting, searching and shortest path algorithms.							K3
CO5	Describe Dynamic programming and its algorithms.							K2	
UNIT-I	BASIC Terminologies of Data Structures						Periods: 12		
Introduction: Basic Terminologies: Elementary Data Organizations. Data Structure, Operations: insertion, deletion, traversal. Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Array and its operations. Searching: Linear Search and Binary Search Techniques and their complexity analysis.									CO1
UNIT-II	STACK and queue operations						Periods: 12		
Stacks and Queues: Stack and its operations, Applications of Stacks: Expression Conversion and evaluation. Queue: Types of Queue: Simple Queue, Circular Queue, Priority Queue. Operations on each type of Queues.									CO2
UNIT-III	LINKED List Operations, trees and graphs						Periods: 12		
Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion, Deletion in a linked list, doubly linked list: operations, Circular Linked Lists: operations. Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, Binary Tree Traversals, AVL Tree. Introduction to B-Tree and B+ Tree. Graph: Basic Terminologies and Representations, Graph traversal algorithms.									CO3
UNIT-IV	DIVIDE AND CONQUER, GREEDY METHOD						Periods: 12		
Divide and Conquer method: Solving recurrence relations, Applications- Binary search, Merge sort, Quick sort. Greedy method: General method, applications - Job sequencing with deadlines, Knapsack problem, Minimum cost spanning trees, Single source shortest path problem.									CO4
UNIT-V	DYNAMIC PROGRAMMING						Periods: 12		
Dynamic Programming, Applications - Multistage graphs, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design, Chained Matrix Multiplication, Graph Applications: AND/OR graphs, Connected components, Identification of articulation points, Bi-connected components									CO5
Lecture Periods: 45			Tutorial Periods: 15		Practical Periods: -		Total Periods: 60		
Text Books ((Minimum 2 and maximum 3 – Latest editions to be given)									
1. A Common-Sense Guide to Data Structures and Algorithms, Second Edition: Level Up Your Core Programming Skills 2nd Edition, by Jay Wengrow, Pragmatic Bookshelf Sep 15, 2020									
2. The Bible of Algorithms and Data Structures: A Complex Subject Simply Explained (Runtime Complexity, Big O Notation, Programming) Kindle Edition by Florian Dedov Aug 20, 2020									
Reference Books									
1. Mastering Data Structures and Algorithms: A Comprehensive Guide by Mr Leelkanth Dewangan, Mr PrashantKumar Tamrakar, et al.   Jul 13, 2023									
2. Data Structures and Algorithms in Python by Michael T. Goodrich , Roberto Tamassia, et al.   Mar 18, 2013									
3. Hands-On Data Structures and Algorithms with Python: Store, manipulate, and access data effectively and boost the performance of your applications, 3rd Edition by Dr. Basant Agarwal Jul 29, 2022									
4. The Self-Taught Computer Scientist: The Beginner's Guide to Data Structures & Algorithms 1st Edition by Cory Althoff Oct 1, 2021									
5. Data Structures the Fun Way: An Amusing Adventure with Coffee-Filled Examples by Jeremy Kubica, No Starch Press, Nov 8, 2022									
Web References									
1. <a href="https://www.javatpoint.com/data-structure-tutorial/">https://www.javatpoint.com/data-structure-tutorial/</a>									
2. <a href="https://www.tutorialspoint.com/data_structures_algorithms/">https://www.tutorialspoint.com/data_structures_algorithms/</a>									
3. <a href="https://www.w3schools.in/data-structures-tutorial/intro/">https://www.w3schools.in/data-structures-tutorial/intro/</a>									
4. <a href="https://www.academia.edu/38287655/Design_and_analysis_of_algorithms_tutorial">https://www.academia.edu/38287655/Design_and_analysis_of_algorithms_tutorial</a>									
5. <a href="https://www.geeksforgeeks.org/fundamentals-of-algorithms/">https://www.geeksforgeeks.org/fundamentals-of-algorithms/</a>									

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### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	3	-	-	-	3	-	-	-	3	-	-	3	3
2	2	2	1	-	2	-	2	-	-	-	-	-	2	-	2
3	2	2	2	-	2	-	2	-	-	-	-	-	2	-	2
4	3	3	3	-	3	-	3	-	-	-	3	-	3	-	3
5	2	2	2	-	2	-	2	-	-	-	-	-	2	-	2

Correlation Level: 1 - Low, 2 - Medium,

### 3 – High Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA		Program: MCA							
Semester	II		Course Category Code: PC			*End Semester Exam Type: TE				
Course Code	P23MCT202		Periods / Week			Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM	
Course Name	CYBER SECURITY AND IoT		3	0	0	3	40	60	100	
(Common to _____ Branches)										
Prerequisite	Basic knowledge on networking and cyber security									
Course Outcome	On completion of the course, the students will be able to								BT Mapping (Highest Level)	
	CO1	Define cyber security, IoT and its structure.							K1	
	CO2	Describe about devices and the network structure for IoT.							K1	
	CO3	Describe the security and privacy requirements for IoT.							K3	
	CO4	Describe the deployment methods for IoT.							K2	
	CO5	To understand the legal considerations for cyber security.							K3	
UNIT-I	Introduction to Cyber security, IoT Architecture and Protocols:					Periods: 9				
Overview of cyber security concepts and principles-Introduction to the Internet of Things and its applications- Security implications of IoT deployment-Understanding the architecture of IoT systems-Communication protocols used in IoT, such as MQTT, CoAP, and HTTP-IoT device identification and addressing										CO1
UNIT-II	IoT Device, Network and Communication Security					Periods: 9				
Securing IoT devices: authentication, access control, and encryption-Firmware security and over-the-air (OTA) updates-Physical security considerations for IoT devices-Securing IoT network infrastructure and protocols-Network segmentation and isolation for IoT systems-Protecting IoT data in transit: encryption, VPNs, and secure tunnels										CO2
UNIT-III	IoT Data Security, Privacy and Cloud Security					Periods: 9				
Security and privacy challenges in IoT data collection and storage-Data encryption, anonymization, and pseudonymization techniques-Compliance with data protection regulations (e.g., GDPR)-Securing IoT data storage and processing in the cloud-Identity and access management (IAM) in cloud-based IoT systems-Security considerations for cloud-to-device communication										CO3
UNIT-IV	IoT Threats and Vulnerabilities Secure IoT Deployment and Management					Periods: 9				
Common threats and attack vectors in IoT environments-IoT malware, botnets, and distributed denial-of-service (DDoS) attacks-Vulnerability assessment and penetration testing for IoT systems-Secure provisioning and configuration of IoT devices-IoT lifecycle management: monitoring, patching, and updates-Incident response and recovery in IoT environments										CO4
UNIT-V	Regulatory and Legal Considerations Emerging Trends and Future Directions					Periods: 9				
Overview of relevant cyber security laws and regulations-Privacy and data protection regulations in the context of IoT-Ethical and legal implications of IoT cyber security-Current trends and challenges in IoT and cyber security-Emerging technologies and their impact on IoT security-Industry standards and best practices for secure IoT deployments										CO5
Lecture Periods: 45			Tutorial Periods: -		Practical Periods: -		Total Periods: 45			
Text Books ((Minimum 2 and maximum 3 – Latest editions to be given)										
1. Cyber-Vigilance and Digital Trust: Cyber Security in the Era of Cloud Computing and IoT 1st Edition by Wiem Touns, Wiley-ISTE, July 30, 2019										
2. Practical Internet of Things Security: Design a security framework for an Internet connected ecosystem, 2nd Edition 2nd edition by Brian Russell (Author), Drew Van Duren (Author), Packt Publishing, November 30, 2018										
Reference Books										
1. Demystifying Internet of Things Security: Successful IoT Device/Edge and Platform Security Deployment 1st ed. Edition by Sunil Cheruvu (Author), Anil Kumar (Author), Ned Smith (Author), David M. Wheeler (Author) Apress, August 14, 2019										
2. Practical Industrial Internet of Things Security: A practitioner's guide to securing connected industries Kindle Edition by Sravani Bhattacharjee, Packt Publishing, July 30, 2018										
3. Practical Python Programming for IoT: Build advanced IoT projects using a Raspberry Pi 4, MQTT, RESTful APIs, WebSockets, and Python 3 1st Edition, Kindle Edition by Gary Smart, Packt Publishing, November 12, 2020										

2, C, 87

42/20



4. Practical IoT Hacking: The Definitive Guide to Attacking the Internet of Things Kindle Edition by Fotios Chantzis (Author), Ioannis Stais (Author), Paulino Calderon (Author), Evangelos Deirmentzoglou (Author), Beau Woods (Author) , No Starch Press, March 23, 2021
5. Build Your Own IoT Platform: Develop a Fully Flexible and Scalable Internet of Things Platform in 24 Hours 1st ed. Edition, Kindle Edition by Anand Tamboli, Apress, April 29, 2019

#### Web References

1. <https://www.nist.gov/>
2. <https://www.ietf.org/>
3. <https://owasp.org/>
4. <https://www.iiconsortium.org/>
5. <https://www.sans.org/>

#### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	3	-	-	2	-	-	-	-	-	-	-	-	-
2	2	-	2	-	-	-	-	-	-	-	-	-	2	-	2
3	2	3	3	-	2	3	-	-	3	-	-	-	3	-	2
4	3	3	3	-	3	3	-	-	3	-	-	-	3	-	2
5	3	3	3	-	3	3	-	-	3	-	-	-	3	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

#### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA		Program: MCA							
Semester	Second		Course Category Code: PC				*End Semester Exam Type: TE			
Course Code	P23MCT203		Periods / Week			Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM	
Course Name	OBJECT ORIENTED PROGRAMMING IN C++		3	0	0	3	40	60	100	
(Common to _____ Branches)										
Prerequisite	Basic knowledge on programming concept.									
Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)		
	CO1	Learn programming from real world examples							K1	
	CO2	Understand Object oriented approach to finding Solutions							K2	
	CO3	Create computer-based solutions to various real-world problems using C++							K3	
	CO4	Learn various concepts of object-oriented approach towards problem solving							K2	
	CO5	Develop the applications using object-oriented programming with C++.							K3	
UNIT-I	INTRODUCTION TO C++					Periods: 9				
Basic components of a C++ - Program and program structure - Compiling and Executing C++ Program - Data types - Expression and control statements Iteration statements in C++ - Introduction to Arrays - Multidimensional Arrays - Strings and String related Library Functions - Functions - Passing Data to Functions - Scope and Visibility of variables in Function.									CO 1	
UNIT-II	PRINCIPLES OF OBJECT-ORIENTED PROGRAMMING					Periods: 9				
Basic Concepts of Object-Oriented Programming: Benefits of OOP – Object Oriented Languages – Applications of OOP. Class objects - data members - member functions –Access Specifiers- this Pointer - Friends - Friend Functions - Friend Classes - Friend Scope - Static Functions - Constructors and Destructors - Static variables and Functions in class - Operator Overloading in C++ - Overloading Unary Operators - Overloading binary operators.									CO 2	
UNIT-III	INHERITANCE					Periods: 9				
Inheritance in C++ - Types of Inheritance - Pointers - Objects and Pointers - Multiple Inheritance. Virtual Functions - Polymorphism - Abstract classes. Real time examples in OOPS.									CO 3	
UNIT-IV	FILES AND STREAMS					Periods: 9				
Exception Handling: Exception – Basics – Exception Handling Mechanism – Throwing Mechanism – Catching Mechanism – Rethrowing Exception. Standard input and output operations: C++ iostream hierarchy - Standard Input/output Stream Library - Organizational Elements of the iostream Library - Programming using Streams - Basic Stream Concepts. File input and output: Reading a File - Managing I/O Streams - Opening a File – Different Methods - Checking for Failure with File Commands - Checking the I/O Status Flags - Dealing with Binary Files - Useful Functions.									CO 4	
UNIT-V	TEMPLATES AND STL					Periods: 9				
Class templates: Implementing a class template - Implementing class template member functions - Using a class template - Function templates - Implementing function templates - Using template functions - Template instantiation - Class template specialization - Template class partial specialization - Template function specialization - Template parameters - Static members and variables - Templates and friends - Templates and multiple-file projects. Standard Template library: Containers - iterators and application of container classes.									CO 5	
Lecture Periods: 45			Tutorial Periods: -		Practical Periods: -		Total Periods: 45			
Text Books ((Minimum 2 and maximum 3 – Latest editions to be given)										
1. C++ Programming:An Object-Oriented Approach by Behrouz A. Forouzan (Author), Richard F. Gilberg (Author) McGraw Hill, 19May 2022										
2. Object-Oriented Programming with C++   8th Edition by E Balagurusamy McGraw Hill 24 September 2020										
Reference Books										
1. Tour of C++, A (C++ In-Depth Series) by Bjarne Stroustrup, Addison-Wesley Professional, 12 October 2022										
2. Object Oriented Programming with C++ by Reema Thareja Oxford University Press India, 1 January 2018										
3. Deciphering Object-Oriented Programming with C++: A practical, in-depth guide to implementing object-oriented design principles to create robust code by Dorothy R. Kirk Packt Publishing 23 September 2022										
4. C++ Programming in easy steps by Mike McGrath in Easy Steps Limited, 10 March 2022										
5. The C++ Workshop: Learn to write clean, maintainable code in C++ and advance your career in software engineering by Dale Green (Author), Kurt Guntheroth (Author), Shaun Ross Mitchell (Author), Packt Publishing Limited, 7 February 2020										

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1. <https://www.tutorialspoint.com/cplusplus/index.htm>
2. <http://www.cplusplus.com/doc/tutorial/>
3. <https://www.w3schools.com/cpp/>
4. <https://www.javatpoint.com/cpp-tutorial>
5. <https://www.geeksforgeeks.org/cpp-tutorial/>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	3	2	-	-	-	-	2	1	-	2	2	3	3
2	2	3	3	2	-	-	-	-	2	1	-	2	2	2	2
3	2	3	3	2	-	-	-	-	2	1	-	2	3	3	3
4	2	3	3	2	1	-	-	-	2	1	-	2	2	2	3
5	2	3	3	2	1	-	-	-	2	1	-	2	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA		Program: MCA							
Semester	Second		Course Category Code: PC			*End Semester Exam Type: TE				
Course Code	P23MCT204		Periods / Week			Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM	
Course Name	WEB APPLICATION DEVELOPMENT		3	0	0	3	40	60	100	
(Common to _____ Branches)										
Prerequisite	Basic Knowledge on any programming language to apply the concepts									
Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)		
	CO1	Describe the tools used for designing a web page.							K1	
	CO2	Discuss the role of XML in designing web application.							K1	
	CO3	Demonstrate application development using JDBC and Servlets							K3	
	CO4	Demonstrate application development using JSP.							K3	
	CO5	Demonstrate application development using JSP. using AJAX and PHP							K3	
UNIT-I	INTRODUCTION TO HTML					Periods: 9				
INTRODUCTION TO HTML5: New HTML5 Form Input Types, Introduction to Cascading Style Sheets: Part 1: Inline Styles, Embedded Style Sheets, Conflicting Styles, and Linking External Style Sheets.									CO1	
JAVA SCRIPT: Introduction to scripting, Control Structures-I, Control Structures-II, Functions, Arrays, Objects.										
UNIT-II	INTRODUCTION TO XML					Periods: 9				
XML: Introduction, XML Basics, Structuring Data, XML Namespaces, Document Type Definitions (DTDs), W3C XML Schema Documents, XML Vocabularies, Extensible Style sheet Language and XSL Transformations, Document Object Model (DOM):									CO2	
Objects and Collections.										
UNIT-III	OVERVIEW OF JDBC					Periods: 9				
JDBC AND SERVLETS: DATABASE ACCESS: Overview of JDBC, JDBC Drivers, connecting to a Database, the Statement Interfaces, Result Sets, Using Metadata									CO3	
SERVLETS: The Life Cycle of a Servlet, Using Tomcat for Servlet Development, A Simple Servlet, The Servlet API, The javax.servlet Package , Reading Servlet Parameters, The javax.servlet.http Package, Handling HTTP Requests and Responses, Cookies, Session Tracking.										
UNIT-IV	OVERVIEW OF JSP					Periods: 9				
JSP: JSP Overview, How JSP Works, A Basic Example, JSP Syntax and Semantics: The JSP Development Model, Components of a JSP Page: Directives, Comments, Expressions, Scriptlets, Declarations, implicit objects, Standard Actions, Tag Extensions, A Complete Example.Expressions, Scriptlets, Expression and Scriptlet Handling by the JSP Container, Implicit Objects and the JSPEnvironment, Initialization Parameters, Request Dispatching: Anatomy of Request Processing, include Directive, The Action,									CO4	
Forwarding Requests, RequestDispatcherObject.										
UNIT-V	INTRODUCTION TO PHP					Periods: 9				
PHP: Introduction, Simple PHP Program, Converting Between Data Types, Arithmetic Operators, Initializing and Manipulating Arrays, String Comparisons, String Processing with Regular Expressions, Form Processing and Business Logic, Reading from a Database. AJAX: Traditional Web Applications vs. Ajax Applications, Rich Internet Applications (RIAs) with Ajax, History of Ajax,									CO5	
Ajax Example Using the XML, HttpRequest Object, Using XML and the DOM.										
Lecture Periods: 45			Tutorial Periods: -			Practical Periods: -		Total Periods: 45		
Text Books ((Minimum 2 and maximum 3 – Latest editions to be given)										
1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery by DT Editorial Services (Author), DreamtechPress, 1 January 2016										
2. JAVA THE COMPLETE REFERENCE 11TH EDITION,by Herbert Schildt (Author), McGraw Hill, 10 December 2020										

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**Reference Books**

1. Web development: This book includes: Web development for Beginners in HTML + Web design with CSS + Javascript basics for Beginners by Andy Vickler, Ladoo Publishing LLC, 24 May 2021
2. JavaScript: JavaScript Programming Made Easy for Beginners & Intermediates (Step By Step With Hands On Projects) by Berg Craig, Antony Mwau, 12 September 2019
3. Java for Web Development: Create Full-Stack Java Applications with Servlets, JSP Pages, MVC Pattern and Database Connectivity by SARIKA AGARWAL (Author), VIVEK GUPTA (Author), bpb, 11 March 2022
4. JavaScript for Modern Web Development: From Web Development Basics to Building Real Applications (English Edition): Building a Web Application Using HTML, CSS, and JavaScript (English Edition) by Alok Ranjan (Author), Abhilasha Sinha (Author), Ranjit Battewad (Author), BPB Publications, 17 April 2020
5. Advanced Web Technologies Simply In Depth: Servlet, JSP, Web Services, C#, ASP .NET, XML, AJAX by Ajit Singh (Author), Praveen Kumar (Author), 11 May 2018

**Web References**

1. <https://developer.mozilla.org/>
2. <https://www.w3schools.com/>
3. <https://www.freecodecamp.org/>
4. <https://www.codecademy.com/>
5. <https://www.javatpoint.com/>
6. <https://www.php.net/>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	-	1	-	2	-	-	-	-	-	1	1	1
2	2	1	1	-	1	-	2	-	-	-	-	-	1	1	1
3	3	2	3	2	2	2	2	2	2	2	2	-	3	1	2
4	3	2	3	2	2	2	2	2	2	2	2	-	3	1	2
5	3	2	3	2	2	2	2	2	2	2	2	-	3	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10	10	10	10	10	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA	Program: MCA							
Semester	Second	Course Category Code: PC			*End Semester Exam Type: LE				
Course Code	P23MCP201	Periods / Week			Credit	Maximum Marks			
		L	T	P	C	CAM	ESE	TM	
Course Name	ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY	0	0	4	2	50	50	100	
Prerequisite	Basic Knowledge on any programming language to apply the concepts								
Course Outcome	On completion of the course, the students will be able to						BT Mapping (Highest Level)		
	CO1	Analyze the algorithm's / program's efficiency in terms of time and space complexity.						3	
	CO2	Solve the given problem by identifying the appropriate Data Structure.						3	
	CO3	Solve problems in linear Data Structures.						3	
	CO4	Solve problems on Trees and Tree Traversals						3	
	CO5	Solve problems on Graphs and Graph Traversals						3	
List of Experiments:									
<div>1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.</div> <div>2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.</div> <div>3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT</div> <div>4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list. b)Delete an element from list c) Search for a key element in list d) count number of nodes in list.</div> <div>5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.</div> <div>6. Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and anarray.</div> <div>7. Write a C program to perform the following operations: a) Insert an element into a binary search tree. b)Delete an element from a binary search tree. c) Search for a key element in a binary search tree.</div> <div>8. Write a C program that use recursive functions to traverse the given binary tree in</div> <div>a. Preorder</div> <div>b. In order</div> <div>c. Post order</div> <div>9. Write a C program to perform the AVL tree operations.</div> <div>10. Write a C program to implement Graph Traversal Techniques.</div>									
Lecture Periods: -		Tutorial Periods: -		Practical Periods: 4		Total Periods: 40			
Reference Books									
<div>1. Mastering Data Structures and Algorithms: A Comprehensive Guide by Mr Leelkanth Dewangan, Mr PrashantKumar Tamrakar, et al.   Jul 13, 2023</div> <div>2. Data Structures and Algorithms in Python by Michael T. Goodrich , Roberto Tamassia, et al.   Mar 18, 2013</div> <div>3. Hands-On Data Structures and Algorithms with Python: Store, manipulate, and access data effectively and boost theperformance of your applications, 3rd Edition by Dr. Basant Agarwal Jul 29, 2022</div> <div>4. The Self-Taught Computer Scientist: The Beginner's Guide to Data Structures &amp; Algorithms 1st Edition by Cory Althoff Oct 1,2021</div> <div>5. Data Structures the Fun Way: An Amusing Adventure with Coffee-Filled Examples by Jeremy Kubica, No Starch Press, Nov 8,2022</div>									
Web References									
<div>1. <a href="https://www.javatpoint.com/data-structure-tutorial/">https://www.javatpoint.com/data-structure-tutorial/</a></div> <div>2. <a href="https://www.tutorialspoint.com/data_structures_algorithms/">https://www.tutorialspoint.com/data_structures_algorithms/</a></div> <div>3. <a href="https://www.w3schools.in/data-structures-tutorial/intro/">https://www.w3schools.in/data-structures-tutorial/intro/</a></div> <div>4. <a href="https://www.academia.edu/38287655/Design_and_analysis_of_algorithms_tutorial">https://www.academia.edu/38287655/Design_and_analysis_of_algorithms_tutorial</a></div> <div>5. <a href="https://www.geeksforgeeks.org/fundamentals-of-algorithms/">https://www.geeksforgeeks.org/fundamentals-of-algorithms/</a></div>									

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### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	-	-	-	-	-	-	-	-	-	-	2
2	3	3	3	3	-	-	-	-	-	-	-	-	-	-	2
3	3	3	3	3	-	-	-	-	-	-	-	-	-	2	3
4	3	3	3	3	-	-	-	-	-	-	-	-	-	2	3
5	3	3	3	3	-	-	-	-	-	-	-	-	-	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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Department	MCA			Program: MCA							
Semester	Second			Course Category Code: PC			*End Semester Exam Type: LE				
Course Code	P23MCP202			Periods / Week			Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM	
Course Name	OBJECT ORIENTEDPROGRAMMING LAB IN C++			0	0	4	2	50	50	100	
Prerequisite	Basic knowledge on programming concept.										
Course Outcome	On completion of the course, the students will be able to								BT Mapping (Highest Level)		
	CO1	Apply the basic programming concepts in the real environment.								-	
	CO2	Demonstrate the basic concepts of OOP (Class, friend function, overloading) in real Environment.								-	
	CO3	Demonstrate the use of inheritance in real environment.								-	
	CO4	Demonstrate virtual class, exception handling and Streams								-	
	CO5	Demonstrate the use of Templates in real environment								-	
List of Experiments:											
<div>1. Control Structures and Looping Structures.</div> <div>2. Array Usages.</div> <div>3. Class Declarations, Definition, and Accessing Class Members.</div> <div>4. Constructor, parameterized constructor and copy constructors.</div> <div>5. Friend Function and Friend Class.</div> <div>6. Function Overloading and Constructor Overloading.</div> <div>7. Operator Overloading.</div> <div>8. Access Members of a Class Using Pointer to Object Members.</div> <div>9. Single Inheritance and Multiple Inheritances.</div> <div>10. Multilevel inheritance, Hierarchical Inheritance and Hybrid Inheritance.</div> <div>11. Virtual Classes and Abstract Classes.</div> <div>12. Exception Handling.</div> <div>13. IOStream, IStream, Ostream classes and their usages.</div> <div>14. File Stream Operations.</div> <div>15. Template Based Program to Sort the Given List of Elements.</div> <div>16. Real World Examples</div>											
Lecture Periods: -			Tutorial Periods: -			Practical Periods: 4		Total Periods: 40			
Reference Books											
<div>1. Tour of C++, A (C++ In-Depth Series) by Bjarne Stroustrup, Addison-Wesley Professional, 12 October 2022</div> <div>2. Object Oriented Programming With C++ by Reema Thareja Oxford University Press India, 1 January 2018</div> <div>3. Deciphering Object-Oriented Programming with C++: A practical, in-depth guide to implementing object-oriented design principles to create robust code by Dorothy R. Kirk Packt Publishing 23 September 2022</div> <div>4. C++ Programming in easy steps by Mike McGrath In Easy Steps Limited, 10 March 2022</div> <div>5. The C++ Workshop: Learn to write clean, maintainable code in C++ and advance your career in software engineering by Dale Green (Author), Kurt Guntheroth (Author), Shaun Ross Mitchell (Author), Packt Publishing Limited, 7 February 2020</div>											
Web References											
<div>1. <a href="https://www.tutorialspoint.com/cplusplus/index.htm">https://www.tutorialspoint.com/cplusplus/index.htm</a></div> <div>2. <a href="http://www.cplusplus.com/doc/tutorial/">http://www.cplusplus.com/doc/tutorial/</a></div> <div>3. <a href="https://www.w3schools.com/cpp/">https://www.w3schools.com/cpp/</a></div> <div>4. <a href="https://www.javatpoint.com/cpp-tutorial">https://www.javatpoint.com/cpp-tutorial</a></div> <div>5. <a href="https://www.geeksforgeeks.org/cpp-tutorial/">https://www.geeksforgeeks.org/cpp-tutorial/</a></div>											

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### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	2	1	-	-	-	-	2	-	3	2	2
2	3	3	3	-	2	1	-	-	-	-	2	-	3	2	2
3	3	3	3	-	2	1	-	-	-	-	2	-	3	2	2
4	3	3	3	-	2	1	-	-	-	-	2	-	3	2	2
5	3	3	3	-	2	1	-	-	-	-	2	-	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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Department	MCA	Program: MCA						
Semester	Second	Course Category Code: PC			*End Semester Exam Type: LE			
Course Code	P23MCP203	Periods / Week			Credit	Maximum Marks		
Course Name	WEB APPLICATION DEVELOPMENT LAB	L	T	P	C	CAM	ESE	TM
		0	0	4	2	50	50	100

Prerequisite: Basic Knowledge on any programming language to apply the concepts

Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)
	CO1	Design a form using HTML, CSS and Scripts.						-
	CO2	Create XML based applications						-
	CO3	Build applications using database connectivity through JDBC and Servlet						-
	CO4	Build applications using JSP						-
	CO5	Build applications using PHP						-

#### List of Experiments:

- Design a static web site required for an online book store.
- Develop and demonstrate the usage of inline, internal and external style sheet using CSS
- Write a JavaScript code to validate the fields of the Registration page.
- Develop and demonstrate a JavaScript application with POP-UP boxes and functions
- Create an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
- Develop an HTML page using JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
- Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.
- Write a program to design a simple calculator using JavaScript, Servlet, JSP and PHP,
- Develop and demonstrate PHP Script for the following problems:
  - Write a PHP Script to find out the Sum of the Individual Digits.
  - Write a PHP Script to check whether the given number is Palindrome or not
  - Write a PHP Program to display current Date, Time and Day.
- Implement the following web applications using Servlets, JSP and PHP
  - A web application that takes a name as input and on submit it shows a hello <name> page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You <name> message with the duration of usage (hint: Use session to store name and time).
  - A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello <name>, you are not authorized to visit the site" message, where <name> should be replaced with the entered name. Otherwise it should send "Welcome <name> to this site" message.
  - A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary.
- Implement a web application with Database using Servlets, JSP and PHP
  - Modify the above PHP program to use an xml instead of database

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 4	Total Periods: 40
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**Reference Books**

1. Web development: This book includes: Web development for Beginners in HTML + Web design with CSS + Javascript basics for Beginners by Andy Vickler, Ladoo Publishing LLC, 24 May 2021
2. JavaScript: JavaScript Programming Made Easy for Beginners & Intermediates (Step By Step With Hands On Projects) by Berg Craig, Antony Mwau, 12 September 2019
3. Java for Web Development: Create Full-Stack Java Applications with Servlets, JSP Pages, MVC Pattern and Database Connectivity by SARIKA AGARWAL (Author), VIVEK GUPTA (Author), bpb, 11 March 2022
4. JavaScript for Modern Web Development: From Web Development Basics to Building Real Applications (English Edition): Building a Web Application Using HTML, CSS, and JavaScript (English Edition) by Alok Ranjan (Author), Abhilasha Sinha (Author), Ranjit Battewad (Author), BPB Publications, 17 April 2020
5. Advanced Web Technologies Simply In Depth: Servlet, JSP, Web Services, C#, ASP .NET, XML, AJAX by Ajit Singh (Author), Praveen Kumar (Author), 11 May 2018

**Web References**

1. <https://developer.mozilla.org/>
2. <https://www.w3schools.com/>
3. <https://www.freecodecamp.org/>
4. <https://www.codecademy.com/>
5. <https://www.javatpoint.com/>
6. <https://www.php.net/>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	2	1	-	-	-	-	2	-	3	2	2
2	3	3	3	-	2	1	-	-	-	-	2	-	3	2	2
3	3	3	3	-	2	1	-	-	-	-	2	-	3	2	2
4	3	3	3	-	2	1	-	-	-	-	2	-	3	2	2
5	3	3	3	-	2	1	-	-	-	-	2	-	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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### Annexure – III

#### Professional Elective - 1: Modern Tools, Languages and Frameworks

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Department	MCA		Programme: MCA							
Semester	II		Course Category Code: PE			*End Semester Exam Type: TE				
Course Code	P23MCE201		Periods / Week			Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM	
Course Name	Spring Boot		3	0	0	3	40	60	100	
(Common to MCA Branches)										
Prerequisite	Basic knowledge of Java programming									
Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)		
	CO1	Describe about Spring Boot, its architecture, core features, and benefits.							K2	
	CO2	Explain Spring Boot integration with databases using Spring Data JPA and CRUD operations.							K2	
	CO3	To create and deploy web applications using Spring Boot and building RESTful APIs.							K3	
	CO4	Illustrate how front end technologies can be integrated with Spring Boot.							K2	
	CO5	Explain the testing and optimization methods for Spring Boot							K3	
UNIT-I	Introduction to Spring Boot					Periods: 9				
Introduction to Spring Framework and Spring Boot, setting up a Spring Boot development environment, Creating and running a basic Spring Boot application, Understanding Spring Boot auto-configuration and starters, Spring Boot application structure and configuration, Working with Spring Boot Actuator for monitoring and management								CO1		
UNIT-II	Dependency Injection and Data Access					Periods: 9				
Dependency Injection in Spring Boot, Working with Spring Boot's IoC (Inversion of Control) container, Introductionto Spring Data JPA and database integration, Creating and managing entities and repositories, Implementing CRUD operations with Spring Data JPA								CO2		
UNIT-III	Web Development with Spring Boot					Periods: 9				
Introduction to Spring Boot Web MVC, Creating RESTful APIs with Spring Boot, Handling HTTP requests and responses using Controllers, Request mapping, request parameters, and path variables, validating input data with Spring Boot Validation, Securing APIs with Spring Security								CO3		
UNIT-IV	Spring Boot and Front-End Integration					Periods: 9				
Integrating front-end technologies (HTML, CSS, JavaScript) with Spring Boot, Using Thyme leaf for server-side templating, working with static resources and web jars, Consuming RESTful APIs from the front-end using, JavaScript and AJAX								CO4		
UNIT-V	Testing, Deployment, and Advanced Topics					Periods: 9				
Unit testing and integration testing in Spring Boot, Mocking dependencies for isolated testing, Continuous Integration and Deployment (CI/CD) with Spring Boot, Profiling and optimizing Spring Boot applications, Advanced Spring Boot topics (e.g., Spring Boot with Docker, Spring Boot with Microservices architecture)								CO5		
Lecture Periods: 45		Tutorial Periods: -		Practical Periods: -			Total Periods: 45			

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### Text Books

1. "Spring in Action" by Craig Walls - This book covers the entire Spring Framework, including Spring Boot, and is considered one of the best resources for learning Spring. It provides practical examples and explanations, making it suitable for both beginners and experienced developers.
2. "Spring Boot in Action" by Craig Walls - This book is focused exclusively on Spring Boot and provides in-depth coverage of the framework. It covers all the essential aspects of Spring Boot and its ecosystem, making it an excellent resource for learning Spring Boot.
3. "Pro Spring Boot 2: An Authoritative Guide to Building Microservices, Web and Enterprise Applications" by Felipe Gutierrez - This book focuses on building various types of applications using Spring Boot, including microservices and web applications. It covers advanced topics and best practices.

### Reference Books

1. "Learn Spring Boot in 100 Steps - Beginner to Expert" by Ranga Karanam - This book takes a step-by-step approach to teach Spring Boot, making it beginner-friendly. It covers fundamental concepts and gradually progresses to more advanced topics.
2. "Building RESTful Web Services with Spring 5 - Second Edition" by Raja CSP Raman - While not exclusively focused on Spring Boot, this book covers building RESTful web services using Spring 5, which is the foundation of Spring Boot.

### Web References

1. <https://spring.io/projects/spring-boot>
2. <https://docs.spring.io/spring-boot/docs/current/reference/html/index.html>
3. <https://spring.io/guides>
4. <https://www.baeldung.com/spring-boot>
5. <https://github.com/spring-projects/spring-boot/tree/main/spring-boot-samples>

### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	2	2	1	2	1	-	-	-	-	1	-	-	-	-
3	2	3	3	2	2	1	2	2	2	1	2	1	1	1	3
4	2	2	2	1	2	1	2	2	1	1	2	1	2	2	3
5	2	3	1	2	2	2	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA	Programme: MCA						
Semester	II	Course Category Code: PE *End Semester Exam Type: TE						
Course Code	P23MCE202	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Selenium	3	0	0	3	40	60	100
(Common to MCA Branches)								
Prerequisite	Basic knowledge of Java programming, Some experience with web browsers							
Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)
	CO1	To understanding of Selenium and its components, including WebDriver, Grid, and IDE.						K2
	CO2	Students will be able to create automated tests for web applications using Selenium WebDriver, interacting with various web elements and performing different actions.						K3
	CO3	Students will learn to handle dynamic elements, waits, and complex web interactions to create robust and stable test scripts.						K3
	CO4	Students will be familiar with integrating Selenium tests with popular test frameworks like TestNG or JUnit for better test organization and reporting.						K3
	CO5	To understand the importance of the Page Object Model (POM) design pattern for maintaining scalable and maintainable test scripts.						K3
UNIT-I	Introduction to Selenium and Web Automation				Periods: 9			
Introduction to Selenium and its history, Setting up the Selenium WebDriver environment, Basic structure of a Selenium test script , Locating elements on a web page (by ID, name, class, etc.),Interacting with web elements (clicking, typing, selecting, etc.), Handling different types of web elements (text boxes, buttons, dropdowns, etc.)							CO1	
,Introduction to browser drivers (e.g., ChromeDriver, GeckoDriver)								
UNIT-II	Advanced Web Element Interaction				Periods: 9			
Handling dynamic elements and waits (implicit, explicit, and fluent waits), Working with iframes and nested elements, Drag-and-drop and mouse actions, Capturing screenshots and handling alerts, JavaScript execution in Selenium tests							CO2	
UNIT-III	Test Frameworks and Page Object Model (POM)				Periods: 9			
Introduction to test frameworks (JUnit or TestNG) for Selenium, Test organization and writing maintainable testcases							CO3	
Introduction to Page Object Model (POM) design pattern, Implementing POM for better test structure and maintainability, Data-driven testing using data providers								
UNIT-IV	Handling Complex Scenarios				Periods: 9			
Cross-browser testing with Selenium, Handling pop-ups and new windows, Handling frames and nested webelements							CO4	
Handling cookies and managing browser profiles, Handling SSL certificates and browser security warnings								
UNIT-V	Advanced Topics and Best Practices				Periods: 9			
Selenium Grid and parallel test execution, Continuous Integration (CI) with Selenium and Jenkins, Test reportingand logging in Selenium, Performance and load testing with Selenium, Best practices for writing effective and reliable Selenium tests, Troubleshooting common issues in Selenium test automation							CO5	
Lecture Periods: 45		Tutorial Periods: -		Practical Periods: -		Total Periods: 45		

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**Text Books**

1. "Selenium WebDriver Recipes in C#" by Zhimin Zhan - This book focuses on Selenium WebDriver with C# and provides practical examples for solving real-world testing challenges.
2. "Mastering Selenium WebDriver" by Mark Collin - This book covers Selenium WebDriver and advanced techniques for web automation. It delves into handling complex scenarios and using Selenium with other tools.
3. "Selenium Testing Tools Cookbook" by Unmesh Gundecha - This book offers a wide range of practical recipes and solutions for Selenium, including WebDriver, Grid, and integrating with other testing frameworks.
4. "Selenium Framework Design in Data-Driven Testing: Build data-driven test frameworks using Selenium WebDriver, AppiumDriver, Java, and TestNG" by Carl Cocchiario - This book explores data-driven testing with Selenium WebDriver, focusing on building robust and scalable test frameworks.

**Reference Books**

1. "Test Automation using Selenium WebDriver with Java" by Mr. Navneesh Garg - This book provides hands-on learning with Selenium WebDriver using Java, guiding readers through practical examples.
2. "Selenium WebDriver: From Foundations To Framework" by Alan Richardson - This book covers Selenium WebDriver from the basics to advanced topics, including implementing test frameworks.

**Web References**

1. <https://www.selenium.dev/>
2. <https://www.selenium.dev/documentation/en/webdriver/>
3. <https://github.com/SeleniumHQ/selenium>
4. [https://www.selenium.dev/documentation/en/webdriver/driver\\_requirements/](https://www.selenium.dev/documentation/en/webdriver/driver_requirements/)
5. <https://www.guru99.com/selenium-tutorial.html>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	-	-	-	-	-	-	-	-	-	-	-	3
2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	2
3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	3
4	2	2	2	-	1	-	2	-	-	-	-	-	2	-	3
5	2	2	2	-	1	-	2	-	2	1	-	2	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA		Programme: MCA						
Semester	II		Course Category Code: CC			*End Semester Exam Type: TE			
Course Code	P23MCE203		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	R Language		3	0	0	3	25	75	100
(Common to MCA Branches)									
Prerequisite	Basic Electrical Engineering, Laplace Transform								
Course Outcome	On completion of the course, the students will be able to								BT Mapping (Highest Level)
	CO1	To Interpret simple R scripts							K2
	CO2	To understand the basics in R programming in terms of constructs, control statements, string functions.							K2
	CO3	To learn to apply R programming for Text processing.							K3
	CO4	To understand the use of R Big Data analytics.							K2
	CO5	To able to appreciate and apply the R programming from a statistical perspective							K3
UNIT-I	Introduction: R					Periods: 9			
Introduction: R interpreter, Introduction to major R data structures like vectors, matrices, arrays, list and data frames, Control Structures, vectorized if and multiple selection, functions.									CO1
UNIT-II	Installing, loading and using packages:					Periods: 9			
Read/write data from/in files, extracting data from web-sites, Clean data, Transform data by sorting, adding/removing new/existing columns, centering, scaling and normalizing the data values, converting types of values, using string in-built functions, Statistical analysis of data for summarizing and understanding data, Visualizing data using scatter plot, line plot, bar chart, histogram and box plot									CO2
UNIT-III	Matrices, Arrays and Lists					Periods: 9			
Matrices, Arrays and Lists Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists.									CO3
UNIT-IV	Control statements, Functions, R graphs					Periods: 9			
Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues –Writing Upstairs - Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R Creating Graphs – Customizing Graphs – Saving graphs to files – Creating three-dimensional plots									CO4
UNIT-V	Interfacing					Periods: 9			
Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear models – Time Series and Auto-correlation – Clustering									CO5
Lecture Periods: 45			Tutorial Periods: 15		Practical Periods: -		Total Periods: 45		
Text Books									
1. Cotton, R., Learning R: a step by step function guide to data analysis. 1st edition. O'reillyMedia Inc.									
2. Norman Mat off, “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011.									
Reference Books									
1. Jared P. Lander, “R for Everyone: Advanced Analytics and Graphics”, Addison-Wesley Data & Analytics Series, 2013.									
2. Mark Gardener, “Beginning R – The Statistical Programming Language”, Wiley, 2013									
3. Robert Knell, “Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R”,Amazon Digital South Asia Services Inc, 2013.’									

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**Web References**

<https://jrnold.github.io/r4ds-exercise-solutions/index.html>

<https://www.r-project.org/>

<https://cran.r-project.org/>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	3	-	-	-	-	-	-	2	-	-	-	-	3	3
2	2	3	3	2	2	-	-	-	2	-	-	-	-	2	2
3	2	3	3	3	2	-	-	-	2	-	-	-	3	3	3
4	3	3	3	2	2	-	-	-	2	-	-	-	2	2	2
5	2	3	3	3	2	-	-	-	2	1	-	-	2	3	2

Correlation Level: 1 - Low, 2 - Medium,

3 – High Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT1	CAT2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2, C, 105

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Department	MCA	Programme: MCA						
Semester	II	Course Category Code: PE *End Semester Exam Type: TE						
Course Code	P23MCE204	Periods / Week			Credit	Maximum Marks		
Course Name	Ruby	L	T	P	C	CAM	ESE	TM
		3	0	0	3	40	60	100
(Common to MCA Branches)								
Prerequisite	Basic knowledge on any programming language.							
Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)
	CO1	Describe the basic concepts of Ruby and its environment.						K1
	CO2	Explain ruby in coordination with object-oriented concept						K2
	CO3	Describe the concepts that incorporated in ruby to handle different situations						K2
	CO4	Demonstrate the application of ruby in web development						K3
	CO5	Illustrate the testing and performance consideration for ruby						K3
UNIT-I	Introduction to Ruby				Periods: 9			
Introduction to Ruby and its history, Installing Ruby and setting up the development environment, Basic Rubysyntax and data types, Variables and constants, Control structures (conditionals and loops), Methods and functions, Strings and string manipulation, Arrays and hashes							CO1	
UNIT-II	Object-oriented programming in Ruby				Periods: 9			
Understanding objects and classes, creating classes and instances, Instance variables and methods, Class variablesand methods, Access control (public, private, protected), Inheritance and mixins, Method overriding and super keyword, Modules and namespaces							CO2	
UNIT-III	Advanced Ruby Concepts				Periods: 9			
Exception handling and error management, File I/O and working with files, Regular expressions in Ruby,Enumerators and iterators, Closures and blocks, Procs and lambdas, Symbols and their use cases, Metaprogramming in Ruby							CO3	
UNIT-IV	Web Development with Ruby				Periods: 9			
Introduction to web development with Ruby, setting up a basic web server using Sinatra or Ruby on Rails, Handling HTTP requests and responses, working with routes and controllers, Templates and views, working with databases (e.g., SQLite, PostgreSQL) using Active Record, Form handling and data validation, Deploying Ruby web applications							CO4	
UNIT-V	Testing and Performance Optimization				Periods: 9			
Introduction to testing and test-driven development (TDD), Overview of RSpec and BDD in Ruby, writing unit tests and integration tests with RSpec, Mocking and stubbing in tests, Performance profiling and optimization techniques, Garbage collection and memory management, Concurrency and multithreading in Ruby, Best practices and code optimization strategies.							CO5	
Lecture Periods: 45		Tutorial Periods: -		Practical Periods: -		Total Periods: 45		

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### Text Books

1. "The Well-Grounded Rubyist" by David A. Black - This book provides a comprehensive introduction to Ruby, covering everything from the basics to advanced topics like metaprogramming. It is highly regarded for its clear explanations and practical examples.
2. "Eloquent Ruby" by Russ Olsen - This book focuses on writing elegant and idiomatic Ruby code. It covers best practices and techniques to make your code more expressive and maintainable.
3. "Programming Ruby: The Pragmatic Programmer's Guide" by Dave Thomas, with Chad Fowler and Andy Hunt - Also known as the "Pickaxe book," this is one of the most popular and authoritative books on Ruby. It covers Ruby from the ground up, making it suitable for both beginners and experienced programmers.
4. "Metaprogramming Ruby 2: Program Like the Ruby Pros" by Paolo Perrotta - As the name suggests, this book delves deep into metaprogramming in Ruby, providing a thorough understanding of this powerful concept.

### Reference Books

1. "Ruby Performance Optimization: Why Ruby Is Slow, and How to Fix It" by Alexander Dymo - This book focuses on optimizing Ruby code for performance. It explores various techniques and tools to identify bottlenecks and improve the speed of your Ruby applications.
2. "The Ruby Way: Solutions and Techniques in Ruby Programming" by Hal Fulton and André Arko - This book presents a collection of practical Ruby programming solutions and tips for solving common problems.
3. "Practical Object-Oriented Design in Ruby: An Agile Primer" by Sandi Metz - While not specifically a Ruby book, this work provides valuable insights into object-oriented design principles and how to apply them effectively in Ruby.
4. "RSpec Essentials" by Mani Tadayon - For those specifically interested in testing with RSpec, this book offers a comprehensive guide to behavior-driven development with RSpec and is an excellent companion for the unit focused on testing.

### Web References

1. <https://www.ruby-lang.org/en/>
2. <https://ruby-doc.org/>
3. <https://www.rubyguides.com/>
4. <https://guides.rubyonrails.org/>

### COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-
3	2	2	1	-	1	-	-	-	-	-	-	-	1	1	1
4	2	2	3	1	2	2	1	2	2	1	2	-	2	2	2
5	2	2	-	2	2	2	1	-	2	1	2	-	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

### Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	MCA		Programme: MCA						
Semester	II		Course Category Code: CC			*End Semester Exam Type: TE			
Course Code	P23MCE205		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	GitHub		3	0	0	3	25	75	100
(Common to MCA Branches)									
Prerequisite	Basic knowledge of version control								
Course Outcome	On completion of the course, the students will be able to								BT Mapping (Highest Level)
	CO1	To gain a solid understanding of version control concepts and the Git version control system.							K1
	CO2	To create and manage local Git repositories, commit changes, create and switch branches, and perform basic version control tasks.							K1
	CO3	To learn how to use GitHub for collaborative software development, including creating repositories, working with remote repositories, and collaborating with others using pull requests.							K3
	CO4	To understand branching strategies and learn how to create, merge, and manage branches effectively.							K2
	CO5	To learn how to use GitHub Pages to host static websites and showcase their projects.							K2
UNIT-I	Introduction to Version Control and Git Basics					Periods: 9			
Introduction to version control and its importance in software development, Understanding the Git version control system and its features, setting up Git locally and configuring user information, creating a new Git repository and initializing version control, Understanding Git concepts: commits, branches, merging, and history.									CO1
UNIT-II	Working with Local Repositories					Periods: 9			
Managing changes with Git: adding, committing, and undoing changes, navigating through Git history: viewing logs and using diff, Branching and merging: creating and managing branches, merging changes, resolving conflicts in Git merges, Using Git stash for temporary storage of changes									CO2
UNIT-III	Collaborating with Remote Repositories (GitHub)					Periods: 9			
Introduction to GitHub and its role in remote collaboration, creating a remote repository on GitHub and connecting it to a local repository, pushing changes to a remote repository, pulling changes from a remote repository and handling conflicts, Collaborative workflows with Git and GitHub: pull requests and code reviews									CO3
UNIT-IV	Advanced Git Features and Best Practices					Periods: 9			
Working with Git aliases for productivity, Git rebase: rebasing branches and resolving conflicts, Git submodules: managing and using submodules in a project, Git hooks: automating tasks with custom scripts, Git best practices: commit conventions, branching strategies, and repository organization									CO4
UNIT-V	GitHub Actions and CI/CD					Periods: 9			
Introduction to GitHub Actions: automating workflows, Building and testing projects with GitHub Actions, Continuous Integration (CI) and Continuous Deployment (CD) with GitHub Actions, Integrating GitHub Actions with other tools and services, Monitoring and managing workflows in GitHub Actions									CO5
Lecture Periods: 45			Tutorial Periods: 15		Practical Periods: -		Total Periods: 45		
Text Books									
1. "Pro Git" by Scott Chacon and Ben Straub - This book is available for free online and provides a thorough introduction to Git, covering basic to advanced topics, including branching, merging, and collaborating with GitHub.									
2. "Git Pocket Guide" by Richard E. Silverman - This concise guide is a quick reference for Git commands and concepts, making it a handy resource for developers who want a quick overview of Git.									
3. "GitHub For Dummies" by Sarah Guthals, Phil Haack, and Brittney Roston - This book is aimed at beginners and offers a practical guide to getting started with GitHub, including creating repositories, collaborating, and using GitHub features effectively.									

2. C. 108

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**Reference Books**

1. "Git in Practice" by Mike McQuaid - This book provides practical examples and use cases for Git, making it useful for developers seeking to apply Git concepts in real-world scenarios.
2. "Version Control with Git" by Jon Loeliger and Matthew McCullough - While not GitHub-specific, this book focuses on Git itself and provides a comprehensive guide to using Git for version control in software projects.
3. "GitHub Essentials" by Achilleas Pipinellis - This book is a beginner's guide to using GitHub effectively, covering repository management, collaboration, and integrating Git workflows.

**Web References**

<https://www.atlassian.com/git/tutorials>  
<https://git-scm.com/book/en/v2>  
<https://guides.github.com/>  
<https://docs.github.com/en/actions>  
<https://docs.github.com/en/get-started/quickstart>  
<https://help.github.com/>  
<https://github.blog/>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	3	3	3	-	-	-	3	3	-	3	-	3	3
2	2	2	2	2	-	-	-	-	2	2	-	2	-	2	2
3	2	3	3	3	3	-	-	-	3	3	-	3	3	3	3
4	2	2	2	2	1	-	-	-	2	2	-	2	-	2	2
5	2	2	2	2	-	-	-	-	2	2	-	2	-	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 - High

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		20	5	5	60	100

\* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.C.109

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Case No.	Case Name	Case Description	Case Status	Case Date
1	Case 1	Case 1 Description	Case 1 Status	Case 1 Date
2	Case 2	Case 2 Description	Case 2 Status	Case 2 Date
3	Case 3	Case 3 Description	Case 3 Status	Case 3 Date
4	Case 4	Case 4 Description	Case 4 Status	Case 4 Date
5	Case 5	Case 5 Description	Case 5 Status	Case 5 Date

Case No.	Case Name	Case Description	Case Status	Case Date
1	Case 1	Case 1 Description	Case 1 Status	Case 1 Date
2	Case 2	Case 2 Description	Case 2 Status	Case 2 Date
3	Case 3	Case 3 Description	Case 3 Status	Case 3 Date
4	Case 4	Case 4 Description	Case 4 Status	Case 4 Date
5	Case 5	Case 5 Description	Case 5 Status	Case 5 Date

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**Annexure – IV**  
**Panel Of Examiners**  
(Recommended)

2. C. 111

Department of M.C.A – 6<sup>th</sup> Meeting of BoS



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# SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)  
(Accredited by NBA-AICTE, New Delhi, Accredited by NAAC with "A" Grade)  
Madagadipet, Puducherry - 605 107



## Department of Computer Applications (MCA Programme)

### Recommended Panel of Examiners

S. No	Name of the Examiner	Specialization	Designation, Department and Institution in which currently working	Contact number and Email id
<b>External Examiners</b>				
1.	Dr.A.Kumaresan	<ul style="list-style-type: none"> <li>Data Mining</li> <li>Networks</li> <li>DBMS</li> <li>Web Technology</li> </ul>	Assistant Professor, Senior Grade 2, School of Computer science and Engineering, Vellore Institute of Technology, Vellore	Mobile: 9894234358 Email: kummaresan@gmail.com
2.	Dr. N. Elavarasan	<ul style="list-style-type: none"> <li>Networking</li> <li>Java</li> <li>Data Structures</li> <li>Web Programming</li> </ul>	Assistant Professor Department of Computer Applications, Srinivasan College of Arts and Science Perambalur Pincode:621212	Mobile: 9087407650 Email: elavarasann1975@gmail.com
3.	Dr.Antonitte Arul Jayanthi	<ul style="list-style-type: none"> <li>Computer Networks</li> <li>Java Programming</li> <li>Data Structures</li> <li>Web Technology</li> </ul>	Associate professor, Dept of computer science and applications Pope John Paul II College college of Education Puducherry	Mobile: 9790341277 Email: jayanthijames11@gmail.com
4.	Dr.Arokkiya Mary.S.T	<ul style="list-style-type: none"> <li>Big Data</li> <li>Machine Learning</li> <li>Advance Java</li> <li>Artificial Intelligence</li> </ul>	Assistant Professor, Department of Computer Science, Bharadidasan Govt. College for Women, (Autonomous), Puducherry.	Mobile: 9047035097 Email: arokyamary25@gmail.com
5.	Dr.P.ShanthiBala	<ul style="list-style-type: none"> <li>Data Structures</li> <li>Software Engineering</li> <li>Soft Computing and</li> <li>Networking</li> </ul>	Associate Professor Dept. Of computer Science Pondicherry University. Puducherry.14	Mobile: 9629878783 Email: Shanthibala.cs@gmail.com

Department of M.C.A – 6<sup>th</sup> Meeting of BoS

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2. C. 113

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6.	Dr.M.Indhumathi	<ul style="list-style-type: none"> <li>• Networking</li> <li>• Java</li> <li>• Data Structures</li> <li>• Web Programming</li> </ul>	Associate professor PG and Research Department of Computer Science Joseph Arts and Science College Tirunavalur, Villupuram District	Mobile: 6380279726 Email: yaathin7@gmail.com
7.	Dr.K. Manivannan	<ul style="list-style-type: none"> <li>• DBMS</li> <li>• Software Engineering</li> <li>• JAVA Programming</li> <li>• Data Science</li> </ul>	Assistant Professor Teaching Experience 16 years Arignar Anna Govt Arts College Villupuram	Mobile: 9486283797 Email: Manik81au@gmail.com
8.	Dr. A.M. James Raj	<ul style="list-style-type: none"> <li>• Networking</li> <li>• Data mining</li> <li>• Image Processing</li> <li>• DBMS</li> <li>• Software Engineering</li> </ul>	M.Sc., M.Phil, M.tech, NET, PH.D Associate professor, Dept of computer science Pope John Paul II College college of Education Puducherry	Mobile: 9585747079 Email: jamdiva05@yahoo.co.in
9.	Dr. M. Nandhini	<ul style="list-style-type: none"> <li>• Data structure</li> <li>• Data science</li> <li>• Software Engineering</li> <li>• Data Mining</li> </ul>	Associate professor, Department of Computer Science, Pondicherry University, Puducherry	Mobile: 9843594675 Email: mnandhini2005@yahoo.com
10.	Dr.B.Muruganandham	<ul style="list-style-type: none"> <li>• Database Technology</li> <li>• Web Technology</li> <li>• Big Data</li> <li>• Software Engineering</li> </ul>	Associate Professor Department of Computer Science and Engineering, SRMIST, Kattankulathur (Campus) Chennai.	Mobile: 9940023373 Email: muruganb@srmist.edu.in
11.	Dr. A Malathi	<ul style="list-style-type: none"> <li>• Computer Networks</li> <li>• .NET Programming</li> </ul>	Associate professor, Dept of computer science and applications Pope John Paul II College college of Education Puducherry	Mobile: 9486416247 Email: malathiprem@hotmail.com
12.	Dr. R Pavithra	<ul style="list-style-type: none"> <li>• Machine Learning</li> <li>• Artificial Intelligence</li> <li>• Data Mining</li> <li>• DBMS</li> </ul>	Asst Professor Immaculate College For Women Chinakanganakuppam Cuddalore	Mobile: 9344705831 Email: Naurin0581@gmail.com

13.	Dr K R Martin	<ul style="list-style-type: none"> <li>• Computer Networks</li> <li>• Java Programming</li> <li>• Data Structures</li> <li>• Web Technology</li> </ul>	Assistant Professor Dept of MCA St. Joseph's College Trichy 620002	Mobile: 9789498764/ 9087848195 Email: Martin_cs1@mail.sjctni.edu.
14.	Dr.R.Jebakumar	<ul style="list-style-type: none"> <li>• Web Technology</li> <li>• DBMS</li> <li>• Programming in C</li> <li>• Software Engineering</li> </ul>	Associate Professor Department of Computing Technologies, SRMIST, Kattankulathur (Campus) Chennai.	Mobile: 9444122318 Email: jebakumr@srmist.edu.in
15.	Dr. M. Natarajan,	<ul style="list-style-type: none"> <li>• C++, Python, Java</li> <li>• Data Warehousing</li> <li>• DBMS</li> <li>• Computer Networks</li> <li>• Cloud Computing</li> </ul>	Department of Computer Science, Thanthai Hans Roever College Perambalur-20	Mobile: 9442035971 Email: prof.mnrajan@gmail.com
16.	Dr.S.Kamalakannan	<ul style="list-style-type: none"> <li>• Computer Networks</li> <li>• Data Structures</li> <li>• DBMS</li> <li>• OOPS</li> </ul>	Associate Professor, Department of Information Technology, School of Computing Sciences, Vels Institute of Science and Technology and Advanced Studies (VISTAS), Chennai.	Mobile: 9444325902 / 6381926109 Email: kannan.scs@velsuniv.ac.in
17.	Dr.K.K.Kulunthan	<ul style="list-style-type: none"> <li>• Agile Software Development</li> <li>• JAVA Programming</li> <li>• DBMS</li> <li>• Web Programming</li> </ul>	Assistant Professor & Head Department of Computer Applications, BWDA Arts and Science College, Villupuram, Tamil Nadu.	Mobile: 8610094909 Email: kulunthan@gmail.com
18.	Dr. B. Muruganantham	<ul style="list-style-type: none"> <li>• Data Warehousing</li> <li>• Object Oriented Programming</li> <li>• Data Structures</li> <li>• DBMS</li> </ul>	Associate Professor Department of Computer Science and Engineering, SRM Institute of Science and Technology, Kattankulathur (Campus)Chennai.	Mobile: 9940023373 Email: muruganb@srmist.edu.in

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2. C. 115

*[Signature]*



19.	Dr. Gokulakrishnan. D	<ul style="list-style-type: none"> <li>• Data Mining</li> <li>• C++, JAVA</li> <li>• DBMS</li> <li>• Networking</li> </ul>	Assistant Professor Department of Computer Science and Engineering, SRM Institute of Science and Technology, Kattankulathur (Campus) Chennai.	Mobile: 9629879934 Email: gokulkrish1453@gmail.com
20.	Dr.K.Umamaheshwari	<ul style="list-style-type: none"> <li>• Machine Learning</li> <li>• Software Engineering</li> <li>• JAVA Programming</li> <li>• Data Sciences</li> </ul>	Assistant Professor, Immaculate College for Women, Cuddalore, Tamil Nadu.	Mobile: 8870123352 / 9976993818 Email: umasundar216@gmail.com
21.	Dr. Sudha. S	<ul style="list-style-type: none"> <li>• Machine Learning</li> <li>• Java Programming</li> <li>• Mobile Application</li> </ul>	Professor Department of Computer Applications Hindustan University Padur, Chennai	Mobile: 99947 33413 Email: sudhas@hindustan.ac.in
22.	Dr. Naresh. R	<ul style="list-style-type: none"> <li>• Agile Software Development</li> <li>• JAVA Programming</li> <li>• Data Structure</li> <li>• Web Programming</li> </ul>	Associate Professor Department of Networking and Communications, School of Computing, SRM Institute of Science and Technology, Kattankulathur, Chennai	Mobile: 99445 99129 Email: nareshhr@srmist.edu.in
23.	Dr. C. N. S. Vinoth Kumar	<ul style="list-style-type: none"> <li>• C# .Net</li> <li>• JAVA Programming</li> <li>• Data Structure</li> <li>• Web Programming</li> </ul>	Associate Professor Department of Networking and Communications, School of Computing, SRM Institute of Science and Technology, Kattankulathur, Chennai	Mobile: 99445 99129 Email: vinothks1@srmist.edu.in
24.	Dr.G.Nasira	<ul style="list-style-type: none"> <li>• Java, C++</li> <li>• .Net</li> <li>• Data Structures</li> <li>• Embedded</li> <li>• Machine Learning</li> </ul>	Assistant Professor and HoD,  Department Of Computer Applications, Chikkanna Government Arts College, Tirupur, Tamil Nadu.	Mobile: 9894674606  Email: nasiragm99@yahoo.com

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2. C. 116

25.	<b>Dr. S. P. Ponnusamy</b>	<ul style="list-style-type: none"> <li>• C++, Python, Java</li> <li>• Data Warehousing</li> <li>• DBMS</li> <li>• Computer Networks</li> <li>• Cloud Computing</li> </ul>	Assistant Professor & Head, Department of Computer Science, Government Arts and Science College, Tittagudi-606106.	Mobile: 9940802417 Email: sponns2k1@gmail.com
26.	<b>Dr. J. Vinothkumar</b>	<ul style="list-style-type: none"> <li>• Cloud Computing</li> <li>• Networks Security</li> <li>• ASP .NET, PHP, JAVA</li> <li>• Block chain Technology,</li> <li>• Data Science</li> </ul>	Asst. Professor Rajiv Gandhi Arts and Science College, Thavalakuppam, Puducherry.	Mobile :9940807092 Email: jaivinothkumar.mca@gmail.com
27.	<b>Dr.T.K.Sivakumar</b>	<ul style="list-style-type: none"> <li>• C, C++, JAVA</li> <li>• Data Structures</li> <li>• Network Security</li> <li>• Software Engineering</li> </ul>	Assistant Professor (Sr. Grade), Department of Computing Technologies, SRM Institute of Science and Technology, Kattankulathur – 603203, Chennai.	Mobile: 9444202864 Email: sivakumt2@srmist.edu.in

2, C, 117

Department of M.C.A – 6<sup>th</sup> Meeting of BoS

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