

Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institution, Affiliated to VTU, Approved by AICTE, Accredited by NAAC with A+ grade)

School of Computer Science and Engineering

Master of Computer Applications (MCA) Programme



Scheme 2026 – 2028

MCA I – IV Semester

For the Academic Year 2026-27



Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY

(An Autonomous Institution, Affiliated to VTU, Belagavi, Approved by AICTE,
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MASTER OF COMPUTER APPLICATIONS PROGRAMME

Dr. AIT- VISION
To create Dynamic, Resourceful, Adept and Innovative Technical professionals to meet global challenges.
Dr. AIT- MISSION
▪ To offer state-of-the-art under graduate, post graduate and doctoral programs in the fields of Engineering, Technology and Management ▪ To generate new knowledge by engaging faculty and students in research, development and innovation. ▪ To provide strong theoretical foundation to the students, supported by extensive practical training to meet the industrial requirements. ▪ To instil moral and ethical values with social and professional commitment.
MCA PROGRAM- VISION
To Develop technically competent and ethical human resource to address the global challenges
MCA PROGRAM- MISSION
• To provide the industry-oriented quality education in association with all stake holders. • To promote entrepreneurship and research for sustainable development. • To inculcate a sense of commitment to the students towards socio-economic development of the nation.
PROGRAM EDUCATIONAL OBJECTIVES
PEO1: Apply the principles of software engineering and software development in verticals related to information technology and Information Technology Enabled Services (ITES). PEO2: Inculcate creative and innovative ideas with latest developments in the industry to be displayed as an entrepreneur or a researcher or an academician. PEO3: To incorporate the lifelong learning process with leadership skills and corporate social responsibilities.



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MASTER OF COMPUTER APPLICATIONS PROGRAMME

PROGRAM SPECIFIC OUTCOMES

PSO1: Apply advanced computing concepts, programming skills, algorithms, databases, and software engineering principles to develop effective software solutions for real-world problems.

PSO2: Design and develop innovative applications using emerging technologies such as Artificial Intelligence, Machine Learning, Data Science, Cloud Computing, Cyber Security, and Generative AI.

PSO3: Analyze, evaluate, and implement computing solutions using appropriate tools and methodologies while demonstrating.

PROGRAM OUTCOMES (POs)

P01 (Foundation Knowledge): Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.

P02 (Problem Analysis): Identify, review, formulate and analyse problems for primarily focusing on customer requirements using critical thinking frameworks.

P03 (Development of Solutions): Design, develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.

P04 (Modern Tool Usage): Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.

P05 (Individual and Teamwork): Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.

P06 (Project Management and Finance): Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management.

P07 (Ethics): Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware.

P08 (Life-long learning): Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.



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Scheme of Teaching and Examination effective from the Academic Year 2026 – 27

I SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Learning Scheme					Examination				Credits
				Class Instruction in Hours		Lab Instruction in Hours	TW & SL	Total Hours/ Sem	Duration (Hrs)	CIE Marks	SEE Marks	Total Marks	
				L	T								
1	BSC	1MCAT101	Mathematical Foundations for Computer Applications	42	28		50	120	03	50	50	100	4
2	IPCC	1MCAU102	Database Management Systems	28		28	34	90	03	50	50	100	3
3	PCC	1MCAT103	Fundamentals of AI and Applications	42			48	90	03	50	50	100	3
4	PCC	1MCAT104	Data Structures and Algorithms	42			48	90	03	50	50	100	3
5	IPCC	1MCAU105	Operating System and Shell Scripting	42		28	50	120	03	50	50	100	4
6	IPCC	1MCAU106	Java Programming	42		28	50	120	03	50	50	100	4
7	PCCL	1MCAL107	Data Structures and Algorithms Lab			28	02	30	03	50	50	100	1
8	PCCL	1MCAL108	Web Programming Lab			28	02	30	03	50	50	100	1
9	NCMC	1MCDN109	Placement Training	56					01	50	--	50	NP/PP
Total										450	400	850	23
10	NCMC	1MCAT110	Additional Mathematics	42						50	--	900	NP/PP

AEC-Ability Enhancement Courses, **PCC** – Professional Core Courses, **PCCL** – Professional Core Course Laboratory, **IPEC**-Integrated Elective Course (IPEC), **VAC** – Value Added Courses. **SEC**-Skill Enhancement Course; **SDA**- Skill Development Activities, **T**-Theory, **U**- Lab Integrated, **L**- Lab, **MC**-Mandatory Course

Integrated courses (IPCC)-combining theory with practical components. (i) Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week. (ii) Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). (iii) The practical component shall be assessed only through CIE.

1MCA110- Additional Mathematics for the students who have not studied Mathematics course at 10+2 level or degree level



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II SEMESTER

(Core Courses and Specialization Courses)

Sl. No.	Course	Subject Code				Teaching & Learning Hours scheme					Examination				Credits
		Cyber Security	Data Science	Internet of Things	Enterprise Application Development	L	T	P	TW&SL	Total Hours /Sem	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	PCC*	1MCAT201*	1MCAT201*	1MCAT201*	1MCAT201*	56			64	120	03	50	50	100	4
2	PCC*	1MCAT202*	1MCAT202*	1MCAT202*	1MCAT202*	42			48	90	03	50	50	100	3
3	PEC	1MCRT203	1MDST203	1MIOT203	1MEDT203	42			48	90	03	50	50	100	3
4	PEC	1MCRT204	1MDST204	1MIOT204	1MEDT204	42			48	90	03	50	50	100	3
5	PECL	1MCRL205	1MDSL205	1MOTL205	1MEDL205		28	28	04	60	03	50	50	100	2
6	PECL	1MCRL206	1MDSL206	1MOTL206	1MEDL206			28	02	30	03	50	50	100	1
7	PECL	1MCRL207	1MDSL207	1MOTL207	1MEDL207			28	02	30	03	50	50	100	1
8	PECL	1MCRL208	1MDSL208	1MOTL208	1MEDL208			28	02	30	03	100	-	100	1
9	NCMC	1MCDN209	1MCDN209	1MCDN209	1MCDN209	56					01	50	--	50	NP/PP
10	NCMC	1MRMI210	1MRMI210	1MRMI210	1MRMI210	Online courses (online.vtu.ac.in)									NP/PP
Total											19	500	350	850	18

Note: PCC*: Professional Core Course, PEC: Professional Elective Course, IPCC-Integrated Professional Core Courses, IPEC – Integrated Professional Elective Courses, NCMC-Non-Credit Mandatory Course, MC-Mandatory Course



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II SEMESTER- Core Courses

Subject Code	Title of the Subject	Subject Code	Title of the Subject	Subject Code	Title of the Subject	Subject Code	Title of the Subject
1MCAT201*	Computer Networks	1MCAT201*	Computer Networks	1MCAT201*	Computer Networks	1MCAT201*	Computer Networks
1MCAT202*	Software Engineering and Project Management	1MCAT202*	Software Engineering and Project Management	1MCAT202*	Software Engineering and Project Management	1MCAT202*	Software Engineering and Project Management
1MCDN209	Placement Training	1MCDN209	Placement Training	1MCDN209	Placement Training	1MCDN209	Placement Training
1MRMI210	Research Methodology and IPR (Online)	1MRMI210	Research Methodology and IPR (Online)	1MRMI210	Research Methodology and IPR (Online)	1MRMI210	Research Methodology and IPR (Online)

Specialization Courses

Cyber Security Professional Elective Courses		Data Science Professional Elective Courses		Internet of Things Professional Elective Courses		Enterprise Application Development Professional Elective Courses	
1MCRT203	Elements of Cyber Security	1MDST203	Data Engineering	1MITT203	Embedded Software Development	1MEDT203	Enterprise Application Architecture
1MCRT204	AI for Cyber Security Cryptosystems	1MDST204	Data Mining & Data Warehousing	1MITT204	Cloud and Edge Computing for IoT	1MEDT204	Java Enterprise Programming
1MCRL205	Cryptosystems Lab	1MDSL205	Statistical Machine Learning Lab	1MITL205	Electronics Lab	1MEDL205	AI for Enterprise Applications Lab
1MCRL206	Cyber Security Lab	1MDSL206	Python for Data Analytics Lab	1MITL206	Embedded Software Development Lab	1MEDL206	Java Enterprise Programming Lab
1MCRL207	Network Programming and Security Lab	1MDSL207	Cloud Data Science Lab	1MITL207	Computer Networks and IoT Protocols Lab	1MEDL207	AI for Enterprise Applications Lab
1MCRL208	Ethical Hacking Lab	1MDSL208	No SQL Lab	1MITL208	Computing Systems from First Principles Lab	1MEDL208	UI/UX Lab

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III SEMESTER

(Core Courses and Specialization Courses)

Sl. No	Course	Subject Code				Teaching & Learning Hours scheme					Examination				Credits
		Cyber Security	Data Science	Internet of Things	Enterprise Application Development	L	T	P	TW&SL	Total Hours /Sem	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	PEC	1MCRT301	1MDST301	1MITT301	1MEDT301	42		28	50	120	03	50	50	100	4
2	PEC	1MCRT302	1MDST302	1MITT302	1MEDT302	42			48	90	03	50	50	100	3
3	PEC	1MCRT303	1MDST303	1MITT303	1MEDT303	42		28	50	120	03	50	50	100	4
4	PEC	1MCRT304	1MDST304	1MITT304	1MEDT304	42			48	90	03	50	50	100	3
5	PECL	1MCRL305	1MDSL305	1MITL305	1MEDL305		28	28	04	60	03	50	50	100	2
6	PCC*/SEC*	1MCAP306*	1MCAP306*	1MCAP306*	1MCAP306*	25-30 hours				210	03	100	100	100	8
Total												350	350	600	24

Note: PCC*: Professional Core Course, PEC: Professional Elective Course, IPCC-Integrated Professional Core Courses, IPEC-Integrated Professional Elective Courses, SDC-Skill Enhancement Course

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III SEMESTER

Specialization Courses

Cyber Security Professional Elective Courses		Data Science Professional Elective Courses		Internet of Things Professional Elective Courses		Enterprise Application Development Professional Elective Courses	
1MCRT301	Vulnerability and Penetration Testing	1MDST301	Big Data Analytics	1MITT301	Industrial Internet of Things Systems	1MEDT301	DevOps for Enterprise Applications
1MCRT302	Blockchain Technology	1MDST302	Optimization Techniques for Analytics	1MITT302	IoT Security and Privacy	1MEDT302	Low-code / No-code Enterprise Platforms
1MCRT303	Digital Forensics	1MDST303	Information Retrieval and Natural Language Processing	1MITT303	Vision Computing for Intelligent IoT Systems	1MEDT303	Cloud Native Enterprise Applications
1MCRT304	LLM and Agentic AI Security	1MDST304	Social Media Analytics	1MITT304	Generative AI for Intelligent Systems	1MEDT304	Enterprise Application Security
1MCRL305	Security Operations and SIEM Lab	1MDSL305	Intelligent Systems and Data Science Lab	1MITL305	IoT Systems Integration and Deployment Lab	1MEDL305	API Engineering Lab
1MCAP306*	Project Work	1MCAP306*	Project Work	1MCAP306*	Project Work	1MCAP306*	Project Work

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IV SEMESTER

(Core Courses and Dual Specialization Courses)

Sl. No.	Course	Subject Code				Teaching & Learning Hours scheme					Examination				Credits
		Cyber Security	Data Science	Internet of Things	Enterprise Application Development	L	T	P	TW&SL	Total Hours /Sem	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	PEC	1MCRT401	1MDST401	1MIOT401	1MEDT401	Online Evaluation					03	50	50	100	3
2	PEC	1MCRT402	1MDST402	1MIOT402	1MEDT402	Online Evaluation					03	50	50	100	3
3	PCC* / SEC*	1MCAI403	1MCAI403	1MCAI403	1MCAI403	Internship (15 weeks)			360		03	100	100	200	9
Total												200	200	400	15
4	SEC	Skill Lab				25-30 hours						100	-	100	2

Note: PCC*: Professional Core Course, PEC: Professional Elective Course. The online Courses must be domain/specialization specific.

Skill Lab credits shall not be considered for the award of rank, calculation of the Programme Cumulative Grade Point Average (CGPA), or vertical progression.

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IV SEMESTER

Specialization Courses

Cyber Security Professional Elective Courses		Data Science Professional Elective Courses		Internet of Things Professional Elective Courses		Enterprise Application Development Professional Elective Courses	
1MCR401	VTU/NPTEL Online Course	1MDS401	VTU/NPTEL Online Course	1MITT401	VTU/NPTEL Online Course	1MEDT401	VTU/NPTEL Online Course
1MCR402	VTU/NPTEL Online Course	1MDS402	VTU/NPTEL Online Course	1MITT402	VTU/NPTEL Online Course	1MEDT402	VTU/NPTEL Online Course
1MCAI403*	Internship	1MCAI403*	Internship	1MCAI403*	Internship	1MCAI403*	Internship

Grand Total

Total Marks: 2700	Total Credits: 80
With Skill Lab	Total Credits: 82

Project Work:

The project work is a critical component of the curriculum, designed to bridge the gap between academic knowledge and industry practices. It provides students with an opportunity to apply their learning to solve real-world problems, develop innovative solutions, and gain hands-on experience in a professional environment.

Project work and Dissertation:

1. Each candidate shall carry out the project work independently as per the Scheme of Teaching and Examinations under the guidance of one of the faculty members of the Department in the Institution of study. If the project is of an inter-disciplinary nature, a co-guide shall be taken from the other concerned department.
2. The topic and title of the dissertation shall be chosen by the candidate in consultation with the guide and co-guide, if any, before the commencement of III semester.
3. The subject and topic of the dissertation shall be from the major field of study of the candidate. Modification of only the title but not the field of work may be permitted at the time of the final submission of the dissertation report during the third semester.

Internship:

Internship refers to the position of a student as trainee or a temporary (or unconfirmed) employee, who works in an organization, with or without pay, in order to gain work experience or satisfy requirements for a qualification. It is a structured, supervised professional experience in an industry, research organization, or community setting. Students taking up internship may be with or without stipend.

Internships play a vital role in bridging the gap between theoretical education and professional practice. In general, engineering internships serve as a crucial component of professional education by providing experiential learning, industry readiness, and holistic skill development, ultimately producing competent engineers or entrepreneurs. Apart from these, it develops professional ethics, work culture awareness and communication skills.

Some of the common types of internships are as follows:

Industry Internship: Carried out in the engineering industry, companies, manufacturing units, startups, business, IT industry. The topic involved may be technical, managerial, production-related tasks, live projects, or innovative activities.

Research Internship: Carried out at universities, research labs, or R and D departments or organisations. The internship may involve literature review, data analysis, and experimental work leading to publications, prototypes, technical reports or innovations. The research internship may induce students to plan for higher studies or academic careers.

Community or Societal Internship: Carried out with government schemes, or rural development projects, Non-Governmental Organisations (NGOs). The internship focused on social and community development activities promotes social responsibility, sustainable development awareness, encourages civic responsibility and ethical engagement.

Entrepreneurship Internship: Undertaken in association with start-ups, or entrepreneurship cells or launching own idea in Pre-Incubation/Incubation centres. The internship offers exposure to business planning, prototype product development, and promotes innovation, risk-taking, and entrepreneurial mindset.

Virtual or Remote or Online Internship: Undertaken using online tools and digital collaboration platforms. Such internships are common in content writing, data science, marketing, and software development. It offers flexible learning environments and access to global opportunities, and allows participation in real projects without being physically present, from anywhere and anytime.

Post-Placement Internship: Refers to the internship offered to students after they receive a confirmed job offer (placement) from a company, but before formally joining as full-time employees. This internship (on-site, virtual, or hybrid) ensures that students are groomed to be professionally ready, technically competent, and culturally aligned with the organization even before official induction.

Skill Enhancement Internship: Carried out at reputed organisations in offline or online mode. The aim of the internship is to expose to real-world tools, technologies, and professional environments to improve a student's employability by offering hands-on experience, application of theoretical concepts, and skill development aligned with current industry and technical trends. Skill Enhancement Internships, depending on focus area and scope, can be carried out at various organisations such as, Academic and Research Institutions, Industry and Corporate Settings, Government and Public Sector, NGOs and Social Enterprises.

For Skill Enhancement Internship topics refer to <https://online.vtu.ac.in/category/courses/Skill-Enhancement-Course>.

SKILL LABS

In order to enhance the employability and strengthen the hands-on training, experiential learning, innovation, design thinking, prototyping, industry collaboration, and domain-specific skill development, thereby enhancing students' technical competence, professional skills, **Skill Labs** are introduced as an integral part of the curriculum for Undergraduate (UG) and Postgraduate (PG) programmes of the University.

Skill Labs carry the prescribed credits, and every student shall compulsorily earn the requisite Skill Lab credits as specified in the **Guidelines** before the completion of the respective degree programme. Earning the prescribed Skill Lab **credits** is a mandatory requirement for the award of the degree.

Preamble

In alignment with the objectives of the National Education Policy (NEP) 2020, the guidelines of the All India Council for Technical Education, and the Government of India's Pradhan Mantri Kaushal Vikas Yojana (PMKVY) under the Skill India Mission, Visvesvaraya Technological University is committed to promoting experiential, project-based, skill-oriented, and industry-driven education through Skill Laboratories/centers established in the University's Skill Centres, University Departments, and at affiliated engineering colleges. These laboratories shall facilitate hands-on training, experiential learning, innovation, design thinking, prototyping, industry collaboration, and domain-specific skill development to enhance students' technical competence and employability.

Guidelines

1. Completion of the prescribed number of Skill Labs is mandatory for the award of the degree.
2. All prescribed Skill Labs shall be completed before the completion of the respective degree programme.
3. Each Skill Lab shall have a minimum duration of 25–30 hours. Successful completion of one Skill Lab of 25–30 hours shall carry one (01) credit.
4. Students admitting to the 2026 Scheme of the MBA and MCA programmes shall successfully complete two (02) Skill Labs.
5. 2026 scheme (MBA and MCA) admitting students have to complete the skill labs before completion of their degree duration.
6. Students shall attend to these skill Labs during Saturdays, Sundays, general holidays, vacations and Summer Semesters with an aim that students acquire skills of their choice to become industry ready graduates.
7. With the introduction of Skill Labs, the total credits for the MBA and MCA programmes under the 2026 Scheme shall be 82 credits. However, the additional two (02) Skill Lab credits shall not be considered for the award of rank, calculation of the Programme Cumulative Grade Point Average (CGPA), or vertical progression. The successful completion of the prescribed Skill Labs shall, however, be reflected in the **final Semester Grade**

Card.

8. The students of affiliated colleges where University-approved Skill Centres have not been established shall complete the prescribed skill Labs at the University Skill Centres (Centers of Excellence) or at university-approved Skill Centers established in other affiliated colleges.

9. The **list** of Skill Labs to be offered through the University Skill Centres (Centres of Excellence), University Regional Offices/Departments, and University-approved Skill Centres established in affiliated colleges shall be notified by the University separately from time to time.

10. The evaluation methodology for the Skill Labs shall be based on the nature and objectives of the respective programme. Skill Labs based on Project-Based Learning (PBL) shall be evaluated on the lines of project work evaluation, while Skill Labs based on Experimental/Hands-on Learning shall be evaluated in a manner like practical examinations.

Each skill lab shall be evaluated out of 100 marks, by two internal examiners after completion of the skill labs immediately. The examiners are appointed by the Principal/Chairperson/Programme coordinator. The marks shall be finalized and kept ready for uploading to the VTU portal whenever called for by the University.

11. The Principal of the concerned college shall submit, from time to time, the list of students registered for the Skill Labs, along with the details of the respective Skill Centre, to the Registrar, VTU, Belagavi, with a copy to the Registrar (Evaluation), VTU, Belagavi, without fail.

Overview of Courses, Credits, Projects, and Internships under VTU Curriculum

I. Abbreviations used in the Scheme of Teaching and Examinations

Abbreviations	Expanded Form of the Abbreviations
AICTE	All India Council of Technical Education
NCrF	National Credit Framework
VTU	Visvesvaraya Technological University
AEC	Ability Enhancement Course
ASC	Applied Science Course
BSC	Basic Science Course
CIE	Continuous Internal Evaluation
CI	Classroom Instruction
CCA	Continuous Comprehensive Assessment
CGPA	Cumulative Grade Point Average
CUL	Cultural
COE	Centre for Online Education
HSMC	Humanities Studies and Management Course
IPCC	Integrated Professional Core Course
LI	Laboratory Instruction
L	Lecture
NCMC	Non-Credit Mandatory Course
NSS	National Service Scheme
NPTEL	National Programme for Technical Enhanced Learning
OEC	Open Elective (Interdepartmental or interdisciplinary) Course
PCC	Professional Core Course
PCCL	Professional Core Course Laboratory

PEC	Professional Elective Courses
PE	Physical Education
P	Practical
SEC	Skill Enhancement Courses
SEE	Semester End Evaluation
SL	Self-Learning
SGPA	Semester Grade Point Average
SWAYAM	Study Webs of Active-Learning for Young Aspiring Minds
TW	Term Work
T	Tutorial
VTU online Course	VTU online courses offered by Centre for Online Education, Mysuru
YOG	Yoga

II. Credit Representation

1-hour Lecture (L) per week=1Credit

2-hoursTutorial(T) per week=1Credit

2- hours Practical / Drawing (P) per week=1Credit

Teaching & Learning Scheme

As per the new National Credit Framework (NCrF), 30 hours of learning of a student is considered equivalent to 1 credit. A semester is considered as a 14-week period of academic interaction with students. The learning components are categorized as follows:

- Classroom Instruction (CI):** Includes different instructional / implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts within the classroom measured in Number of hours per semester.
- Laboratory Instruction (LI):** Expressed as number of hours per semester which Includes experiments / practical performances / problem-based experiences in laboratory, workshop, field or other locations using different instructional / Implementation strategies.
- Term work (TW):** Includes assignments, seminars, presentations, case studies, micro projects, field activities, industrial visits, academic preparation duration and any other student activities in Number of hours per semester.
- Self-Learning (SL):** MOOCs (SWAYAM/NPTEL/Industry certified courses), spoken tutorials, online educational resources, self-initiated projects, Learning through digital resources etc in Number of hours per semester. (If provided in curriculum structure).

	Course Details	
1.	One Credit Theory Courses:	
	Teaching-Learning sessions in a semester	14 hours
	Examination pattern for CIE and SEE	Multiple Choice Question (MCQ)
	Teaching hours per week - L:T:P	1:0:0
2.	One Credit Laboratory Courses:	
	Teaching-Learning sessions in a semester	28 hours (2 hours session /week)
	Examination pattern for CIE and SEE	Continuous assessments, lab Internal test and SEE
	Teaching hours per week - L:T:P	0:0:2
3.	Two Credit Theory Courses:	
	Teaching-Learning Sessions in a semester	28 hours
	Examination pattern for CIE and SEE	Descriptive
	Teaching hours per week - L:T:P	2:0:0
4.	Three Credit ESC/ETC/PCC/PEC/OEC Courses:	
	Teaching-Learning Sessions in a semester	42 hours
	Examination pattern for CIE and SEE	Descriptive
	Teaching hours per week for theory courses - L:T:P	3:0:0
5.	Four Credit Program Core Courses (PCC):	
	Teaching-Learning Sessions in a semester	56 hours
	Examination pattern for CIE and SEE	Descriptive
	Teaching hours per week for theory courses - L:T:P	4:0:0
6.	Four Credit Integrated Professional Core Courses (IPCC):	
	Teaching-Learning Sessions in a semester (Teaching sessions: 42 hours + Practical sessions: 28 hours)	70 hours
	Examination pattern for CIE and SEE	Descriptive
	Practical part of examination	CIE (No SEE).
	Teaching hours per week - L: T: P	3: 0: 2

III. Details of Courses

- (1) Integrated Professional Core Course (IPCC):** The Integrated Professional Core Course (IPCC) refers to a core theory course that is integrated with a laboratory of the same subject. Each IPCC carries 4 credits, with Teaching–Learning hours structured (L : T : P) as either (3:0:2). The theory component of the IPCC shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). The laboratory part shall be assessed exclusively through CIE, with no SEE. However, questions derived from the laboratory part may be included in the SEE question paper to ensure comprehensive evaluation
- (2) Non-Credit Mandatory Courses (NCMC):** are aimed at enhancing students' knowledge, skills, and awareness beyond the core curriculum. Successful completion of the NCMC is compulsory for fulfilling the requirements of the academic program. It shall not be considered for the computation of SGPA, CGPA and vertical progression. Each student shall register for the prescribed NCMC(s) in the prescribed semester. A student who fails to qualify in the prescribed NCMC shall not be eligible for the conferment of the degree.
- (3) Professional Elective Courses (PEC):** A professional elective course (PEC) is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum of the same discipline.
- (4) Ability Enhancement Course Laboratory (AEC):** An Ability Enhancement Course Laboratory is a practical, skill-oriented lab course designed to strengthen students' practical abilities, professional competencies that support communication, environmental awareness, computational thinking, interdisciplinary learning, and application skills through hands-on learning experiences.
The laboratory may pertain to disciplinary or interdisciplinary involving experiments, design tasks, and mini-projects aligned with current industry practices.
- (5) Skill Enhancement Courses (SEC):** These courses are intended to develop specific practical skills and competencies that improve students' employability, technical proficiency, and professional readiness to bridge the gap between academic and industry requirements. These courses emphasize hands-on training, application of theoretical knowledge, and development of discipline-relevant and transferable skills required in industry and society, and develop entrepreneurship and start-up skills.
- (6) Online Courses:** Online courses are educational programs delivered over the Internet through a digital platform, allowing students to access lessons, assignments, and discussions from anywhere at any time. Most online courses offer flexibility, allowing students to access materials and complete assignments on their own schedule. However, students have to pass the course within a stipulated period as per the norms of the university.

- (7) VTU Online Courses:** VTU Online courses are online courses offered by Centre of Online Education (COE) Mysuru. A wide range of multidisciplinary courses are available to learners anywhere, anytime to earn university-prescribed credits through proctored examination for the award of a degree.
- (8) NPTEL/SWAYAM Online Courses:** The National Programme on Technology Enhanced Learning (NPTEL)/SWAYAM (Study Webs of Active Learning for Young Aspiring Minds) are the specific Indian platforms to host national Massive Open Online Courses (MOOCs). It offers online courses on a wide range of disciplines to learners anywhere, anytime, to earn university-prescribed credits through proctored examination for the award of a degree. All NPTEL/SWAYAM courses are MOOCs, but not all MOOCs are offered on these specific Indian platforms.

IV. **Ability Enhancement Project (AEP) / Skill Development Project (SDP)**

An Ability Enhancement Project (AEP) or Skill Development Project (SDP) is a focused project aimed at enhancing specific skills or abilities in a particular domain. It's designed to bridge the gap between theoretical knowledge and practical application.

Key Objectives:

1. Develop practical skills relevant to the industry or field.
2. Enhance problem-solving, critical thinking, and analytical abilities.
3. Improve communication, teamwork, and collaboration skills.
4. Apply theoretical concepts to real-world problems or scenarios.
5. Foster creativity, innovation, and entrepreneurship.

Characteristics:

1. Practical and hands-on approach.
2. Industry-relevant skills and tools.
3. Mentorship and guidance.
4. Opportunity to work on real-world projects or case studies.
5. Emphasis on skill development and enhancement.



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Course Title	Mathematical Foundations for Computer Applications				
Course Code	1MCAT101				
Course Category	BSC (Basic Science Course)				
Teaching - Learning Scheme & Credit	L	T	P	Total Credits	Total Teaching Hours
	3	1	0	4	Lecture: 42 + Tutorials: 28 + Practical: 0 + Self-Study: 50 = 120
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100		Duration of SEE: 03 Hours

Course Learning Objectives:	
CLO1	Understand the fundamental concepts of linear algebra, differential calculus, logic, and relations to build a strong mathematical foundation.
CLO2	Apply matrix operations, differentiation techniques, and logical reasoning to solve computational and analytical problems.
CLO3	Analyze statistical measures, probability distributions, and hypothesis testing to interpret data and validate conclusions.
CLO4	Evaluate mathematical models and problem-solving approaches in optimization, probability, and graph theory.
CLO5	Develop critical thinking and problem-solving skills by integrating concepts from algebra, calculus, logic, statistics, and discrete mathematics into real-world applications.

SYLLABUS	No. of Hours	BTLs
UNIT 1	11	L1-L4
Rank of a matrix-Row Echelon Form and Normal form, Solving system of equations -Gauss Elimination, Eigen values and Eigen vectors, Cayley - Hamilton theorem - Inverse of a matrix		
Derivatives-Core concepts, Rules of differentiation, higher order derivatives, partial derivatives-basics.		
SELF-STUDY COMPONENT	10 Hours	
Matrix operations, Determinants, Minors, Cofactors, Inverse of matrices.		
UNIT 2	11	L1-L4
Propositions and logical operators, Truth table, Propositions generated by a set Logical equivalence-converse, inverse and contrapositive, logical implications, Quantifiers, Rules of Inference		
SELF-STUDY COMPONENT	10 Hours	
Problem-solving exercises on truth tables and logical equivalence, Quantifier and inference problems.		
UNIT 3	11	L1-L4
Descriptive Statistics, Measure of Central Tendency -Mean, Median and Mode, Quartiles, Measure of Dispersion -Range, Median, Variance and Standard deviation, Skewness and Kurtosis, Correlation-Pearson correlation, Spearman & Kendall Rank correlation.		
Probability Distributions-Binomial & Poisson Distributions		
SELF-STUDY COMPONENT	10 Hours	
Analyse a real-world dataset and identify central tendency and variability, calculate and interpret Pearson, Spearman and Kendall correlations.		



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UNIT 4	11	L1-L4
Hypothesis Testing: One-Sample Tests (Large Samples): Introduction, Hypothesis Testing, Procedure for Hypothesis Testing, all types of One-tailed and Two-tailed Tests. Chi-Square Test: Chi-Square one Sample Test, Steps involved in the process		
SELF-STUDY COMPONENT		10 Hours
Type I/II errors and decision rules. Numerical problems on one-sample large-sample tests and one-/two-tailed tests. Chi-square goodness-of-fit problems.		
UNIT 5	11	L1-L4
Relations- Properties of relations, Matrices of relations, Equivalence relations Graphs and Graphs models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, The Königsberg Bridge problem.		
SELF-STUDY COMPONENT		10 Hours
Explore vertices, edges, degree, paths, cycles and special graphs such as complete, bipartite and regular graphs. Solve Euler and Hamilton path/circuit problems and relate them to routing and optimization problems, Königsberg Bridge Problem and its historical significance.		

TEXT BOOKS	
1.	Grimaldi, R.P and Ramana, B.V. "Discrete and Combinatorial Mathematics", 5 th Edition, Pearson Education, 2006.
2.	Theory and Problems of Probability, Seymour Lipschutz and Marc Iars Lipson, 2 nd Edition Schaum's Outline Series, ISBN: 0-07-118356-6.
3.	Larsen, Richard J., and Morris L. Marx: An Introduction to Mathematical Statistics and its Applications, Pearson Education, 2017.

REFERENCE BOOKS	
1.	Discrete Mathematics & its Applications, Kenneth H Rosen, 7 th Edition, 2010, McGraw-Hill, ISBN10: 0073383090, ISBN-13: 978-0-073383095.
2.	Trembley, J.P. and Manohar, R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, New Delhi, 2007.
3.	Richard I. Levin, David S. Rubin, Statistics for Management, Seventh Edition, PrenticeHall of India, Pvt. Ltd., 2000.

e-LEARNING RESOURCES
https://onlinecourses-archive.nptel.ac.in/noc18_cs53/preview
https://ocw.mit.edu/courses/6-042j-mathematics-for-computer-science-fall-2010/download/

Assessment Details for both CIE and SEE
The weightage assigned to the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) is 50% each. To pass the course, students must secure a minimum of 50% marks separately in both CIE and SEE. Continuous Internal Evaluation (CIE) The CIE consists of two components:



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1. CIE – Theory Component
2. Assignment
3. Seminar
4. Group Activity

Students must secure a minimum of 50% marks in the combined total of the CIE Theory, Assignment, Seminar and Group Activity components to qualify for appearing in the SEE.

Semester End Examination (SEE)

The Theory SEE is conducted for 100 marks with a duration of 3 hours. The marks obtained are subsequently scaled down to 50 marks for calculating the final course grade.

The student must secure a minimum of 50% marks in the SEE to pass the course.

****Self-Study Component should be included for CIE.**

CONTINUOUS INTERNAL EVALUATION (CIE)		Max. Marks	Minimum Marks Required in CIE to Qualify for SEE (50% individually)
Theory	Weightage of CIE-1 and CIE-2 or CIE-3	30	15
	Assignment	10	5
	Seminar	05	2.5
	Group Activity	05	2.5
	TOTAL	50	25

SEE QUESTION PAPER PATTERN

Q. No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
UNIT	1		2		3		4		5	
1. Two full questions (each of 20 Marks) are to be set from each unit.										
2. Student shall answer five full questions selecting one full question from each unit.										

Course Outcomes: After the completion of the course, the student will be able to

CO1	<i>Explain and apply</i> concepts of matrices (rank, echelon forms, eigenvalues, eigenvectors, Cayley-Hamilton theorem) and <i>perform</i> differentiation.
CO2	<i>Construct and analyze</i> logical arguments using propositions, truth tables, equivalence, quantifiers, and rules of inference.
CO3	<i>Compute and interpret</i> descriptive statistics and <i>apply</i> probability distributions to solve problems.
CO4	<i>Perform and evaluate</i> hypothesis testing procedures, including one-sample tests, chi-square tests, and interpretation of one-tailed and two-tailed results.
CO5	<i>Apply</i> properties of relations and graph and <i>construct</i> solutions to discrete mathematical problems such as the Konigsberg Bridge.

COURSE SUSTAINABLE DEVELOPMENT GOALS (SDGs)

Goal No.	Goal Title	Description
4	Quality Education	Ensure Inclusive and equitable quality education and promote lifelong learning opportunities for all



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8	Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
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Mapping of COs with POs with PSOs											
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	–	–	2	3	2	1
CO2	3	3	2	2	1	–	1	3	3	2	2
CO3	3	3	2	3	1	1	–	3	3	3	2
CO4	3	3	3	3	1	1	1	3	3	3	2
CO5	3	3	3	3	1	1	–	2	3	2	2

Mapping of COs with Knowledge and Attitude Profile (WK)									
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0									
CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	1	3	2	2	–	1	–	1	–
CO2	1	3	2	2	–	1	–	2	1
CO3	1	3	2	2	1	2	–	2	–
CO4	1	3	2	2	1	2	–	2	1
CO5	1	3	2	2	–	2	–	2	–

Course Coordinator:

Shobha Rani B R
Associate Professor
MCA Programme



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Semester: I

Scheme: 2026

Course Title	Database Management Systems				
Course Code	1MCAU102				
Course Category	IPCC (Integrated Professional Core Course)				
Teaching - Learning Scheme & Credit	L	T	P	Total Credits	Total Teaching Hours
	2	0	1	3	Lecture: 28 + Tutorials: 0 + Practical: 28 + Self Study: 34 = 90
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100		Duration of SEE: 03 Hours

Course Learning Objectives:	
CLO1	Learning fundamental concepts, architecture, components, and applications of Database Management Systems.
CLO2	Design conceptual and logical database models using ER diagrams , relational models, and appropriate constraints.
CLO3	Apply SQL commands to create, manipulate, retrieve, and manage data in relational databases.
CLO4	Analyze and normalize relational databases to reduce redundancy and maintain data integrity and consistency .
CLO5	Implement database transactions, security, concurrency control, and recovery techniques for reliable database management.

SYLLABUS	No. of Hours	BTLs
UNIT 1	5	L1
Introduction to DBMS: properties – processes - Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, Three -schema architecture and data independence		
SELF-STUDY COMPONENT	6 Hours	
Data models, schemas and instances - Database languages and interfaces		
UNIT 2	6	L1, L3
Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, Relationship Sets, Roles and Structural Constraints Weak Entity Types.		
SELF-STUDY COMPONENT	7 Hours	
Construction of ER diagrams for multiple domains		
UNIT 3	6	L3
Overview of the SQL Query Language, SQL Data Definition, Basic structure of SQL Queries values, Aggregate Functions, Queries using where, group by, order by		
SELF-STUDY COMPONENT	7 Hours	
Additional Basic Operations – Working on queries		



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UNIT 4		6	L3,L4
Working with subqueries, SQL joins, Handling views			
SELF-STUDY COMPONENT		7 Hours	
Working with data control language commands and implementing virtual tables			
UNIT 5		5	L1-L4
Informal Design Guidelines for Relation Schemas, Functional dependencies, Normal Forms based on Primary Keys, General Definitions of 2nd and 3 rd Normal Forms			
SELF-STUDY COMPONENT		7 Hours	
Normalization with Boyce Codd Normal Form, Domain Key Normal Form, Transaction Management – Understanding transaction locks, serializability			
PRACTICAL COMPONENT			
1.	Working with DDL commands and constraints		
2.	Working with DML commands		
3	Implementing aggregate functions		
4	Implementing date functions		
5	Applying queries with arithmetic functions		
6	Applying queries with having, group by functions		
7	Working with sub queries		
8	Implementing with complex queries		
9	Working with joins		
10	Working with views		

TEXT BOOKS	
1.	Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Addison -Wesley, 2011
2.	Silberschatz, Korth and Sudharshan Data base System Concepts,6th Edition, Tata McGraw Hill, 2011.

REFERENCE BOOKS	
1.	C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson education,2009
2.	Raghu Ramakrishnan and Johannes Gehrke: Database management Systems, 3rdEdition, McGraw-Hill, 2003

e-LEARNING RESOURCES	
https://nptel.ac.in/courses/106105175	
https://nptel.ac.in/courses/106106220	



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Assessment Details for both CIE and SEE

The weightage assigned to the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) is 50% each.

To pass the course, students must secure a minimum of 50% marks separately in both CIE and SEE.

Continuous Internal Evaluation (CIE)

The CIE consists of two components:

1. CIE – Theory Component
2. Assignment
3. Seminar
4. Group Activity

Students must secure a minimum of 50% marks in the combined total of the CIE Theory, Assignment, Seminar and Group Activity components to qualify for appearing in the SEE.

Semester End Examination (SEE)

The Theory SEE is conducted for 100 marks with a duration of 3 hours. The marks obtained are subsequently scaled down to 50 marks for calculating the final course grade.

The student must secure a minimum of 50% marks in the SEE to pass the course.

****Self-Study Component should be included for CIE.**

CONTINUOUS INTERNAL EVALUATION (CIE)		Max. Marks		Minimum Marks Required in CIE to Qualify for SEE (50% individually)
Theory	Weightage of CIE-1 and CIE-2 or CIE-3	30		15
Laboratory components	The record will be evaluated weekly, and the average score will be considered	10	20	10
	Lab CIE	10		
Total				25

SEE QUESTION PAPER PATTERN

Q. No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
UNIT	1		2		3		4		5	
1. Two full questions (each of 20 Marks) are to be set from each unit.										
2. Student shall answer five full questions selecting one full question from each unit.										

Course Outcomes: After the completion of the course, the student will be able to

CO1	Understand the fundamental concepts, and advantages of Database Management Systems,
CO2	Apply high-level conceptual data models to design databases for a given database application.
CO3	Develop and execute SQL queries using data definition statements, basic query structures to retrieve and manipulate database information.
CO4	Construct SQL queries to retrieve, combine, and manage data from multiple database tables efficiently.
CO5	Apply functional dependencies and normalization principles to analyze and design relation schemas and explain transaction management concepts including locks and serializability.



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COURSE SUSTAINABLE DEVELOPMENT GOALS (SDGs)		
Goal No.	Goal Title	Description
4	Quality Education	Ensure Inclusive and equitable quality education and promote lifelong learning opportunities for all
8	Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Mapping of COs with POs with PSOs											
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	2			1	2	2	2	1
CO2	3	3	3	2	1			2	3	2	1
CO3	3	3	3	3	1		1	2	3	3	1
CO4	3	3	3	3	1		1	2	3	3	1
CO5	3	3	3	2	1	1	1	2	3	2	2

Mapping of COs with Knowledge and Attitude Profile (WK)									
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0									
CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	–	2	–	3	–	2	–	–	1
CO2	–	3	–	3	3	2	–	–	1
CO3	–	3	–	3	2	3	–	–	1
CO4	–	3	–	3	2	3	–	1	1
CO5	–	3	–	3	3	2	–	1	2

Course Coordinator:

Dr. Indumathi S K
Associate Professor
MCA Programme



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Semester: I

Scheme: 2026

Course Title	Introduction to AI and Applications				
Course Code	1MCAT103				
Course Category	PCC (Professional Core Course)				
Teaching - Learning Scheme & Credit	L	T	P	Total Credits	Total Teaching Hours
	3	0	0	3	Lecture: 42 + Tutorials: 0 + Practical: 0 + Self Study: 48 = 90
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100		Duration of SEE: 03 Hours

Course Learning Objectives:	
CLO1	To provide students with a comprehensive understanding of the foundations, evolution, concepts, intelligent agents, and current developments in Artificial Intelligence.
CLO2	To develop the ability to formulate and solve complex problems using search, game-playing, knowledge representation, and logical reasoning techniques.
CLO3	To introduce machine learning paradigms and model evaluation, with emphasis on Explainable, Responsible, and Ethical AI.
CLO4	To familiarize students with AI applications and emerging technologies such as NLP, LLMs, Computer Vision, Robotics, and Multi-Agent Systems across diverse domains.
CLO5	To provide students with a comprehensive understanding of the foundations, evolution, concepts, intelligent agents, and current developments in Artificial Intelligence.

SYLLABUS	No. of Hours	BTLs
UNIT 1	8	L1-L4
Introduction and Intelligent Agents: Introduction; What is Artificial Intelligence? The Foundations of Artificial Intelligence; The History of Artificial Intelligence; The State of the Art; Intelligent Agents; Agents and Environments; The Nature of Environments; The Structure of Agents.		
SELF-STUDY COMPONENT	10 Hours	
Artificial Intelligence from its early development to modern applications, different types of intelligent agents and their real-world applications, Explore the structure of intelligent agents, including sensors, actuators		
UNIT 2	8	L1-L4
Solving Problems by Searching: Problem-Solving Agents; Example Problems; Searching for Solutions; Uninformed Search Strategies; Informed (Heuristic) Search Strategies; Local Search Algorithms and Optimization Problems; Search in Complex Environments; Online Search Agents and Unknown Environments.		
SELF-STUDY COMPONENT	9 Hours	



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Explore Breadth-First Search (BFS), Depth-First Search (DFS), Study local search algorithms such as Hill Climbing and Simulated Annealing for optimization problems, implement simple search algorithms using Python		
UNIT 3	8	L1-L4
Adversarial Search and Knowledge-Based Systems: Adversarial Search and Games; Optimal Decisions in Games; Alpha-Beta Pruning; Knowledge-Based Agents; Propositional Logic; First-Order Logic; Inference in First-Order Logic.		
SELF-STUDY COMPONENT		10 Hours
Study game-playing AI using examples such as Chess, Tic-Tac-Toe, and Connect Four, Practice Propositional Logic and First-Order Logic using real-world examples, Explore inference mechanisms		
UNIT 4	9	L1-L4
Machine Learning Concepts and Responsible AI: Introduction to Machine Learning, Relationship between Artificial Intelligence, Machine Learning and Deep Learning, Types of Machine Learning (Supervised, Unsupervised and Reinforcement Learning), AI Model Development Lifecycle, Model Training, Validation and Testing, Challenges in Machine Learning, Explainable AI (XAI)		
SELF-STUDY COMPONENT		10 Hours
Explore the relationship between Artificial Intelligence, Machine Learning, and Deep Learning with real-world examples, Explore Explainable AI (XAI) and techniques for improving model transparency		
UNIT 5	9	L1-L4
Artificial Intelligence Applications: Introduction to Natural Language Processing and Large Language Models, Computer Vision, Robotics and Intelligent Autonomous Systems, Multi-Agent Systems, AI Applications in Healthcare, Finance, Agriculture, Smart Cities and Transportation, Responsible and Ethical AI.		
SELF-STUDY COMPONENT		9 Hours
Explore the applications of Natural Language Processing (NLP) and Large Language Models (LLMs) in chatbots, translation, and content generation, Investigate AI applications through real-world case studies.		

TEXT BOOKS	
1.	Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, Pearson Education, 4th Global Edition, 2021.
2.	Tom Taulli, Artificial Intelligence Basics: A Non-Technical Introduction, 2nd Edition, A press, 2023.

REFERENCE BOOKS	
1.	Artificial Intelligence: Foundations of Computational Agents, David L. Poole and Alan K. Mackworth, Cambridge University Press, 2017.



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2.	Deep Learning, Ian Goodfellow, Yoshua Bengio, and Aaron Courville, MIT Press, 2016.
3.	Machine Learning, Tom M. Mitchell, McGraw-Hill Education, 1997.
4.	Artificial Intelligence, McGraw-Hill Education, 3rd Edition.

e-LEARNING RESOURCES
https://onlinecourses.nptel.ac.in/noc25_cs159/preview
https://www.geeksforgeeks.org/artificial-intelligence/artificial-intelligence/
AI For Everyone

Assessment Details for both CIE and SEE			
The weightage assigned to the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) is 50% each. To pass the course, students must secure a minimum of 40% marks separately in both CIE and SEE. Continuous Internal Evaluation (CIE) The CIE consists of two components: 1. CIE – Theory Component 2. Assignment 3. Seminar 4. Group Activity Students must secure a minimum of 50% marks in the combined total of the CIE Theory, Assignment, Seminar and Group Activity components to qualify for appearing in the SEE. Semester End Examination (SEE) The Theory SEE is conducted for 100 marks with a duration of 3 hours. The marks obtained are subsequently scaled down to 50 marks for calculating the final course grade. The student must secure a minimum of 40% marks in the SEE to pass the course. **Self-Study Component should be included for CIE. Self-study component should be included in the CIE under Question 4 only.			
CONTINUOUS INTERNAL EVALUATION (CIE)		Max. Marks	Minimum Marks Required in CIE to Qualify for SEE (50% individually)
Theory	Weightage of CIE-1 and CIE-2 or CIE-3	30	15
	Assignment	10	5
	Seminar	05	2.5
	Group Activity	05	2.5
	TOTAL	50	25



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SEE QUESTION PAPER PATTERN

Q. No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
UNIT	1		2		3		4		5	
1. Two full questions (each of 20 Marks) are to be set from each unit.										
2. Student shall answer five full questions selecting one full question from each unit.										

Course Outcomes: After the completion of the course, the student will be able to

CO1	Understand the fundamental concepts of artificial intelligence, intelligent agents, agent architectures, and the characteristics of problem-solving environments.
CO2	Apply search strategies, optimization techniques, and knowledge representation methods to solve artificial intelligence problems.
CO3	Analyze adversarial search, logical inference, and machine learning approaches for intelligent decision-making in diverse application domains.
CO4	Apply explainability, bias mitigation, fairness, ethics, responsible AI principles, and performance measures in the development and assessment of artificial intelligence solutions.
CO5	Analyze and explain the use of Artificial Intelligence techniques in solving real-world problems.

COURSE SUSTAINABLE DEVELOPMENT GOALS (SDGs)

Goal No.	Goal Title	Description
4	Quality Education	Ensure Inclusive and equitable quality education and promote lifelong learning opportunities for all
8	Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Mapping of COs with POs with PSOs

Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	-	2	2	-	-	3	3	-
CO2	3	3	3	-	3	2	-	-	3	3	-
CO3	3	-	-	2	2	3	-	-	3	3	-
CO4	3	3	3		3	3	-	-	3	3	-
CO5	3	3	3	2	3	3	-	-	3	3	-



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Mapping of COs with Knowledge and Attitude Profile (WK)									
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0									
CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	2	2	3	1	1	2	2	2	3
CO2	3	3	3	3	3	3	2	2	3
CO3	2	1	2	2	1	2	3	2	3
CO4	3	3	3	3	3	3	2	2	3
CO5	3	3	3	3	3	3	3	3	3

Course Coordinators:

Shobha Rani B R
Assistant Professor
MCA Programme



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Semester: I

Scheme: 2026

Course Title	DATA STRUCTURES AND ALGORITHMS				
Course Code	1MCAT104				
Course Category	PCC (Professional Core Course)				
Teaching - Learning Scheme & Credit	L	T	P	Total Credit	Total Teaching Hours Credit
	3	0	0	3	Lecture: 42 + Tutorials: 0 + Practical: 0 + Self Study: 48 = 90
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100		Duration of SEE: 03 Hrs

Course Learning Objectives:	
CLO1	Understand the fundamental concepts of data structures, algorithms, complexity analysis, and their applications in problem solving.
CLO2	Implement linear data structures such as arrays, linked lists, stacks, queues, and their variants.
CLO3	Apply non-linear data structures such as trees, binary search trees and graphs to solve computational problems.
CLO4	Analyze and apply searching and sorting algorithms based on their time complexities.
CLO5	Design an efficient algorithms using appropriate data structures for solving real-world computational problems.

SYLLABUS	No. of Hours	BTLs
UNIT 1	8	L1-L4
Foundations of Data Structures & Algorithmic Analysis: Data Structures Introduction: Fundamental Data Structures. Linear Array: Arrays, Dynamically Allocated Array, Linked Memory: Singly Linked Lists and Chains, Doubly Linked Lists. Algorithm Analysis Introduction: What is an Algorithm? Fundamentals of Algorithmic Problem Solving, The Analysis Framework, Asymptotic Notations and Basic Efficiency Classes.		
SELF-STUDY COMPONENT		9
Implement fundamental array operations; understand dynamic memory management; Calculate basic algorithm efficiency; Online quiz covering data structures, algorithms, complexity, and asymptotic notations.		
UNIT 2	9	L1-L4
Stacks, Queues, and Mathematical Analysis of Algorithms: Stacks; Stacks Using Dynamic Arrays; Queues; Circular Queues Using Dynamic Arrays; Evaluation of expressions. Mathematical Analysis: Non-recursive Algorithms, Recursive Algorithms.		
SELF-STUDY COMPONENT		9



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Develop programs for infix-to-postfix conversion and postfix expression evaluation using stacks. Analyze non-recursive and recursive algorithms with respect to time complexity. Implement and analyze recursive algorithms such as factorial, Fibonacci, binary search, and Tower of Hanoi.		
UNIT 3	9	L1-L4
Tree Structures, Searching & Hashing: Trees: Introduction, Binary Trees, Binary Tree Traversal, Binary Search Trees (BST). Searching Algorithms: Sequential Search and Brute-Force String Matching, and Decrease and Conquer - Binary Search. Hashing: Introduction and Static Hashing.		
SELF-STUDY COMPONENT		9
Implement binary trees and Binary Search Trees. Develop programs for tree insertion, searching, height, and node-related operations. Implement binary search using the decrease-and-conquer approach, and brute-force string matching. Study hash functions and collision resolution techniques and implement a hash table using linear probing. Compare searching and hashing techniques.		
UNIT 4	8	L1-L4
Graph Algorithms & Sorting Paradigms: Graphs: The Graph Abstract Data Type. Graph Traversals: Depth-First Search (DFS) and Breadth-First Search (BFS). Brute-Force Sorting: Selection Sort and Bubble Sort. Divide-and-Conquer Sorting: Merge Sort and Quick Sort.		
SELF-STUDY COMPONENT		9
Study graph representations using adjacency matrices and adjacency lists and implement graph traversal algorithms such as Depth-First Search (DFS) and Breadth-First Search (BFS). Implement and analyse divide-and-conquer sorting algorithms;		
UNIT 5	8	L1-L4
Greedy, Transform-and-Conquer, and Balanced Trees: The Greedy Method: Minimum Spanning Trees via Prim's Algorithm. Single-Source Shortest Path via Dijkstra's Algorithm. Transform-and-Conquer Structures: Heaps: Heaps and Heap Sort, Balanced Search Trees: AVL Trees, 2-3 Trees.		
SELF-STUDY COMPONENT		9
Analyze Prim's and Dijkstra's algorithms using different graph representations. Use a priority queue implemented using a heap to schedule patients/processes according to priority. Study why balanced trees such as AVL Trees, 2-3 Trees, and B-Trees are useful for efficient searching and indexing.		

TEXT BOOKS:

1	Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Edition (2023), Universities Press(India) Private Limited.
2	Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition (2024), Pearson Education, Limited.

REFERENCE BOOKS:

1	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, 4th Edition (2022), MIT Press.
2	Seymour Lipschutz, Data Structures (Schaum's Outlines), Revised 1st Edition (2014), McGraw-Hill.



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3	Reema Thareja, Data Structures using C, 3rd Edition (2023), Oxford University
4	Robert Sedgewick and Kevin Wayne, Algorithms, 4th Edition (2011), AddisonWesley. 5.
5	Adnan Aziz, Tsung-Min Kuo, and Amit Prakash, Elements of Programming Interviews in C, 2nd Edition (2014), CreateSpace.
e-LEARNING RESOURCES:	
1	National Programme on Technology Enhanced Learning (NPTEL), Programming, Data Structures and Algorithms in C, Indian Institute of Technology, Madras. https://nptel.ac.in/courses/106106127
2	National Programme on Technology Enhanced Learning (NPTEL), Design and Analysis of Algorithms, Indian Institute of Technology Madras. https://nptel.ac.in/courses/106106131
3	Massachusetts Institute of Technology (MIT) OpenCourseWare, Introduction to Algorithms (6.006), Department of Electrical Engineering and Computer Science. https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-spring-2020/
4	Visualgo Data Structure Visualizations, Interactive animations of sorting, search trees, and graphs. https://visualgo.net/en

Assessment Details for both CIE and SEE

The weightage assigned to the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) is 50% each.

To pass the course, students must secure a minimum of 50% marks separately in both CIE and SEE.

Continuous Internal Evaluation (CIE)

The CIE consists of the following components:

1. CIE – Theory Component
2. Assignment
3. Seminar
4. Group Activity

Students must secure a minimum of 50% marks in the combined total of the CIE Theory, Assignment, Seminar, and Group Activity components to qualify to appear in the SEE.

Semester End Examination (SEE)

The Theory SEE is conducted for 100 marks with a duration of 3 hours. The marks obtained are subsequently scaled down to 50 marks for calculating the final course grade.

The student must secure a minimum of 50% marks in the SEE to pass the course.

****Self-Study Component should be included for CIE.**

The self-study component should be included in the CIE under Question 4 only.

CONTINUOUS INTERNAL EVALUATION (CIE)		Max. Marks	Minimum Marks Required in CIE to Qualify for SEE (50% individually)
Theory	Weightage of CIE-1 and CIE-2 or CIE-3	30	15
	Assignment	10	5
	Seminar	05	2.5
	Group Activity	05	2.5
	TOTAL	50	25



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QUESTION PAPER PATTERN (SEE)										
Q. No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
UNIT	1		2		3		4		5	
1. Two full questions (each of 20 Marks) are to be set from each unit.										
2. Students shall answer five full questions, selecting one full question from each unit.										

Course Outcomes: After the completion of the course, the student will be able to:	
CO1	Demonstrate fundamental concepts of different data structures and basic algorithmic analysis.
CO2	Apply linear structures like arrays, linked lists, stacks, and queues to manage sequential data.
CO3	Develop functions using non-linear structures like trees and graphs alongside their searching and traversal protocols
CO4	Analyze suitable data structures and algorithm techniques to solve real-world computational or engineering problems effectively
CO5	Design an efficient algorithm that use appropriate data structures to solve real-world computational problems.

COURSE SUSTAINABLE DEVELOPMENT GOALS (SDGs)		
Goal No.	Goal Title	Description
4	Quality Education	Ensure Inclusive and equitable quality education and promote lifelong learning opportunities for all
8	Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Mapping of COs with POs with PSOs											
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO2
CO1	3	2	2	1	-	-	-	1	3	2	2
CO2	3	2	2	1	-	-	-	1	3	2	2
CO3	3	3	2	1	-	-	-	1	3	2	2
CO4	3	3	3	1	-	-	-	1	3	2	2
CO5	3	2	3	1	-	-	-	1	3	2	2



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Mapping of COs with Knowledge and Attitude Profile (WK)									
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0									
CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	3	3	3	2	2	1	0	1	1
CO2	3	3	3	3	3	2	2	1	1
CO3	3	3	3	3	3	3	2	2	1
CO4	3	3	2	3	3	3	3	2	2
CO5	3	3	2	3	3	3	3	2	1

Course Coordinator:

Dr. Dharani. N. V,
Assistant Professor,
MCA program



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Course Title	Operating System and Shell Scripting				
Course Code	1MCAU105				
Course Category	IPCC (Integrated Professional Core Course)				
Teaching - Learning Scheme & Credit	L	T	P	Total Credits	Total Teaching Hours
	3	0	1	4	Lecture: 42 + Tutorials: 0 + Practical: 28 + Self Study: 50 = 120
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100		Duration of SEE: 03 Hours

Course Learning Objectives:	
CLO1	Understand the fundamental concepts and functions of operating systems, including processes, memory management, file systems, and resource management.
CLO2	Student will solve operating system problems related to CPU scheduling, deadlocks, memory allocation, and page replacement techniques.
CLO3	Gain proficiency in Linux by using commands for file management, process management
CLO4	Develop shell scripting skills using variables, operators, decision-making statements, loops, functions
CLO5	Develop shell scripting techniques to automate common system administration tasks such as file management

SYLLABUS	No. of Hours	BTLs
UNIT 1	9	L1-L4
Operating System Fundamentals Introduction to Operating Systems: Evolution, Types of Operating Systems, Batch Systems, Multiprogramming, Multitasking, Time-sharing Systems and Real-time Systems. Operating System Services, System Calls, Kernel and User Mode. Operating System Structures and Architectures. Process Concept, Process States, Process Control Block (PCB) and Context Switching.		
SELF-STUDY COMPONENT	10 Hours	
Prepare a comparison between batch, multiprogramming, multitasking, time-sharing, and real-time systems. Study examples of operating systems belonging to different categories. Explore common system calls for process and file management. Draw the structure of a Process Control Block (PCB) and explain each field.		
UNIT 2	9	L1-L4
Process, Memory and File Management Threads and Multithreading. CPU Scheduling: FCFS, SJF, Priority and Round Robin Scheduling Algorithms. Memory Management: Contiguous Memory Allocation, Paging, Segmentation and Virtual Memory. Page Replacement Algorithms: FIFO, LRU and Optimal. Deadlocks: Prevention, Avoidance, Detection and Recovery. File Systems and Directory Structures.		
SELF-STUDY COMPONENT	10 Hours	
Study the difference between processes and threads . Draw and explain the process and thread life cycles . Study multithreading and its advantages. observe running processes and threads using OS utilities		



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such as Task Manager or ps. Study the role of the Process Control Block (PCB) during process management		
UNIT 3	8	L1-L4
Linux Environment and Command Utilities: Linux architecture and file system hierarchy. Linux shell environment and Bash shell. Linux file and directory commands. File permissions and ownership. Process management commands. Shell expansion and environment variables. Standard input, standard output and standard error. Pipes and input/output redirection. Filter Commands: cat, tee, head, tail, wc, sort, uniq, cut, paste, tr, grep and comm. Regular Expressions and Text Processing: Basic and extended regular expressions, pattern matching using grep, stream editing using sed, field processing and report generation using awk.		
SELF-STUDY COMPONENT	10 Hours	
Develop a menu-driven calculator using case. Create a student grade calculator using conditions and functions. Write a script to check whether a number is prime, even, or odd. Develop a file and directory management script. Create a script to generate a system information report.		
UNIT 4	8	L1-L4
Shell Scripting Fundamentals Introduction to Shell Scripting; script creation, execution and debugging; shell variables and environment variables; quoting and command substitution; positional parameters and command-line arguments; arithmetic operations and expressions; conditional statements using if, if-else and case; looping constructs using for, while and until; shell functions; arrays; string manipulation; reading user input; script testing, debugging and basic shell script development.		
SELF-STUDY COMPONENT	10 Hours	
Introduction to Bash shell scripting and its applications. Creating, executing, and debugging shell scripts. Working with shell variables and environment variables. Understanding quoting, escaping, and command substitution. Using positional parameters and command-line arguments.		
UNIT 5	8	L1-L4
Shell Scripting and Automation File handling using shell scripts. Text processing using grep, sed and awk in shell scripts. Regular expressions in shell scripting. Log file analysis. CSV data processing. Backup and archival automation. Task scheduling using cron. System monitoring scripts. User and process administration scripts. Error handling, signals and traps. Introduction to DevOps automation concepts using Git, Docker and Jenkins through official documentation and instructor-guided demonstrations.		
SELF-STUDY COMPONENT	10 Hours	
Study file handling and directory management using shell scripts. Practice text processing with grep, sed, and awk. Explore regular expressions for pattern matching and data validation. Develop scripts for log file analysis and automated report generation		

PRACTICAL COMPONENT
Operating Systems Programs (1–4) Experiment 1: CPU Scheduling Simulator Develop a program to implement and compare FCFS and SJF Scheduling. The program should calculate Waiting Time, Turnaround Time, Average Waiting Time and Average Turnaround Time.



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Experiment 2: Page Replacement Algorithm Simulator

Develop a program to implement FIFO and LRU Page Replacement algorithms. The program should track page hits and page faults, display frame contents after each reference and compare algorithm efficiency.

Experiment 3: Banker's Algorithm for Deadlock Avoidance

Develop a program to accept Allocation, Maximum and Available matrices, compute Need Matrix, determine safe state and display safe sequence.

Experiment 4: Inter Process Communication using Pipes

Develop a program to create parent and child processes, communicate using pipes, pass data from parent to child and perform string transformation in child process.

Shell Scripting Programs (5–10)

Experiment 5: Basic File, Directory and Permission Audit Tool

Develop a shell script that accepts a directory path and generates a report containing total files and directories, largest files, empty files and directories, recently modified files and world-writable files.

Experiment 6: Student Record Processing and Grade Analysis

Develop a shell script to accept marks of multiple students, calculate total and average, assign grades, display topper and show pass/fail statistics.

Experiment 7: Basic Log File Analyzer using Filters Develop a shell script to count total log entries, count ERROR/WARNING/INFO messages, extract IP addresses and identify repeated IPs.

Experiment 8: Simple Backup Automation Script

Develop a shell script to backup a directory, compress using tar, add timestamp and log backup status.

Experiment 9: Basic System Health Monitoring Script

Develop a shell script to monitor CPU, memory and disk usage, check threshold values, generate alerts and save reports.

Experiment 10: Basic Deployment Validation Script

Develop a shell script to check installed packages, running services, validate disk and memory availability and generate final PASS/FAIL report.

TEXT BOOKS

- | | |
|----|--|
| 1. | Abraham Silberschatz, Peter B. Galvin and Greg Gagne, <i>Operating System Concepts</i> , 10th Edition, Wiley, 2018. ISBN: 978-1119456339 |
| 2. | Sumitabha Das, <i>UNIX: Concepts and Applications</i> , 4th Edition, McGraw Hill Education, 2017. ISBN: 978-0070635463 |
| 3. | William E. Shotts Jr., <i>The Linux Command Line: A Complete Introduction</i> , 2nd Edition, No Starch Press, 2019. ISBN: 978-1593279523 |



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REFERENCE BOOKS	
1.	Andrew S. Tanenbaum and Herbert Bos, <i>Modern Operating Systems</i> , 5th Edition, Pearson, 2022. ISBN: 978-0137618880
2.	Daniel J. Barrett, <i>Linux Pocket Guide</i> , 4th Edition, O'Reilly Media, 2024. ISBN: 978-1098156268
3.	Scott Chacon and Ben Straub, <i>Pro Git</i> , 2nd Edition, Apress, 2019. ISBN: 978-1484200773
4.	Karl Matthias and Sean P. Kane, <i>Docker: Up & Running</i> , 3rd Edition, O'Reilly Media, 2023.

e-LEARNING RESOURCES
https://bcs.wiley.com/he-bcs/Books?action=index&itemId=0471694665&itemTypeId=BKS&bcsId=2103
https://tldp.org/

Assessment Details for both CIE and SEE			
The weightage assigned to the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) is 50% each. To pass the course, students must secure a minimum of 40% marks separately in both CIE and SEE. Continuous Internal Evaluation (CIE) The CIE consists of two components: 1. CIE – Theory Component 2. Assignment 3. Seminar 4. Group Activity Students must secure a minimum of 50% marks in the combined total of the CIE Theory, Assignment, Seminar and Group Activity components to qualify for appearing in the SEE. Semester End Examination (SEE) The Theory SEE is conducted for 100 marks with a duration of 3 hours. The marks obtained are subsequently scaled down to 50 marks for calculating the final course grade. The student must secure a minimum of 50% marks in the SEE to pass the course. **Self-Study Component should be included for CIE. Self-study component should be included in the CIE under Question 4 only.			
CONTINUOUS INTERNAL EVALUATION (CIE)		Max. Marks	Minimum Marks Required in CIE to Qualify for SEE (40% in Each Component)
Theory	Weightage of CIE-1 and CIE-2 or CIE-3	30	15
Laboratory components	The record will be evaluated weekly, and the average score will be considered.	10	20
	Lab CIE	10	
TOTAL		50	25



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SEE QUESTION PAPER PATTERN

Q. No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
UNIT	1		2		3		4		5	
1. Two full questions (each of 20 Marks) are to be set from each unit.										
2. Student shall answer five full questions selecting one full question from each unit.										

Course Outcomes: After the completion of the course, the student will be able to

CO1	Understand the basic concepts of operating systems, including processes, memory, file systems, and resource management
CO2	Analyze CPU scheduling, deadlock handling, memory allocation, and page replacement techniques for solving operating system problems.
CO3	Use Linux commands for file management, process management, file permissions, filters, pipes, and input/output redirection.
CO4	Develop shell scripts using variables, operators, decision-making statements, loops, functions, arrays, and command-line arguments.
CO5	Apply shell scripting to automate file management, backups, log analysis, and basic system monitoring tasks.

COURSE SUSTAINABLE DEVELOPMENT GOALS (SDGs)

Goal No.	Goal Title	Description
4	Quality Education	Develops students' knowledge and practical skills in operating systems, Linux, and shell scripting, supporting quality technical education and lifelong learning
9	Industry, Innovation and Infrastructure	Provides foundational knowledge of operating systems and system automation that supports the development and management of reliable digital infrastructure.

Mapping of COs with POs with PSOs

Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	–	1	1	3	2	1
CO2	3	3	3	2	3	–	1	1	3	3	2
CO3	3	3	3	2	3	1	1	1	3	3	3
CO4	3	3	3	2	3	1	1	1	3	3	3
CO5	3	3	3	2	3	1	2	2	3	3	3



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Mapping of COs with Knowledge and Attitude Profile (WK)									
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0									
CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	3	2	3	3	2	1	1	—	2
CO2	3	3	3	3	3	2	1	2	3
CO3	2	2	3	3	3	3	1	1	3
CO4	2	2	3	3	3	3	1	1	3
CO5	2	2	3	3	3	3	2	2	3

Course Coordinators:

Anitha J
Assistant Professor
MCA Programme



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Course Title	JAVA PROGRAMMING				
Course Code	1MCAU106				
Course Category	IPCC (Integrated Professional Core Course)				
Teaching - Learning Scheme & Credit	L	T	P	Total Credits	Total Teaching Hours
	3	0	1	4	Lecture: 42 + Tutorials: 0 + Practical: 28 + Self Study: 50 = 120
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100		Duration of SEE: 03 Hours

Course Learning Objectives:	
CLO1	Understand the different object-oriented concepts and implement basic programs
CLO2	Develop Java programs using classes, objects, methods, constructors, inheritance
CLO3	Design interfaces and packages to achieve abstraction, code reusability
CLO4	Use advanced Java features such as enumerations, autoboxing, annotations
CLO5	Design client server application in java

SYLLABUS	No. of Hours	BTLs
UNIT 1	9	L1-L4
Java Programming Fundamentals: The Java Language, The Key Attributes of Object-Oriented Programming, A First Simple Program, Handling Syntax Errors Introducing Data Types and Operators: Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast, Operator Precedence, Expressions.		
SELF-STUDY COMPONENT	10 Hours	
Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-Each Style for Loop, Strings, The Bitwise operators.		
UNIT 2	8	L1-L4
Introducing Classes, Objects and Methods Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizes, The this Keyword. A Closer Look at Methods and Classes: Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Varargs: Variable-Length Arguments.		
SELF-STUDY COMPONENT	10 Hours	
Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Override		
UNIT 3	8	L1-L4
Interfaces Interface Fundamentals, creating an Interface, implementing an Interface, Using Interface References,		



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Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Final Thoughts on Interfaces. Packages: Package Fundamentals, Packages and Member Access, Importing Packages, Static Import Exception Handling: The Exception Hierarchy, Exception Handling fundamentals, The Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses,		
SELF-STUDY COMPONENT	10 Hours	
Catching subclass Exceptions, try blocks can be nested Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java’s Built-in Exceptions		
UNIT 4	9	L1-L4
Multithreaded Programming Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads. Enumerations, Auto boxing and Annotations: Enumerations, Java Enumeration are class types, The Values() and Valueof() Methods, Constructors, methods, instance variables and enumerations, Auto boxing		
SELF-STUDY COMPONENT	10 Hours	
Applet basics, A complete Applet Skeleton, Applet Initialization and Termination, A key Aspect of an Applet Architecture, Requesting Repainting, using the status window, Passing parameters to Applets		
UNIT 5	8	L1-L4
Networking with Java.net Networking fundamentals, The Networking classes and Interfaces, The InetAddress class, The Socket Class, The URL class, The URL Connection Class, The HttpURL Connection Class.		
SELF-STUDY COMPONENT	10 Hours	
Collections Overview, The Collection Interfaces, The collection Classes. The Arrays Class		

PRACTICAL COMPONENT
1. Develop a JAVA Program to demonstrate Constructor Overloading and Method Overloading. 2. Write a JAVA Program to implement Inner class and demonstrate its Access protection 3. Write a program in Java for String handling which performs the following: i) Checks the capacity of String Buffer objects. ii) Reverses the contents of a string given on console and converts the resultant string in upper case. iii) Reads a string from console and appends it to the resultant string of (iv). Write a JAVA Program to demonstrate multi-level Inheritance. 4. Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle 5. Write a java program to handle the following system exceptions ArrayIndexOutOfBounds, FileNotFoundException and NumberFormat Exception. 6. Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept 7. Design a program to create two threads, one thread will print odd numbers and second thread will print even numbers between 1 to 10 numbers 8. Develop a Student Management System. Create a student class with attributes (USN, Name,



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Semester, CGPA) and methods to read, display, and update student details. Create multiple objects and demonstrate object creation and method invocation.

9. Create a Student class with overloaded constructors to initialize student details in different ways: Default constructor, Constructor with USN and Name, Constructor with USN, Name, Semester, and CGPA. Overload the calculateResult() method to perform different operations: Calculate total marks for 3 subjects, Calculate total marks for 5 subjects, Calculate percentage using obtained marks and maximum marks, Calculate SGPA using grade points of different courses.

TEXT BOOKS

1. Herbert Schildt, *Java: The Complete Reference*, McGraw-Hill, 12th Edition, ISBN: ISBN13-9788195096770, 2022.
2. Rod Johnson, Juergen Hoeller, Alef Arendsen, Thomas Risberg, Colin Sampaleanu, *Professional Java™ Development with the Spring Framework*, July 2005, Wrox, ISBN: 9780764574832.
3. Jason Brittain and Brian D. Eubanks, *Java Servlet and JSP Programming*, O'Reilly Media, 1st Edition, 2001

REFERENCE BOOKS

1. Kathy Sierra and Bert Bates, *Head First Design Patterns*, O'Reilly Media.
2. Joseph B. Ottinger Jeff Linwood Dave Mintz, *Beginning Hibernate 6 Java Persistence from Beginner to Pro*, 5th Edition, Apress.

e-LEARNING RESOURCES

Java Programming Fundamentals: www.java.com
Java Coding: https://www.programiz.com/java-programming
JSP Fundamentals: https://jakarta.ee/specifications/pages/
Spring Framework: https://spring.io/projects/spring-framework

Assessment Details for both CIE and SEE

The weightage assigned to the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) is 50% each.

To pass the course, students must secure a minimum of 40% marks separately in both CIE and SEE.

Continuous Internal Evaluation (CIE)

The CIE consists of two components:

1. CIE – Theory Component
2. Assignment
3. Seminar
4. Group Activity

Students must secure a minimum of 50% marks in the combined total of the CIE Theory, Assignment, Seminar and Group Activity components to qualify for appearing in the SEE.

Semester End Examination (SEE)

The Theory SEE is conducted for 100 marks with a duration of 3 hours. The marks obtained are subsequently scaled down to 50 marks for calculating the final course grade.

The student must secure a minimum of 50% marks in the SEE to pass the course.

****Self-Study Component should be included for CIE.**

Self-study component should be included in the CIE under Question 4 only.



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CONTINUOUS INTERNAL EVALUATION (CIE)		Max. Marks	Minimum Marks Required in CIE to Qualify for SEE (40% in Each Component)
Theory	Weightage of CIE-1 and CIE-2 or CIE-3	30	15
Laboratory components	The record will be evaluated weekly, and the average score will be considered.	10	10
	Lab CIE	10	
TOTAL		50	25

SEE QUESTION PAPER PATTERN

Q. No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
UNIT	1	2	3	4	5	6	7	8	9	10
1. Two full questions (each of 20 Marks) are to be set from each unit.										
2. Student shall answer five full questions selecting one full question from each unit.										
Course Outcomes: After the completion of the course, the student will be able to										
CO1	Apply fundamental Object-Oriented Programming concepts such as classes, methods									
CO2	Develop Java programs using classes, objects, methods, constructors, inheritance									
CO3	Implement exception handling and multithreading techniques									
CO4	Apply advanced Java features such as enumerations, autoboxing, annotations									
CO5	Design and develop basic client-server applications using Java									

COURSE SUSTAINABLE DEVELOPMENT GOALS (SDGs)

Goal No.	Goal Title	Description
4	Quality Education	Ensure Inclusive and equitable quality education and promote lifelong learning opportunities for all
8	Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Mapping of COs with POs with PSOs

Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	1	2	–	–	1	3	2	2
CO2	3	3	3	2	3	–	–	1	3	3	2
CO3	3	3	3	2	3	–	1	1	3	3	3
CO4	3	3	3	2	3	1	1	2	3	3	3
CO5	3	3	3	2	3	1	1	2	3	3	3



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Mapping of COs with Knowledge and Attitude Profile (WK)									
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0									
CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	3	3	3	2	2	1	—	—	2
CO2	3	3	3	3	3	2	1	—	2
CO3	3	3	3	3	3	2	1	1	3
CO4	3	3	3	3	3	3	2	2	3
CO5	3	3	3	3	3	3	2	2	3

Course Coordinator:

Anitha J
Assistant professor
MCA Programme



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Course Title	DATA STRUCTURES AND ALGORITHMS LABORATORY				
Course Code	1MCAL107				
Course Category	LABORATORY				
Teaching - Learning Scheme & Credit	L	T	P	Total	Total Teaching Hours
	0	0	1	1	Lecture: 0+ Tutorials: 0 + Practical: 28 + Self Study: 02 = 30
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100		Duration of SEE: 03 Hrs

Course Learning Objectives:	
CLO1	Understanding the appropriate data structures and algorithmic techniques to solve complex real-world computational problems.
CLO2	Develop code to perform required operations and validate results.
CLO3	Using appropriate programming tools and development environments for implementing, testing, and debugging data structure and algorithm applications.
CLO4	Build a technical document consisting of experiment setup, design, implementation, and results with inferences.
CLO5	Evaluate efficient algorithms that use appropriate data structures to solve real-world computational problems.

PART – A	
LIST OF EXPERIMENTS	
1	Implement a Program in C for converting an Infix Expression to a postfix expression.
2	Design, develop, and execute a program in C to simulate the working of a Queue of integers using an array. Provide the following operations: a. Insert b. Delete c. Display.
3	Develop a C program to simulate the working of a singly linked list, providing the following operations: a. Display & Insert b. Delete from the beginning/end. c. Delete a given element.
4	Develop a C program to implement the following searching techniques: a. Linear Search b. Binary Search.
5	Develop a C program to implement the following sorting algorithms using user-defined functions: a. Bubble sort (Ascending order) b. Selection sort (Descending order).
6	Develop a C Program to find the Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm
PART – B	
OPEN-ENDED EXPERIMENTS	
Note: Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, and students are given the freedom to explore, design, and conduct the experiment based on the problem	



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statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.	
Concept 1: Stack Applications: Design and develop an application using stack operations for solving a suitable computational problem.	
Concept 2: Queue Applications: Develop an application using queue-based data structures to perform efficient data management operations	
Concept 3: Doubly Linked List Applications: Design and implement an application using doubly linked list concepts for dynamic data storage and manipulation.	
Concept 4: Sorting Techniques and Performance Analysis: Implement suitable sorting techniques for a given problem and analyse the performance based on input size and execution time.	
Concept 5: Graph Algorithms Applications: Apply graph-based algorithms to solve problems related to shortest path.	
Concept 6: Recursive / Non-recursive Techniques: Develop an application using recursive or non-recursive techniques to solve computational problems.	
SELF-STUDY COMPONENT	02
Setting Up the Data Structures Programming Environment • Installation and configuration of a C compiler and IDE. • Setting up Visual Studio Code / Code Blocks / Dev-C++ for Data Structures programming. • Configuring the compiler, environment variables, and required extensions. • Creating, compiling, executing, and debugging a simple C/C++ program. • Execution and testing of basic Data Structures programs in the configured environment.	

TEXT BOOKS:	
1	Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Edition (2023), Universities Press (India) Private Limited.
2	Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition (2024), Pearson Education, Limited.

REFERENCE BOOKS:	
1	Richard F. Gilberg and Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, 2nd Edition (2007), Cengage Learning.
2	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition (2002), Pearson Education. 3. Reema Thareja, Data Structures Using C, 2nd Edition (2014), Oxford University Press.
3	Reema Thareja, Data Structures Using C, 2nd Edition, (2014), Oxford University Press.

e-LEARNING RESOURCES:	
1	NPTEL – Programming, Data Structures and Algorithms using C: https://nptel.ac.in/courses/106105171
2	NPTEL – Data Structures and Algorithms: https://nptel.ac.in/courses/106102064
3	VisuAlgo – Data Structure Visualizations: https://visualgo.net/en
4	GeeksforGeeks – Data Structures in C: https://www.geeksforgeeks.org/data-structures/



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5	GeeksforGeeks – C Programming: https://www.geeksforgeeks.org/c-programming-language/
6	Programiz – C Programming and DSA: https://www.programiz.com/c-programming https://www.programiz.com/dsa
7	OnlineGDB – Online C Compiler: https://www.onlinegdb.com/online_c_compiler

Assessment Details for CIE			
CONTINUOUS INTERNAL EVALUATION (CIE)		Max. Marks	Minimum Marks Required in CIE to Qualify for SEE
Laboratory Components	Each experiment will be evaluated using the prescribed rubrics, and the average of the marks obtained across all experiments will be considered for the final evaluation.	10	25
	LAB CIE	40	
TOTAL		50	
SEMESTER END EXAMINATION (SEE)			
The student must secure a minimum of 50% marks in the SEE to pass the course.			
PRACTICAL EXAMINATION GUIDELINES			
• All laboratory experiments shall be included for the practical examination. • The instructions and marks breakup printed on the cover page of the answer script shall be strictly adhered to by the examiners. • Students shall be allowed to randomly select any one experiment from the given lot. • Change of the selected experiment shall be permitted only once. • Any change of experiment shall attract mark deduction as per the Dr. AIT Autonomous Examination Rules and Regulations.			

Course Outcomes:	
CO1	Apply the appropriate data structures and algorithmic techniques to solve complex, real-world computational problems.
CO2	Develop programs to implement linear data structures such as arrays, linked lists, stacks, and queues and perform their fundamental operations.
CO3	Implement tree and graph data structures and apply suitable searching, traversal, and sorting techniques.
CO4	Apply appropriate data structures and algorithmic techniques to develop efficient solutions for complex real-world computational problems.
CO5	Design, implement, test, debug, and evaluate data structure and algorithm applications using appropriate programming tools and document the experimental results.



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COURSE SUSTAINABLE DEVELOPMENT GOALS (SDGs)		
Goal No.	Goal Title	Description
4	Quality Education	Ensure Inclusive and equitable quality education and promote lifelong learning opportunities for all

Mapping of COs with POs with PSOs											
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO2
CO1	3	2	2	1	-	-	-	1	3	2	2
CO2	3	2	2	1	-	-	-	1	3	2	2
CO3	3	3	2	1	-	-	-	1	3	2	2
CO4	3	3	3	1	-	-	-	1	3	2	2
CO5	3	2	3	1	-	-	-	1	3	2	2

Mapping of COs with Knowledge and Attitude Profile (WK)									
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0									
CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	3	3	3	2	2	1	0	1	1
CO2	3	3	3	3	3	2	2	1	1
CO3	3	3	3	3	3	3	2	2	1
CO4	3	3	2	3	3	3	3	2	2
CO5	3	3	2	3	3	3	3	2	1

Course Coordinator:

Dr. Dharani. N. V,
Assistant Professor,
MCA program



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Course Title	WEB PROGRAMMING LAB				
Course Code	1MCAL108				
Course Category	PCCL (Professional Core Course Laboratory)				
Teaching - Learning Scheme & Credit	L	T	P	Total Credits	Total Teaching Hours
	0	0	1	1	Lecture: 0 + Tutorials: 0 + Practical: 28 + Self Study: 02 = 30
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100		Duration of SEE: 03 Hours

Course Learning Objectives:	
CLO1	To provide hands-on experience in designing responsive, interactive web applications using modern front-end technologies.
CLO2	To develop skills in client-side validation, DOM manipulation, and asynchronous data handling.
CLO3	To introduce RESTful API development and CRUD operations for dynamic web applications.
CLO4	To encourage creativity and problem-solving through open-ended experiments in real-world domains.
CLO5	To integrate concepts of session management, data storage, and user authentication in web applications.

SYLLABUS	
PART: A - CONVENTIONAL EXPERIMENTS	
1.	Design and develop a responsive multi-page website for an Online Book Store. The website should include Home, About, Events/Services, Gallery, Contact, and Registration pages. Use HTML5 semantic tags, CSS3 styling, Flexbox/Grid, Bootstrap components such as Navbar, Cards, Carousel, Forms, Buttons, and Footer.
2.	Develop an Online Student Registration Form containing fields such as Name, USN, Email, Mobile Number, Password, Confirm Password, Date of Birth, Gender, Course, Address, and Terms & Conditions. Implement client-side validation using JavaScript for mandatory fields, password strength, email format, phone number, age verification, password matching, and error messages without page refresh.
3.	Develop a Student Result Management Dashboard. Allow users to add, edit, delete, and search student records dynamically using DOM manipulation. Calculate total marks, percentage, grade, and display results in an HTML table without reloading the page. Include sorting and filtering features.
4.	Create a Weather Information Application (or Employee Directory/Product Catalog). Fetch JSON data from a public REST API (or local JSON file) using Fetch API. Display data dynamically as cards or tables. Implement loading indicators, error handling, search functionality, filtering, and asynchronous updates without page refresh.
5.	Develop a User Login and Shopping Cart Simulation. Store username and user preferences using cookies. Maintain login status and shopping cart contents using session storage (or server-



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	side sessions if PHP is used). Provide Login, Logout, Add to Cart, Remove from Cart, and View Cart functionalities. Display personalized welcome messages based on stored session information.
6.	Develop a Student Information REST API. Implement CRUD operations (Create, Read, Update, Delete) for student records using Node.js with Express (or PHP). Create REST endpoints such as GET, POST, PUT, and DELETE. Test the APIs using Postman or browser requests. Return responses in JSON format and validate request data before processing
PART: B - PRACTICAL OPEN-ENDED EXPERIMENTS	
Open-ended experiments are laboratory activities in which the outcome is not predetermined. Students are given the freedom to explore, design, and conduct experiments based on problem statements related to the concepts defined by the Course Coordinator. Such experiments encourage creativity, critical thinking, problem-solving, and inquiry-based learning	
1.	Develop a web-based College ERP module for managing student information which will include the following: • Design responsive web pages using Bootstrap. • Implement Login page. • Create Student Registration form with JavaScript validation. • Display student details using DOM manipulation. • Develop REST APIs for student CRUD operations. • Maintain user login using session/cookies. • Fetch and display student data from the server asynchronously using Fetch API.
2.	Develop a web application to manage campus placement activities which will include the following: • Responsive dashboard for students and placement officer. • Student profile registration. • Company registration. • Job posting. • Student application form with validation. • Display eligible students dynamically. • Store login information using sessions. • Create REST APIs for students and companies.
3.	Develop a Hospital Appointment System which will include the following features: • Create responsive patient registration and login pages. • Appointment booking form with validation. • Display available doctors dynamically. • Book and cancel appointments. • Store user session after login. • Develop REST APIs for doctors and appointments.
4.	Develop a web application for managing Inventory along with the following features: • Product registration form. • Stock entry and update.



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	• Search products. • Display inventory dynamically. • Maintain login session. • REST APIs for inventory operations.
5.	Develop a basic Online Examination Portal along with the following features: • Student login. • Display questions fetched from JSON. • Timer using JavaScript. • Auto evaluation. • Display score dynamically. • Store exam session. • REST APIs for questions and results.
6.	Develop a Hostel Room allocation System along with the following features: • Student registration. • Hostel room booking. • Room availability display. • Student search. • Session management. • CRUD APIs for rooms and students.

SELF-STUDY COMPONENT	02 Hours
To host the web application through git or any other web hosting service.	

Teaching and Learning Process (Innovative Delivery Methods)	
1.	Active Learning Techniques
2.	Problem-Based Learning (PBL)
3.	Team-Based Learning (TBL)
4.	Project Based Learning

TEXT BOOKS	
1.	Ramez Elmasri, Shamkant B. Navathe, <i>Fundamentals of Database Systems</i> , Pearson, 7 th Edition, 2016.
2.	Shashank Tiwari, <i>Professional NoSQL</i> , Wiley India/Wrox Publication, 1 st Edition, 2011.
3.	Robin Nixon, <i>Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5</i> , O'Reilly Media, 5 th Edition



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REFERENCE BOOKS	
1.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, <i>Database System Concepts</i> , McGraw Hill, 7th Edition.
2.	Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3 rd Edition, McGraw Hill, 2018.
3.	Pramod J. Sadalage and Martin Fowler, <i>NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence</i> , Addison-Wesley Professional
4.	Ethan Brown, <i>Web Development with Node and Express</i> , O'Reilly Media.
5.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, <i>Database System Concepts</i> , McGraw Hill, 7th Edition.

e-LEARNING RESOURCES

Assessment Details for CIE			
CONTINUOUS INTERNAL EVALUATION (CIE)		Max. Marks	Minimum Marks Required in CIE to Qualify for SEE
Laboratory Components	Each experiment will be evaluated using the prescribed rubrics, and the average of the marks obtained across all experiments will be considered for the final evaluation.	10	25
	LAB CIE	40	
TOTAL		50	
SEMESTER END EXAMINATION (SEE)			
The student must secure a minimum of 40% marks in the SEE to pass the course.			
Practical Examination Guidelines			
• All laboratory experiments shall be included for the practical examination. • The instructions and marks breakup printed on the cover page of the answer script shall be strictly adhered to by the examiners. • Students shall be allowed to randomly select any one experiment from the given lot. • Change of the selected experiment shall be permitted only once. • Any change of experiment shall attract mark deduction as per the Dr. AIT Autonomous Examination Rules and Regulations.			

Course Outcomes: After the completion of the course, the student will be able to	
CO1	Design responsive multi-page websites using HTML5, CSS3, Bootstrap, and JavaScript.
CO2	Implement client-side validation and dynamic DOM manipulation for interactive forms and dashboards.
CO3	Develop REST APIs and perform CRUD operations for managing data in web applications.



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CO4	Apply asynchronous programming concepts (Fetch API, JSON handling) to build real-time applications.
CO5	Create open-ended web solutions (ERP, placement, hospital, inventory, exam, hostel systems) demonstrating problem-solving and innovation.

COURSE SUSTAINABLE DEVELOPMENT GOALS (SDGs)		
Goal No.	Goal Title	Description
4	Quality Education	Ensure Inclusive and equitable quality education and promote lifelong learning opportunities for all
8	Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Mapping of COs with POs with PSOs											
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	1	–	–	2	3	2	1
CO2	3	3	3	3	1	–	2	2	3	2	1
CO3	3	3	3	3	1	1	2	2	3	2	2
CO4	3	3	3	3	1	–	2	3	3	3	2
CO5	3	3	3	3	3	2	2	3	3	3	3

Mapping of COs with Knowledge and Attitude Profile (WK)									
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0									
	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	–	2	3	3	1	3	–	2	1
CO2	–	3	3	3	1	3	1	2	2
CO3	–	3	3	3	1	3	1	2	2
CO4	–	3	3	3	1	3	1	3	2
CO5	1	3	3	3	2	3	2	3	3

Course Coordinator:

Shobha Rani B R
Associate Professor
MCA Programme



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Course Title	Placement Training				
Course Code	1MCAT109				
Course Category	NCMC (Non- Credit Mandatory Course)				
Teaching - Learning Scheme & Credit	L	T	P	Total Credits	Total Teaching Hours
	4	0	0	0	Lecture: 56 + Tutorials: 0 + Practical: 0+ Self Study: 0 = 56
CIE Marks: 50	SEE Marks: -		Total Max. Marks: 50		Duration of SEE: -

Course Learning Objectives:	
CLO1	Enable students to identify, plan, and set career goals with clarity and foresight, fostering motivation and structured progress toward professional success.
CLO2	Develop personality skills and instill corporate discipline, nurturing professional ethics and workplace adaptability.
CLO3	Strengthen students' ability to overcome stress while cultivating punctuality and effective time management practices.
CLO4	Enhance students' skills in listening, speaking, reading, and writing to make accurate inferences and predictions in diverse discourse contexts.
CLO5	Build strong foundations in English grammar and verbal reasoning, emphasizing conceptual understanding followed by extensive practice to achieve confidence, speed, and accuracy.

SYLLABUS	No. of Hours	BTLs
UNIT 1	12	L1-L4
Self-awareness and Self-confidence: Knowing your own self, Knowing others, Working well with others, Knowing personal attitudes, Developing the right attitude for work, Being proactive & positive. Goal Settings: Importance of goal, Creating SMART goals, Action plan to meet goals, Tips for effective execution of goals Career Planning: Qualities of an Engineer, available opportunities for Engineering graduates, Avenues and Skills.—(GA)- Role play on self-introduction, strengths and weakness 2) Improve my GPA to 3.5, Make new friends on Campus		
UNIT 2	11	L1-L4
Building Personality and Discipline: Personality Building, Types of Personality, Ways of developing personality, 3 types of discipline, Advantages of being disciplined Mindful Grooming and Cleanliness: Expectations from the industry, Building personal presence, Corporate grooming, Types and Impact of Grooming, Tips on Personal Grooming.—(GA)- Understanding on Dress Etiquettes (Debate-Role Play) Attitude and Behavior: Types & Structures of Attitudes, Personal & Positive Attitudes		
UNIT 3	11	L1-L4
Emotional intelligence Quotient: Types of emotional quotient, Signs of emotional intelligence, Characteristics of emotional intelligence, Ways to increase EQ Time Management: Importance of time, Time Management Matrix, Tips for managing time		



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effectively, Prioritizing. Stress Management: Causes, Types & Symptoms of stress Writing Skills: Importance of Writing Skills, Dos & DON'T's of Writing Skills, Ways to improve writing skills, Tips for writing skills. Reading Skills: Dos & Don'ts of good reading, Improve your reading skills.--(GA)-Read and Respond- Passage: -5 Questions (1 mark each):		
UNIT 4	11	L1-L4
Listening Skills: Hearing & Listening, Barriers to Listening, Active Listening Skills & Importance of listening Speaking Skills: Basics of Speaking skills, 7 C's for Better Speaking, Types of Speaking & Elements of public speaking.--(GA)- Presentation on a particular topic on writing skills, Escape the Classroom, The Survival Challenge		
UNIT 5	11	L1-L4
Leadership skills and motivation: Attributes of a leader, Leadership Styles, Key Characteristics(GA) Quiz, Word Relay (The Verbal Challenge) Common mistakes in English, Classic Indianisms, Course of action, Cause and effect		

TEXT BOOKS	
1.	Quantitative Aptitude for Competitive Examinations – R.S. Aggarwal
2.	Fast Track Objective Arithmetic – Rajesh Verma
3.	Objective General English – S.P. Bakshi

REFERENCE BOOKS	
1.	Quantitative Aptitude for Competitive Examinations Revised / Updated Edition, 2026 ISBN:13-9789355012326
2.	A Modern Approach to Verbal & Non-Verbal Reasoning Dr. R.S. Aggarwal Fully Revised Video Edition, 2024–25 / 2025 S. Chand Publishing, ISBN-13-9789364685979
3.	High School English Grammar and Composition, P.C. Wren & H. Martin, Revised Edition, ISBN 13- 9789352833573

e-LEARNING RESOURCES	
1.	https://www.geeksforgeeks.org/questions/aptitude/
2.	https://www.khanacademy.org/math?utm_source=chatgpt.com
3.	https://learnenglish.britishcouncil.org/?utm_source=chatgpt.com



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Assessment Details for both CIE and SEE

The weightage assigned to the Continuous Internal Evaluation (CIE) is 50%.

Continuous Internal Evaluation (CIE)

To pass the course, students must secure a minimum of 50% marks in CIE.

There is NO SEE.

CONTINUOUS INTERNAL EVALUATION (CIE)		Max. Marks	Minimum Marks Required in CIE to Qualify for SEE (50% individually)
MCQ	Weightage of CIE-1 and CIE-2 or CIE-3	30	15
	Assignment	10	5
	Seminar	05	2.5
	Group Activity	05	2.5
	TOTAL	50	25

Course Outcomes: After the completion of the course, the student will be able to:	
CO1	The students will be able to learn about the overview of their goals and also gets to know diversities in the field of their career planning.
CO2	The student will develop and improve their personal and professional effectiveness. By the end of this unit, students will have deployed themselves about the corporate culture.
CO3	At the completion of this unit, students will develop the self-confidence and emerge as the confident person.
CO4	After the completion of this unit students will understand the stress, time and emotional management. Also, they will learn about the overcoming the fear and uncomfortable situations such as public speaking.
CO5	After the completion of this unit, students will gain knowledge about the assertiveness of Listening, Reading, Writing & Interpersonal segments

COURSE SUSTAINABLE DEVELOPMENT GOALS (SDGs)

Goal No.	Goal Title	Description
4	Quality Education	Ensure Inclusive and equitable quality education and promote lifelong learning opportunities for all
8	Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.



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Mapping of COs with POs with PSOs											
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO2
CO1	2	3	3	2	1	-	-	1	2	3	2
CO2	1	1	2	1	1	-	-	2	1	3	3
CO3	1	2	2	1	1	-	-	3	1	3	3
CO4	1	2	2	1	1	1	1	3	1	3	3
CO5	1	2	2	1	1	-	-	3	1	3	3

Mapping of COs with Knowledge and Attitude Profile (WK)									
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0									
CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	2	3	3	2	2	1	0	1	1
CO2	1	1	2	2	2	2	1	3	2
CO3	1	1	2	2	1	2	2	3	3
CO4	1	1	2	2	1	2	3	3	3
CO5	1	2	2	2	1	2	2	3	3

Course Coordinator:

Dr. S. K Indumathi
Placement Coordinator, Dr. AIT



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Course Title	Additional Mathematics				
Course Code	1MCAT110				
Course Category	MC (Mandatory Learning Course)				
Teaching - Learning Scheme & Credit	L	T	P	Total Credits	Total Teaching Hours
	40	0	0	0	Lecture: 40 + Tutorials: 0 + Practical: 0 + Self-Study: 0 = 40
CIE Marks: 50	SEE Marks: --		Total Max. Marks: --		Duration of SEE: 0 Hours

Course Learning Objectives:	
CLO1	To introduce the fundamental concepts of Set Theory and Relations and enable students to apply these concepts in solving mathematical and computational problems.
CLO2	To develop mathematical reasoning and logical thinking skills for understanding, interpreting and constructing mathematical arguments.
CLO3	To introduce the fundamental concepts of Matrices and enable students to represent and formulate problems using matrix expressions.
CLO4	To develop the ability to understand and apply the concepts of Arithmetic and Geometric Series for determining the sum of the first n terms.
CLO5	To introduce the fundamental concepts of Probability and enable students to determine the probability of simple and compound events.

SYLLABUS	No. of Hours	BTLs
UNIT 1	8	L1-L4
Introduction. Representation of sets, Types of Sets, Finite set, Infinite set, equivalent set, disjoint set, Subset, Power set. Venn diagram. Set operations: Union, Intersection, Complement of a set, Difference, Symmetric Difference. Laws of set theory. Cartesian product of sets, Relations and properties.		
UNIT 2	8	L1-L4
Logic Statement, Propositions, Connectives, Basic Logic Operations: Conjunction, Disjunction, Negation, Implication and Double Implication. Truth table, Logical Equivalence/Equivalent Statements, Tautologies and Contradictions.		
UNIT 3	8	L1-L4
Matrix Introduction, Types of matrices, Scalar multiplication, Addition of matrices, Product of matrices. Transpose of a matrix, Symmetric and Skew Symmetric matrix, Rank of a matrix, Determinant of a matrix. Singular matrix.		
UNIT 4	8	L1-L4
Introduction, Sequences, Series, Arithmetic Progression, Sum of Finite number of terms in A.P, Arithmetic Means, Geometric Progression, sum to n terms of G.P, Geometric Mean, relation between A.M and G.M.		
UNIT 5	8	L1-L4



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Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability – classical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.

TEXT BOOKS

1.	Discrete Mathematics and Its Applications by Kenneth H. Rosen (8th Edition, McGraw-Hill)
2.	Discrete Mathematics with Applications (5th Edition) – Susanna S. Epp

REFERENCE BOOKS

1.	Kenneth H Rosen, “Discrete Mathematics and its Applications”, McGraw Hill publications, 7th edition.
2.	Walpole Myers Ye “Probability and Statistics for engineers and Scientist” Pearson Education, 8th edition.
3.	Richard A Johnson and C. B Gupta “Probability and statistics for engineers” Pearson Education.
4.	J.K Sharma “Discrete Mathematics”, Mac Millan Publishers India, 3rd edition, 2011.
5.	Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 43rd Edition, 2015.

e-LEARNING RESOURCES

http://.ac.in/courses.php?disciplineID=111
http://www.class-central.com/subject/math(MOOCs)
http://academicearth.org/
VTU EDUSAT PROGRAMME-20

Assessment Details for both CIE and SEE

The weightage assigned to the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) is 50% each.

To pass the course, students must secure a minimum of 40% marks separately in both CIE and SEE.

Continuous Internal Evaluation (CIE)

The CIE consists of two components:

1. CIE – Theory Component
2. Assignment
3. Seminar
4. Group Activity

Semester End Examination (SEE)

There is NO SEE examination for the additional mathematics

CONTINUOUS INTERNAL EVALUATION (CIE)		Max. Marks	Minimum Marks Required in CIE to Qualify for SEE (50% individually)
Theory	Weightage of CIE-1 and CIE-2 or CIE-3	30	15
	Assignment	10	5
	Seminar	05	2.5
	Group Activity	05	2.5
	TOTAL	50	25



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SEE QUESTION PAPER PATTERN										
Q. No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
UNIT	1		2		3		4		5	
1. Two full questions (each of 20 Marks) are to be set from each unit.										
2. Student shall answer five full questions selecting one full question from each unit.										
Course Outcomes: After the completion of the course, the student will be able to										
CO1	Explain and apply the basic concepts of set theory and relations to solve mathematical problems.									
CO2	Analyze mathematical reasoning to read, comprehend, and construct valid mathematical arguments.									
CO3	Understand and formulate problems using matrix concepts and expressions to solve computational tasks.									
CO4	Determine and compute the sum of the first n terms of arithmetic and geometric series.									
CO5	Apply the basic concepts of probability to calculate probabilities of simple and compound events, and evaluate outcomes in problem-solving contexts.									

COURSE SUSTAINABLE DEVELOPMENT GOALS (SDGs)		
Goal No.	Goal Title	Description
4	Quality Education	Ensure Inclusive and equitable quality education and promote lifelong learning opportunities for all
8	Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Mapping of COs with POs with PSOs										
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	3	2	1	0	0	0	2	2	1
CO2	3	3	2	1	1	0	1	2	2	1
CO3	3	3	3	2	0	0	0	2	3	2
CO4	3	2	2	1	0	0	0	2	2	1
CO5	3	3	3	2	1	0	0	2	3	2

Mapping of COs with Knowledge and Attitude Profile (WK)									
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0									
CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	1	3	2	2	–	1	–	1	–
CO2	1	3	2	2	–	1	–	2	1
CO3	1	3	2	2	1	2	–	2	–
CO4	1	3	2	2	1	2	–	2	1
CO5	1	3	2	2	–	2	–	2	–



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Course Coordinators:

Shobha Rani B R Associate Professor MCA Programme
