

Yashoda Shikshan Prasarak Mandal's
YASHODA TECHNICAL CAMPUS, SATARA
(An Autonomous Institute)

Affiliated to Shivaji University, Kolhapur

Approved by AICTE, DTE Mumbai NEA Accredited | NAAC Accredited



FACULTY OF COMPUTER APPLICATION

Syllabus for
Master of Computer Application (MCA)

MCA Part-I (SEM I & II)

(To be implemented from August 2026 onwards)

(As per NEP-2020)

Yashoda Technical Campus, Satara
Faculty of Computer Application

Master of Computer Application (MCA)

MCA (Part I) from Academic Year 2026-27

1. Preamble

The **Master of Computer Application (MCA)** is a two-year (Four-Semester) full-time postgraduate professional programme designed to prepare graduates for careers in the rapidly evolving field of Information Technology. The programme provides a strong foundation in computer science, software development, data analytics, artificial intelligence, cyber security, cloud computing, mobile computing, database management systems, networking, and emerging digital technologies.

The curriculum has been designed in accordance with the **National Education Policy (NEP) 2020**, **AICTE Model Curriculum**, and **Outcome-Based Education (OBE)** framework. It emphasizes experiential learning, industry-oriented skill development, innovation, entrepreneurship, and research to produce competent software professionals capable of addressing real-world challenges.

The programme offers Program Electives and Open Electives in emerging areas based on industry requirements and student interests. It integrates project-based learning, internships, laboratory practice, seminars, MOOCs, and value-added certification courses to enhance employability and professional competence.

Students are encouraged to undertake online certification courses through platforms such as **SWAYAM**, **NPTEL**, **COURSEERA**, and other recognized MOOC platforms to strengthen their technical knowledge and acquire industry-relevant skills. The programme also promotes innovation and entrepreneurship through incubation support, industry interaction, and collaborative projects.

The curriculum focuses on developing technical expertise, analytical thinking, communication skills, ethical values, leadership qualities, and lifelong learning abilities, thereby preparing graduates for successful careers in the global IT industry.

2. Duration of the Programs:

Postgraduate Programmes: The postgraduate programme shall normally extend over **four semesters**, spread across **two academic years** as per NEP framework.

3. Objectives

The objectives of the MCA programme are to:

- 1) Provide a strong theoretical foundation in Computer Science and Information Technology.



- 2) Develop programming, software engineering, and system design skills for developing quality software solutions.
- 3) Equip students with knowledge of emerging technologies such as Artificial Intelligence, Machine Learning, Data Analytics, Cloud Computing, Internet of Things, Cyber Security, and Mobile Computing.
- 4) Foster problem-solving, analytical thinking, innovation, and research aptitude.
- 5) Promote experiential learning through laboratory work, internships, industry projects, and seminars.
- 6) Develop professional ethics, leadership, communication, teamwork, and entrepreneurial skills.
- 7) Prepare graduates for higher studies, research, competitive examinations, and successful careers in academia and industry.
- 8) Encourage lifelong learning through professional certifications, MOOCs, and continuous skill enhancement.

4. Eligibility

a) First-Year MCA Admission

Candidates seeking admission to the First Year MCA programme shall satisfy the following eligibility criteria:

- 1) The candidate must be an Indian National.
- 2) **Academic Qualification-** The candidate must have passed a Bachelor's Degree of minimum three years duration from a recognized University or Institution. Preferably with Mathematics at 10+2 level or at Graduation level
- 3) **Eligible Qualifying Degrees:** Candidates from the following disciplines are eligible:
 - Passed any Bachelor's Degree (e.g., B.E. / B.Tech.(CSE/IT), B.Sc., B.Com., B.A., B.Voc., BCA, etc.) of a minimum three-year duration from a recognized University, preferably with Mathematics at the 10+2 level

At the Graduation level, and obtained at least 50% marks (45% marks in case of candidates belonging to Reserved Categories) in the qualifying examination. For students not having a NON-IT background, a compulsory Bridge Course in Mathematics and Computer science shall be framed by the respective University/Institution. Additional Bridge Courses related to Computer Science subjects may also be prescribed by the respective University/Institution, wherever necessary.

4) Minimum Marks



- General Category: At least 50% aggregate marks in the qualifying examination.
- Reserved / EWS / PwD Categories: At least 45% aggregate marks (Applicable to Maharashtra State candidates only).

5) Entrance Examination Score

- Maharashtra State Seats- The candidate must obtain a valid non-zero score in the MAH-MCA CET conducted by the State CET Cell, Maharashtra.
- All India Seats- Admission shall be based on a valid MAH-MCA CET score or as per the admission rules prescribed by the Competent Authority from time to time.

6) Reservation of Seats-As per rules of by the Competent Authority.

7) Selection Basis- The selection would be done as per the guidelines given by the Directorate of Technical Education Maharashtra State and the competent authority time to time.

b) Direct Second Year (Lateral Entry)

Candidates seeking admission to the Second Year MCA shall satisfy the eligibility criteria prescribed by AICTE, Government of Maharashtra, and the affiliating University.

Eligible candidates shall have completed:

- 1) B.E./B.Tech. (Computer Science/Information Technology), or
- 2) BCA (Honours), or
- 3) BCA (Honours with Research)
- 4) Minimum 50% aggregate marks for General Category.
- 5) Minimum 45% aggregate marks for Reserved/EWS/PwD candidates of Maharashtra State.

Admission shall be governed by the prevailing rules and regulations of the Competent Authority.

Reservation of Seats-As per rules of by the Competent Authority.

Selection Basis- The selection would be done as per the guidelines given by the Directorate of Technical Education Maharashtra State and the competent authority time to time

5. Job Opportunities

Graduates of the MCA programme have excellent career opportunities in software industries, IT-enabled services, research organizations, government departments, financial institutions, and multinational companies.

They may be employed as:

- Software Developer
- Software Engineer
- Full Stack Developer
- Web Designer and Web Developer
- Mobile Application Developer
- Database Administrator



- System Analyst
- Network Engineer
- Cloud Architect
- Cyber Security Analyst
- Information Security Consultant
- Data Analyst
- Data Scientist
- Machine Learning Engineer
- DevOps Engineer
- AI Engineer
- IT Consultant
- Software Tester and Quality Assurance Engineer
- Technical Support Engineer
- Research Associate
- Entrepreneur/Startup Founder

Graduates may also pursue higher education, research programmes, and professional certifications in specialized areas of Information Technology.

6. Medium of Instruction: The medium of instruction, examination, project work, seminar presentation, and dissertation shall be **English**.

7. Teachers' Qualification

The qualifications of faculty members teaching the MCA programme shall be as prescribed by **AICTE**, **UGC**, the **Government of Maharashtra**, and the **Affiliating University**, as amended from time to time.

Generally, faculty members shall possess:

- a) First Class in MCA/M.Tech./M.E. in the relevant discipline or equivalent qualification.
- b) Qualifications and experience as prescribed by AICTE and the University.
- c) Desirable qualifications include a Ph.D. in the relevant discipline, research publications, industry experience, and professional certifications.

8. PEO, PO and CO Mappings: Program Educational Outcomes: After completion of this program, the graduates / students would:

PEO I	Technical Expertise	Apply fundamental domain knowledge of core courses to develop effective computing solutions through creativity and logical reasoning.
PEO II	Successful Career	Deliver professional services using up-to-date technologies in computer application-based careers.



PEO III	Interdisciplinary and Life Long Learning	Develop leadership skills and incorporate ethics, teamwork, effective communication, and time management in the profession; undergo higher studies, certifications, and technology research as per market needs.
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Program Outcomes (POs):

Program Outcomes (POs) describe the knowledge, skills, and professional competencies that students are expected to acquire upon successful completion of the **Master of Computer Application (MCA)** programme. They enable graduates to apply computing knowledge, solve complex problems, develop innovative software solutions, uphold professional ethics, work effectively in teams, and adapt to emerging technologies, thereby preparing them for successful careers, higher education, and lifelong learning.

PO1 – Foundation Knowledge: Apply knowledge of mathematics, programming logic, and coding fundamentals for solution architecture and problem solving.

PO2 – Problem Analysis: Identify, review, formulate, and analyse problems, primarily focusing on customer requirements using critical thinking frameworks.

PO3 – Development of Solutions: Design, develop, and investigate problems with an innovative approach for solutions incorporating ESG/SDG goals.

PO4 – Modern Tool Usage: Select, adapt, and apply modern computational tools such as development of algorithms, with an understanding of limitations including human biases.

PO5 – Individual and Teamwork: Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups, using methodologies such as Agile.

PO6 – Project Management and Finance: Apply principles of project management such as scheduling and work breakdown structure, and demonstrate conversance with principles of finance for profitable project management.

PO7 – Ethics: Commit to professional ethics in managing software projects with financial aspects; learn to use new technologies for cyber security and insulate customers from malware.

PO8 – Life-Long Learning: Demonstrate change management skills and the ability to learn and keep up with contemporary technologies and ways of working.

9. Course Outcomes (COs)

Every course offered under the **Master of Computer Application (MCA)** programme has well-defined **Course Outcomes (COs)**. The COs specify the knowledge, skills, and competencies that students are expected to acquire upon successful completion of a course. Each Course Outcome contributes to the



attainment of the Program Outcomes (POs) and supports the achievement of the Program Educational Objectives (PEOs). The relationship among PEOs, POs, and COs is illustrated below.

Program Educational Objectives (PEOs)	Thrust Area	Associated Program Outcomes (POs)	Courses Contributing to COs
PEO I	Technical Expertise	PO1, PO2, PO3, PO4, PO8	0PMCPC101, 0PMCPC102, 0PMCPC103, 0PMCPC104, 0PMCOE106, 0PMCPC107, 0PMCPC108, 0PMCPC201, 0PMCPC202, 0PMCPC203, 0PMCPC206, 0PMCPC301, 0PMCOE302, 0PMCPC306, 0PMCPC401, 0PMCPC402, 0PMCPC403, 0PMCPC407
PEO II	Successful Career	PO1-PO8	0PMCPE204, 0PMCVS205, 0PMCPE207, 0PMCPR208, 0PMCHM303, 0PMCVS304, 0PMCPE305, 0PMCIR308, 0PMCPE405, 0PMCVS406, 0PMCPC408
PEO III	Interdisciplinary and Life Long Learning	PO4, PO5, PO6, PO7, PO8	0PMCRM404, 0PMCPR208, 0PMCIR308, 0PMCPR309, 0PMCPR409, 0PMCPE204, 0PMCPE305, 0PMCPE405, 0PMCOE302, 0PMCPC403

10. Program Specific Outcomes (PSOs)

The graduates of the **Master of Computer Application (MCA)** programme will be able to:

PSO1: Advanced Computing and Software Development

Students will be able to analyze, design, develop, and deploy efficient software solutions using advanced programming, algorithms, software engineering, databases, web technologies, Artificial Intelligence, Data Science and Full Stack Development to solve complex real-world problems.

PSO2: Research, Innovation, and Professional Growth

Students will be able to pursue successful careers, higher education, research, and entrepreneurship by demonstrating innovation, professional ethics, leadership, teamwork, communication, and lifelong learning in the field of computer applications.



MCA -I Semester-I

Course Code	Course Domain	Course Name	Teaching Scheme					Evaluation Scheme					TOTAL
			L	T	P	SL	Credit	Scheme	Theory		Practical		
									Max.	Min. Passing	Max.	Min. Passing	
0PMCPC101	F,E,R	Python Programming	4	0	0	4	4	ISE	30	50*	0	100	
								MSE	10				
								ESE	60				
0PMCPC102	F	Advanced Database Management Systems	4	0	0	4	4	ISE	30	50*	0	100	
								MSE	10				
								ESE	60				
0PMCPC103	F	Operating System	4	0	0	4	4	ISE	30	50*	0	100	
								MSE	10				
								ESE	60				
0PMCPC104	F	Software Engineering and Project Managment	4	0	0	4	4	ISE	30	50*	0	100	
								MSE	10				
								ESE	60				
0PMCOE105	F,R	Statistical and Mathematical Foundation	2	0	0	2	2	ISE	10	25*	0	50	
								MSE	10				
								ESE	30				
0PMCPC106	F,E	Python Programming Lab	0	0	4	1	2	ISE			20	25**	50
								ESE			30		
0PMCPC107	F,E	Advanced DBMS Lab	0	0	4	1	2	ISE			20	25**	50
								ESE			30		
TOTAL			18	0	8	20	22	TOTAL MARKS					550
Total Contact Hours Per Week			26										

Course Category	Programme Core Course	Programme Elective Course	Open Elective Course	Vocational and Skill Enhancement Course	Humanities and Management Course	Internship	Project	Research Methodology	Total
Sem-I	PC	PE	OE	VS	HM	IR	PR	RM	22
Credit	20	0	2	0	0	0	0	0	

ISE: In-semester Evaluation, MSE: Mid Semester Examination, ESE: End Semester Examination

Note 1:

* ISE + MSE = 40%, ESE = 40%, and the combined together needs to be 50% for passing Theory Course.

** ISE = 40%, ESE = 50%, and the combined together need to be 50% for passing Lab Courses.


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MCA -I Semester-II

Course Code	Course Domain	Course Name	Teaching Scheme					Evaluation Scheme					TOTAL
			L	T	P	SL	Credit	Scheme	Theory		Practical		
									Max.	Min. Passing	Max.	Min. Passing	
0PMCPC201	F	Data Sturcure Using Python	4	0	0	4	4	ISE	30	50*		0	100
								MSE	10				
								ESE	60		0		
0PMCPC202	F,R	Data Communication and Networking	4	0	0	4	4	ISE	30	50*		0	100
								MSE	10				
								ESE	60		0		
0PMCPC203	F,E,R	Software Testing	2	0	0	2	2	ISE	10	25*		0	50
								MSE	10				
								ESE	30		0		
0PMCPE204	F,E,R	Professions I Elective-I: 204.1_Artificial Intelligence and Machine Learning Fundamentals 204.2_Data Engineering Foundations & Analytics 204.3_Frontend Development using React	4	0	0	4	4	ISE	30	50*		0	100
								MSE	10				
								ESE	60				
0PMCVS205	F	Aptitude Techniques & soft skills	2	0	0	2	2	ISE	10	25*		0	50
								MSE	10				
								ESE	30		0		
0PMCPC206	F	Data Sturcure Using Python Lab	0	0	4	1	2	ISE			20	25**	50
								ESE			30		
0PMCPE207	F,E,R	Program Elective-I Lab	0	0	4	1	2	ISE			20	25**	50
								ESE			30		
0PMCPR208	F,E,R	Mini Project	0	0	4	1	2	ISE			20	25**	50
								ESE			30		
TOTAL			16	0	12	19	22		TOTAL MARKS				550
Total Contact Hours Per Week			28										

Course Category	Programme Core Course	Programme Elective Course	Open Elective Course	Vocational and Skill Enhancement Course	Humanities and Management Course	Internship	Project	Research Methodology	Total
Sem-I	PC	PE	OE	VS	HM	IR	PR	RM	22
Credit	12	6	0	2	0	0	2	0	

ISE: In-semester Evaluation, MSE: Mid Semester Examination, ESE: End Semester Examination

Note 1:

* ISE + MSE = 40%, ESE = 40%, and the combined together needs to be 50% for passing Theory Course.

** ISE = 40%, ESE = 50%, and the combined together need to be 50% for passing Lab Courses.

Note 2:

Internship: Students are expected to complete 60 Days of internship after the Second semester(Summer), and its evaluation will be conducted in the Third semester.


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MCA -II Semester-III

Course Code	Course Domain	Course Name	Teaching Scheme					Evaluation Scheme					TOTAL
			L	T	P	SL	Credit	Scheme	Theory		Practical		
									Max.	Min. Passing	Max.	Min. Passing	
0PMCPC301	F,E	JA VA Programming	4	0	0	4	4	ISE	30	50*		0	100
								MSE	10				
								ESE	60				
0PMCOE302	F,E,R	Internet of Things	2	0	0	2	2	ISE	10	25*		0	50
								MSE	10				
								ESE	30				
0PMCHM303	F	Entrepreneurship Development	2	0	0	2	2	ISE	10	25*		0	50
								MSE	10				
								ESE	30				
0PMCVC304	F	MOOC	2	0	0	2	2	ISE	10	25*		0	50
								MSE	10				
								ESE	30				
0PMCPE305	F,E,R	Professionals Elective-II: 305.1_Advanced Machine Learning and Deep Learning 305.2_Intelligent Machine Learning & Big Data Analytics 305.3_Python Backend Development	4	0	0	4	4	ISE	30	50*		0	100
								MSE	10				
								ESE	60				
0PMCPC306	F,E	JA VA Programming Lab	0	0	4	1	2	ISE			20	25**	50
								ESE			30		
0PMCPE307	F,E	Program Elective-II Lab	0	0	4	1	2	ISE			20	25**	50
								ESE			30		
0PMCI308	F,E	Internship	0	0	4	1	2	ISE			50	25**	50
								ESE					
0PMCP309	F,E,R	Major Project	0	0	8	4	4	ISE			100	50*	100
								ESE					
TOTAL			14	0	20	21	24	TOTAL MARKS					600

Total Contact Hours Per Week

34

Course Category	Programme Core Course	Programme Elective Course	Open Elective Course	Vocational and Skill	Humanities and Management	Internship	Project	Research Methodology	Total
Sem-I	PC	PE	OE	VS	HM	IR	PR	RM	24
Credit	6	6	2	2	2	2	4	0	

ISE : In-semester Evaluation , MSE: Mid Semester Examination , ESE: End Semester Examination

Note 1:

* ISE + MSE = 40%, ESE = 40%, and the combined together needs to be 50% for passing Theory Course.

** ISE = 40%, ESE = 50%, and the combined together need to be 50% for passing Lab Courses.

Note 2:

Internship: Students are expected to complete 60 Days of internship after the Second semester(Summer), and its evaluation will be conducted in the Third semester.


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MCA- II Semester-IV

Course Code	Course Domain	Course Name	Teaching Scheme					Evaluation Scheme					TOTAL
			L	T	P	SL	Credit	Scheme	Theory		Practical		
									Max	Min. Passing	Max	Min. Passing	
0PMCPC401	F,E	Advanced JAVA Programming	4	0	0	4	4	ISE MSE ESE	30 10 60	50*		0	100
0PMCPC402	F,E,R	Cyber Security	2	0	0	2	2	ISE MSE ESE	10 10 30	25*		0	50
0PMCPC403	F,E,R	Cloud Computing	2	0	0	2	2	ISE MSE ESE	10 10 30	25*		0	50
0PMCRM404	F,R	Research Methodology	2	0	0	2	2	ISE MSE ESE	10 10 30	25*		0	50
0PMCPE405	F,E,R	Professionals Elective-III: 405.1_Generative AI and Intelligent Systems 405.2_Generative AI, MLOps & Applied Data Science 405.3_DevOps and Cloud Deployment	4	0	0	4	4	ISE MSE ESE	30 10 60	50*		0	100
0PMCVS406	F	Seminar	2	0	0	2	2	ISE ESE	50 10	25*			50
0PMCPC407	F,E	Advanced JAVA Programming Lab	0	0	4	1	2	ISE ESE	 		20 30	25**	50
0PMCPE408	F,E	Program Elective -III Lab	0	0	4	1	2	ISE ESE	 		20 30	25**	50
0PMCPR409	F,E,R	Mini Project	0	0	4	2	2	ISE ESE	 		20 30	25**	50
TOTAL			16	0	12	20	22			TOTAL MARKS			550
Total Contact Hours Per Week			28										

Course Category	Program Core Course	Programme Elective Course	Open Elective Course	Vocational and Skill Enhancement Course	Humanities and Management Course	Inter ship	Project	Research Methodology	Total
Sem-I	PC	PE	OE	VS	HM	IR	PR	RM	22
Credit	10	6	0	2	0	0	2	2	

ISE : In-semester Evaluation , MSE: Mid Semester Examination , ESE: End Semester Examination

Note 1:

* ISE + MSE = 40%, ESE = 40%, and the combined together needs to be 50% for passing Theory Course.

** ISE = 40%, ESE = 50%, and the combined together need to be 50% for passing Lab Courses.


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Proposed Streams For Program Electives (PE)

Track / Specialization	Module 1 (4 Credits)	Module 2 (4 Credits)	Module 3 (4 Credits)
Artificial Intelligence	Artificial Intelligence and Machine Learning Fundamentals	Advanced Machine Learning and Deep Learning	Generative AI and Intelligent Systems
Data Science	Data Engineering Foundations & Analytics	Intelligent Machine Learning & Big Data Analytics	Generative AI, MLOps & Applied Data Science
Full Stack Development	Frontend Development using React	Python Backend Development	DevOps and Cloud Deployment

12. Credit Distribution Chart for MCA Program

CREDIT DISTRIBUTION : SEMESTER WISE-MCA						
1 Lecture hour = 1 Credit 2 Lab Hours = 1 Credit 1 Tutorial Hour = 1 Credit						
Sr.No	Type of Course	No of Credits /Semester				Total
		1	2	3	4	
1	Programme Core Course(PC)	20	12	6	10	48
2	Programme Elective Course (PE)	0	6	6	6	18
3	Open Elective (OE)	2	0	2	0	4
4	Vocational and Skill Enhancement Course (VS)	0	2	2	2	6
5	Humanities & Management Courses (HM))	0	0	2	0	2
6	Project/Mini Project (PR)	0	2	4	2	8
7	Internship (IR)	0	0	2	0	2
8	Research Methodology(RM)	0	0	0	2	2
Total		22	22	24	22	90

Programme Total (2 Years MCA)

Year / Semester	Total Credits	Total Marks	Theory ESE	Theory CIE	Practical Marks	Total Hours (TH + PR)
MCA-I Semester I	22	550	270	180	100	18 TH + 08 PR
MCA-I Semester II	22	550	240	160	150	16 TH + 12 PR
MCA-II Semester III	24	600	210	140	250	14 TH + 20 PR
MCA-II Semester IV	22	550	210	140	200	16 TH + 12 PR
Programme Total (2 Years MCA)	90	2250	930	620	700	64 TH + 52 PR



Semester	L	T	P	Credits	Total Maks
Sem-I	18	0	8	22	550
Sem-II	16	0	12	22	550
Sem-III	14	0	20	24	600
Sem-IV	16	0	12	22	550
Total	64	0	52	90	2250

13. Workload (Periods/Lectures per Course)

The workload for each course shall be as prescribed in the curriculum structure approved by the Academic Council. Generally, a 4-credit theory course shall comprise 60 contact hours, while a 2-credit theory course shall comprise 30 contact hours during a semester, with each lecture having a duration of 60 minutes. Laboratory courses, project work, internships, and other academic activities shall be conducted as per the credit structure and academic regulations of the Institution.

14. Standard of Passing and Award of Grades

The evaluation of students shall be carried out through **Continuous Internal Assessment (CIA-ISE+MSE)** and **End Semester Examination (ESE)** in accordance with the examination regulations of the Institution.

- The student will require to obtain **minimum of 40% of the total marks in each head of examination** (40% in semester and Mid Semester Evaluation and 40% End Semester examination) and **aggregate of 50% in each course.**
- A student must have cleared all papers of Sem-I and Sem-II or the student who have **earned 50% of total credits of Semester-I and Semester-II** then student will appear for Sem – III.
- Once student is passed the **End Semester examination and failed in the internal evaluation** then student **will fill the exam form again and appear for internal evaluation only in even semester.**
- Letter Grades shall be awarded based on the total marks obtained by the student in accordance with the grading system approved by the Institute.
- The grade point conversion table shall be as prescribed in the Examination and Academic Regulations of the Institution.

15. Grading System

The Institute follows a Seven-Point Letter Grading System as per shivaji university guidelines for evaluating the academic performance of students. The final Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) shall be calculated in accordance with the Academic and Examination Regulations of the Institute.



Gradation Chart:

Sr. No.	Marks Obtained (out of 100)	Grade Point	CGPA Range	Letter Grade	Class Awarded
1	Absent	0	—	Absent	—
2	0–49	0	0.00–4.99	F (Fail)	Fail
3	50–55	5	5.00–5.49	C	Pass Class
4	56–60	6	5.50–6.49	B	Second Class
5	61–70	7	6.50–7.49	B+	First Class
6	71–80	8	7.50–8.49	A	First Class
7	81–90	9	8.50–9.49	A+	First Class with Distinction
8	91–100	10	9.50–10.00	O (Outstanding)	Outstanding

Note:

- i) Marks obtained ≥ 0.5 shall be rounded off to next higher digit.
- ii) The SGPA & CGPA shall be rounded off to 2 decimal points.

Note:

- The SGPA and CGPA shall be calculated as per the credit-based grading system adopted by the Institute.
- A student shall be declared to have successfully completed the programme only after fulfilling all academic and examination requirements prescribed by the Institute.
- The award of the degree and final classification shall be governed by the Academic and Examination Regulations of Yashoda Technical Campus, Satara, as amended from time to time.



16. Nature of Theory Question paper:

Nature of Theory Question paper UG (BCA) and PG (MCA)

a) Nature of question paper is as follows for 60 Marks End Semester Examination (4 Credit)

QUESTION PAPER PATTERN 60 MARKS

Duration: 2.5 Hours

Total Marks – 60

Instructions:

- 1) Quc.1 and Quc. 7 are compulsory.
- 2) Attempt any THREE questions from Quc. No.2 to Quc. No. 6.
- 3) Figures to the right indicate marks.

Q. 1)	Short Answer questions (5 questions for 2 mark each)	10 MARKS
Q. 2)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q. 3)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q. 4)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q. 5)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q. 6)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q. 7)	Write notes on (Any Four out of five)	20 MARKS

b) Nature of question paper is as follows for 30 Marks University end semester Examination (ESE) (2 Credit)

Duration: 2.5 Hour

Total Marks – 60

Instructions:

1. All questions are compulsory
2. Figures to the right indicate marks.

Q. 1)	Short Answer questions (5 questions for 2 mark each)	10 MARKS
Q. 2)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q. 3)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q. 4)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q. 5)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q. 6)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q. 7)	Write notes on (Any Four out of five)	20 MARKS

c) Nature of question paper is as follows for 50 Marks Mid semester Examination (MSE) (4 Credit)

Duration: 2 Hours

Total Marks – 50

Instructions:

1. Que.1 and Que. 6 are compulsory.



2. Attempt any THREE questions from Que. No.2 to Que. No. 5.

3. Figures to the right indicate marks.

Q.1)	Broad answer question	10 MARKS
Q.2)	Broad answer question	10 MARKS
Q.3)	Broad answer question	10 MARKS
Q.4)	Broad answer question	10 MARKS
Q.5)	Broad answer question	10 MARKS
Q.6)	Write notes on (Any TWO out of FOUR)	10 MARKS

d) Nature of question paper is as follows for 30 Marks Institute Mid Semester Examination (MSE) (2 Credit)

Duration: 1.5 Hour

Total Marks – 30

Instructions:

1. All questions are compulsory
2. Figures to the right indicate marks.

Q.1)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
OR		
Q.1)	Broad question/case study/Exercise Example/Quantitative problems	10 MARKS
Q.2)	Write Short answer question/Exercise/Problem (Any TWO) i) ii) iii) iv)	10 MARKS
Q.4)	Write short notes (Any TWO) i) ii) iii) iv)	10 MARKS

17. Nature of Practical Question Paper:

1) Practical Examination for 30 Marks (Practical End-Semester Examination)

- The practical examination shall be of 30 marks.
- The question paper will consist of two practical questions, each carrying 10 marks.

Students are required to attempt any two questions from three.

Viva-Voce (Oral): 10 marks.

a. **Internal= Attendance+ Journal** = 10+10 = 20 marks.

Attendance (75% to 80% 4 marks, 81% to 85% 6 Marks, 86% to 90% 8 marks, 91% to 100% 10 Marks)



b. Duration of Examination: 2 Hours.

Conduct of Practical Examination- The practical examinations shall be conducted by a panel of examiners appointed by the College. The examiner panel shall comprise experienced faculty members with a minimum of five years of full-time teaching experience in the relevant discipline

1. Medium of Instruction: The medium of instructions shall be in English.

18. Internal Marks Distribution –

The Internal Assessment shall be carried out through continuous evaluation as per **NEP 2020, Outcome-Based Education (OBE)**, and **Bloom's Taxonomy**. The assessment shall include written examinations, assignments, attendance, and learner-centric pedagogical activities.

Internal Assessment Marks Distribution for 40 Marks

Component	Marks
Assignment	05
Attendance	05
Mid Semester Examination (MSE)	10
Offline and Online Activity (as per NEP 2020 Pedagogy and Bloom's Taxonomy)	20
Total	40

Internal Assessment Marks Distribution for 20 Marks

Component	Marks
Assignment	02
Attendance	03
Mid Semester Examination (MSE)	10
Offline and Online Activity (as per NEP 2020 Pedagogy and Bloom's Taxonomy)	05
Total	20

Note:

- The faculty member may select suitable **offline and online activities** based on the nature of the course.
- Activities should promote higher-order learning skills such as Apply, Analyze, Evaluate, and Create as defined in Bloom's Taxonomy.
- The department shall maintain records of assignments, attendance, internal examinations, and activity evaluations for verification by the University/Autonomous College authorities, whenever required.



Sr. No.	Pedagogy	Suggested Activities
1	Classroom Teaching	Lecture, Question–Answer Session
2	Assignment-Based Learning	Home Assignment, Worksheet
3	Activity-Based Learning	Quiz, Puzzle, Class Activity
4	Group Learning	Group Discussion, Group Task
5	Presentation	Individual or Group Presentation
6	Problem Solving	Solve Programming or Numerical Problems
7	Case Study	Discuss Real-Life Examples
8	Demonstration	Live Software or Coding Demo
9	Hands-on Learning	Practice Using Software/Tools
10	Project-Based Learning	Mini Project, Model Development
11	Self-Learning	Read Notes, Watch Videos, Online Learning
12	Peer Learning	Learn with Classmates, Peer Teaching
13	Brainstorming	Share Ideas and Find Solutions
14	Flipped Learning	Study Before Class and Discuss in Class
15	Seminar	Present a Technical Topic
16	Online Learning	Google Classroom, NPTEL, SWAYAM, MOOCs
17	Library Learning	Book Reading, Article Review
18	Industry Interaction	Expert Talk, Webinar, Guest Lecture
19	Coding Practice	Programming Exercises, Coding Challenge
20	Continuous Assessment	Quiz, Assignment, Attendance, Class Participation

19. Mini Project—(Semester II and IV)

The project may be undertaken **in a group of not more than three students** under the supervision of a faculty mentor. Students shall identify a real-world problem and develop an innovative software solution using the knowledge and skills acquired throughout the MCA programme. The project should preferably be based on emerging technologies such as Artificial Intelligence, Machine Learning, Data Science, Cloud Computing, Cyber Security, Internet of Things (IoT), Block chain, Mobile Computing, Full Stack



Development, Big Data Analytics, or any other contemporary computing domain approved by the Department.

The project shall be carried out under the supervision of a faculty mentor, appointed by the department and shall be evaluated through continuous internal assessment and an End Semester Practical Examination. Students shall submit the project report in the prescribed format and successfully complete the presentation and viva-voce examination.

Mini Project Assessment Scheme (50 Marks)

Assessment Component	Marks
Internal Assessment (IA)	20
End Semester Practical Examination (ESE)	30
Total	50

Internal Assessment Rubric of Mini Project Examination (20 Marks)

Component	Marks
Problem Definition, Feasibility Study & Requirement Analysis	02
System Design & Progress Review	06
Software Development & Implementation Progress	08
Documentation, Presentation & Internal Viva	04
Total	20

End Semester Mini Project Examination Rubric (30 Marks)

Component	Marks
Software Implementation & Functionality	10
Innovation, Technical Complexity & Testing	3
Project Report	5
Project Demonstration & Presentation	7
Viva-Voce	5
Total	30

- Successful completion of the project, submission of the dissertation, project demonstration, and viva-voce examination are mandatory for the award of credits.



20. Major Project / Internship – (Semester III)

The Major Project shall be undertaken individually based on the knowledge and experience gained during the mandatory 60 days of Summer Internship completed after the Semester II End Semester Examination. Students are required to identify an industry-oriented or research problem, perform requirement analysis, prepare the system design, develop an appropriate solution, and prepare a Project Report in the prescribed format under the guidance of an assigned faculty mentor and, wherever applicable, an industry mentor. The Summer Internship certificate from the respective organization is mandatory for project certification by the Institute. The project work must be completed individually, and students must submit two copies of the Project Report to the Department before the Semester End Semester Examination. The Project Viva-Voce will be conducted after the Semester III Theory End Semester examination by a Institute-appointed panel of two examiners having a doctorate and more than 5 to 10 years of experience as full-time teachers.

The project shall be evaluated independently of the internship. Students must successfully complete both the Project and Internship separately to earn the respective credits.

Major Project – Evaluation Rubric (100 Marks)

Component	Marks
Problem Identification & Objectives	5
Feasibility Study & Requirement Analysis	5
System Design (Architecture/UML/Database/UI)	15
Software Development & Implementation	30
Testing & Validation	10
Documentation (Project Report)	15
Viva-Voce	20
Total	100

21. Summer Internship – I (Semester III) (50 Marks)

Students shall successfully complete a **60-day Summer Internship** after the **Semester II End Semester Examination** in a recognized industry, organization, startup, research laboratory, or government organization. Upon completion of the internship, students shall submit an internship completion certificate issued by the host organization, an internship report, and deliver a presentation for evaluation.



Internship – I Evaluation Rubric (50 Marks)

Component	Marks
Attendance, Joining letter, Completion letter	5
Industry Weekly Report	10
Student Guide Meet Record	10
Major Project Synopsis	15
Presentation	10
Total	50

22. Fee Structure

The tuition fee and other applicable fees for the MCA programme shall be as prescribed by the **Fee Regulating Authority (FRA), Government of Maharashtra**, and approved by the Competent Authority from time to time. The fee structure shall be notified by the Institution before the commencement of each academic year.

23. Infrastructure and Academic Requirements

The Institution shall provide adequate academic and physical infrastructure in accordance with the norms prescribed by **AICTE, UGC, the Government of Maharashtra**, and other statutory authorities.

The minimum infrastructure requirements shall include:

- Qualified Faculty:** Faculty members shall possess qualifications and experience as prescribed by AICTE and the affiliating authority.
- Computer Laboratories:** Well-equipped computer laboratories with the latest hardware, licensed software, development tools, and operating systems as per AICTE norms.
- Internet and Networking:** High-speed internet connectivity with campus-wide Wi-Fi facilities to support teaching, learning, research, and online academic activities.
- Digital Learning Facilities:** Access to MOOCs, NPTEL, SWAYAM, virtual laboratories, online tutorials, and other e-learning resources.
- Smart Classrooms:** ICT-enabled classrooms equipped with LCD projectors, interactive smart boards, internet connectivity, and multimedia facilities.
- Seminar and Innovation Facilities:** Seminar halls, tutorial rooms, auditorium, Innovation and Incubation Centre, Entrepreneurship Development Cell, and collaborative learning spaces.
- Library and Digital Resources:** A well-equipped library with printed books, e-books, e-journals, IEEE, ACM, Springer, Science Direct, DELNET, and other digital resources.
- Language Laboratory:** A modern language laboratory with adequate computer systems and communication skill development software for enhancing English communication and soft skills.



24. Curriculum Revision

The MCA curriculum shall be reviewed and revised periodically to incorporate advancements in Computer Science, Information Technology, Artificial Intelligence, Data Science, Cyber Security, Cloud Computing, Internet of Things (IoT), and other emerging technologies.

The curriculum revision process shall be based on feedback from industry experts, alumni, employers, faculty members, students, professional bodies, and academic experts. The revised curriculum shall be approved through the appropriate academic bodies of the Institution in accordance with AICTE, UGC, and NEP 2020 guidelines.

25. Bridge Course

The Bridge Course is designed to provide the necessary foundational knowledge in Computer Science and Mathematics to students admitted from non-computing disciplines, enabling them to successfully pursue the MCA programme.

Objectives

- Bridge the knowledge gap between computing and non-computing graduates.
- Strengthen fundamental concepts of Computer Science and Mathematics.
- Develop basic programming and problem-solving skills required for the MCA curriculum.

Eligibility

The Bridge Course shall be **mandatory** for students who have not studied Computer Science and/or Mathematics at the qualifying degree level, as prescribed by AICTE and the Institution.

Duration and Credits

- Duration:** 60 Contact Hours
- Credits:** 4

Evaluation Scheme

Assessment Component	Marks
Continuous Internal Assessment (Assignments, Practical's, Quizzes, Class Participation)	50
End-Course Multiple Choice Examination	50
Total	100



MCA (Commerce & Management) - Bridge Course Syllabus As per the norms of AICTE 60 contact sessions 4 credits	
Unit I Fundamentals of Computer Introduction to Digital Computer, Block Diagram of computer, Computer Hardware, Introduction to Software, Types of software, Introduction to operating system, Types of Operating system, Functions of Operating system.	
Unit II Fundamentals of Accounting- Introduction to Accounting, Objectives, Need and Scope of Accounting, Types of Accounts, Branches of accounts, Accounting concepts and conventions. Journal entries, ledger posting, trial balance, financial statements. Accounting with Tally: Introduction to gateway, company creation, ledger creation, voucher entries.	
Unit III Fundamentals of Mathematics and Statistics Measures of Central Tendency- Mean, Mode, Median, Elementary set theory: Representation of sets, Operations on sets, Distributive and De Morgan's laws, Probability, Permutations and Combinations.	
Unit IV- Fundamentals of Programming- Introduction to C programming, Data types in C, Operators in C, Branching and looping statements in C. Array in C, Introduction to Object oriented Programming, Introduction to C++, Class, Object, Constructor, Destructor, Inheritance, Polymorphism.	
Unit-V Database Management System Definition of Database, Needs, features Database Management Systems (DBMS): Definition, components, file system, comparison of file processing system with DBMS, functions of DBMS, advantages, disadvantages of DBMS, Structure of DBMS, Database constraints, .Introduction to SQL.	
Reference Books - 1. Computer Fundamentals, Sixth Edition, Pradeep K. Sinha, Priti Sinha. 2. Programming in ANSI C, E Balagurusamy, Tata McGraw-Hill Publishing 3. Programming in C++ by Yashwant Kanetkar (PBP Publications) 4. Koontz and Weirich : Essentials of Management 5. Database System Concept – Silberschatz, Korth 6. Fundamentals of Database System- Ramez Elmasri, Shamkant B. Navathe (Pearson) 7. SQL, PL/SQL the programming language of Oracle Ivan Bayross BPP 4th 8. Computer System Architecture Morris Mano Pearson 3rd Edition 9. Gupta C. B.: Introduction to Statistics 10. Discrete mathematics - Seymour Lipschutz, Marc Lipson (MGH), Schaum's outlines. 11. Advance Accountancy:- M.C. Shukla & T.S. Grewal 12. Advance Accountancy:- S.C. Jain & K.L. Narang	


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MCA-I

SEMESTER-I

Class	M.C.A. Sem.-I
Course Code and Course Title	0PMCPC101, Python Programming
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	48/00/00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	30 / 10 / 60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0PMCPC101_1	Apply Python programming fundamentals, standard data types, control structures, and object-oriented programming concepts to develop Python programs.	L3
0PMCPC101_2	Develop modular Python applications using functions, modules, regular expressions, exception handling, and file handling techniques.	L3, L6
0PMCPC101_3	Apply Python libraries for Data Science and Artificial Intelligence, and develop database-driven and GUI-based Python applications.	L3, L6
0PMCPC101_4	Develop web applications using the Django framework by implementing MVT architecture, models, forms, and CRUD operations.	L3, L6

Course Contents:		
Unit 1	Python Fundamentals and Object-Oriented Programming Introduction to Python: History, Features, Applications Python Basics: Identifiers, Keywords, Indentation, Comments, Statements. Variables and Standard Data Types: Numeric, String, List, Tuple, Set and Dictionary. Operators: Arithmetic, Relational, Logical, Assignment, Membership, Identity and Operator Precedence. Decision Making: if, if-else, elif, Nested if, Switch-case using if-elif-else. Looping: while, for, Nested Loops, Loop Control Statements (break, continue, pass), else with loops. Introduction to Object-Oriented Programming: Classes and Objects, Creating Instance Objects, Inheritance, Polymorphism and Encapsulation, Method Overriding, Operator Overloading and Data Hiding.	12 Hours
Unit 2	Functions, Modules, Exception Handling and File Management Functions: Definition, Calling, Arguments, Default and Keyword Arguments, Variable Length Arguments, Lambda Functions, Scope of Variables and Return Statements. Modules and Packages: Importing Modules, User Defined Modules, dir(), globals(), locals() and creating and importing the Packages, User defined and predefined packages.	12 Hours



	Regular Expressions: Pattern Matching, Search, Match and Substitution Operations. Exception Handling: try-except, Multiple Exceptions, try-except-else, try-finally and User Defined Exceptions. Garbage Collection. File Handling: Opening, Closing, Reading, Writing, Appending Files and File Positioning using seek().	
Unit 3	Python Libraries, Database and GUI Programming Python Libraries for AI & Data Science – NumPy, Pandas, Matplotlib, Seaborn, SciPy, Scikit-learn, TensorFlow, NLTK, Keras (Installation, Use & Their Functions), OpenCV, BeautifulSoup. GUI Programming using Tkinter: Introduction to Tkinter, Widgets (Label, Message, Button, Radio Button, Check Button, Entry, Text, Canvas and Scale), Dialog Boxes and Layout Management (Pack, Grid and Place). Database Programming: Database Connectivity.	12 Hours
Unit 4	Web Development using Django Framework Introduction to Web Frameworks & CGI: Overview of Web Development, Client-Server Architecture, Introduction to CGI (Common Gateway Interface), Limitations of CGI, Need for Web Frameworks, Introduction to Django, Features and Advantages of Django. Django Setup and Project Structure: Installation of Python and Django, Virtual Environment, Creating a Django Project, Django Project Structure, Running Development Server, Creating an Application.	12 Hours

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year
1	Python Crash Course	Eric Matthes	No Starch Press	3rd	2023
2	Learning Python	Mark Lutz	O'Reilly Media	5th	2013
3	Python Programming: An Introduction to Computer Science	John Zelle	Franklin, Beedle & Associates	3rd	2017
4	Django 5 By Example	Antonio Melé	Packt Publishing	5th	2024
5	Python for Data Analysis	Wes McKinney	O'Reilly Media	3rd	2022
6	Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow	Aurélien Géron	O'Reilly Media	3rd	2023

E- Learning Resources

Sr. No.	Title	Platform	Web Link
1	The Joy of Computing using Python	NPTEL/SWAYAM	https://onlinecourses.nptel.ac.in/noc25_cs69/preview
2	Python for Everybody Specialization	Coursera	https://www.coursera.org/specializations/python



3	Django for Everybody Specialization	Coursera	https://www.coursera.org/specializations/django
4	Python Tutorial	Python.org	https://docs.python.org/3/tutorial/
5	NumPy, Pandas, Matplotlib, Scikit-learn & TensorFlow Documentation	Official Documentation	https://numpy.org/ , https://pandas.pydata.org/ , https://matplotlib.org/ , https://scikit-learn.org/ , https://www.tensorflow.org/

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Class	MCA, Sem.-I
Course Code and Course Title	0PMCPC102 – Advanced Database Management System
Prerequisite/s	
Teaching Scheme: Lecture/Tutorial/Practical	48/00/00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	30 / 10 /60

Course Outcomes (COs):		Bloom's Level
Upon successful completion of this course, the student will be able to:		
0PMCPC102_1	Explain the concepts of DBMS, RDBMS, data models, normalization, transaction management, and apply SQL statements to design, retrieve, and manipulate relational databases.	L1, L2 , L3
0PMCPC102_2	Develop PL/SQL programs using variables, control structures, cursors, exception handling, procedures, functions, packages, and triggers to solve database programming problems.	L2, L3, L4
0PMCPC102_3	Analyze database architectures, distributed and parallel databases, security mechanisms, backup and recovery techniques, performance optimization, and database administration to recommend suitable database solutions.	L2, L4, L5
0PMCPC102_4	Evaluate NoSQL database models and implement MongoDB operations, including CRUD, indexing, aggregation, replication, sharding, and migration strategies from relational databases.	L3, L4, L5

Course Contents:		
Unit 1	Introduction to Relational Database Management System Introduction to Database Management System (DBMS), Introduction and Objectives of RDBMS, Features and Advantages of RDBMS, Difference between DBMS and RDBMS Data Models: Hierarchical, Network, Entity-Relationship (ER), Relational Data Model. Relational Algebra, Codd's Rules, Functional Dependencies, Database Normalization : First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF), Boyce-Codd Normal Form (BCNF), Transaction Management: ACID Properties, Concurrency Control, Structured Query Language (SQL) Introduction to SQL, SQL Data Types, SQL Commands: DDL, DML, DQL, DCL, TCL Constraints: NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, CHECK, DEFAULT, SQL Operators, Built-in Functions: String, Numeric, Date & Time, Aggregate, IN, BETWEEN, LIKE, ANY, ALL, EXISTS, Join Operations: Inner Join, Outer Join, Self Join, Cross Join, Set Operations, Views, Indexes, Sequences, Subqueries, Embedded SQL	12 Hours



Unit 2	PL/SQL Programming Introduction to PL/SQL: Features and Advantages, PL/SQL Block Structure, Variables, Constants and Data Types, Operators and Expressions, Control Structures: IF Statement, IF-ELSE Statement, Nested IF, CASE Statement, LOOP, WHILE LOOP, FOR LOOP. Cursors: Implicit Cursor, Explicit Cursor, Cursor FOR Loop, Parameterized Cursor. Exception Handling: Types of Exceptions, Predefined Exceptions, User-defined Exceptions, Exception Handling Techniques. Stored Procedures, Functions, Packages, Triggers, Stored Packages, Trigger Types (Row-Level and Statement-Level)	12 Hours
Unit 3	Database System Architecture: Database Architecture, Centralized Database Systems, Client-Server Architecture, Web-Based Database Systems, Spatial Databases. Parallel Databases: Introduction, Need, Architectures, Distributed Databases: Introduction, DDBMS Architecture, Homogeneous and Heterogeneous Databases, Distributed Transactions, Two-Phase Commit Protocol, Concurrency Control, Distributed Query Processing. Advanced Database Systems. Object-Relational Databases, Multimedia Databases, Mobile Databases. Database Security: Concept, Authentication and Authorization, User Roles and Privileges, SQL Injection, Data Encryption, Auditing. Backup and Recovery: Backup Techniques, Recovery Methods, Checkpoints, Log-Based Recovery. Database Performance: Query Processing, Query Optimization, Cost-Based Optimization, Index Tuning, Performance Monitoring. Database Administration: Database Users, Data Dictionary, Storage Management, Database Maintenance. Emerging Trends: Introduction to Cloud, NoSQL, New SQL, In-Memory, AI-assisted, Graph, Multi-Model, Edge, Vector Databases.	12 Hours
Unit 4	NoSQL and Modern Database Technologies Introduction to NoSQL: Evolution of NoSQL, Need for NoSQL Databases, Characteristics of NoSQL, Advantages and Limitations of NoSQL, CAP Theorem, BASE Properties. Types of NoSQL Databases: Key-Value Stores, Document Databases, Column-Family Databases, Graph Databases MongoDB: MongoDB Architecture, BSON Documents, Collections, CRUD Operations, Query Operators, Sorting and Projection, Indexing, Aggregation Framework, Data Modelling, Replication, Sharding Migration: Migration from RDBMS to NoSQL,	12 Hour

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Distributed Database Systems,	M. Tamer Özsu, Patrick Valduriez	Springer.	4th Edition	2020
2	Designing Data-Intensive Applications,	Martin Kleppmann	O'Reilly	1st Edition	2017



3	An Introduction to Database Systems,	C. J. Date	Pearson.	8th Edition	2003
4	Seven Databases in Seven Weeks	Eric Redmond, Jim R. Wilson	Pragmatic Bookshelf.	2nd Edition	2018

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	McGraw-Hill Education	7th Edition	2019.
2	Database Systems: Design, Implementation and Management	Carlos Coronel, Steven Morris	Cengage Learning	13th Edition	2018
3	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence	Pramod J. Sadalage, Martin Fowler	Addison-Wesley	1st Edition	2012
4	Fundamentals of Database Systems	Ramez Elmasri, Shamkant B. Navathe	Pearson	7th Edition	2017

E- Learning Resources:

Sr. No.	Title	Course Instructor	Platform	Web Link
1	Database Management System	Prof. S. Sudarshan	NPTEL	https://nptel.ac.in/courses/106105175
2	Database Systems Concepts & Design	Dr. Edward F. Gehringer	Coursera	https://www.coursera.org
3	MongoDB Basics	MongoDB University	MongoDB University	https://learn.mongodb.com
4	MongoDB Documentation	MongoDB Inc.	MongoDB Docs	https://www.mongodb.com/docs


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Class	M.C.A. Sem. – I
Course Code and Course Title	0PMCPC103, Operating System
Prerequisite/s	
Teaching Scheme: Lecture/Tutorial/Practical	48/00/00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	30 / 10 /60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0PMCPC103_1	Explain operating system fundamentals, architecture, services, and system operations.	L3
0PMCPC103_2	Analyze process management, multithreading, IPC, and CPU scheduling algorithms.	L3, L4
0PMCPC103_3	Apply synchronization, deadlock handling, and memory management techniques to operating system problems.	L3, L4
0PMCPC103_4	Evaluate file systems and secondary storage management techniques for efficient storage and resource management.	L5

Course Contents:		
Unit 1	Unit I: Fundamentals of Operating Systems and System Architecture Introduction to Operating Systems, objectives and functions of operating systems, computer system organization, computer system architecture, computing environments, operating system operations, operating system structures, operating system services, user–operating system interface, system calls, types of system calls, system programs, operating system design and implementation, virtual machines, operating system generation, system boot, operating system debugging, distributed systems, special-purpose systems, protection and security.	12 Hours
Unit 2	Unit II: Process Management and CPU Scheduling Process/ concept, process states, process control block, process scheduling, operations on processes, inter-process communication, multithreaded programming, thread concepts, multithreading models, thread libraries, threading issues, CPU scheduling concepts, scheduling criteria, scheduling algorithms, thread scheduling, and multiprocessor scheduling.	12 Hours
Unit 3	Unit III: Process Synchronization, Deadlocks, and Memory Management Process synchronization, critical section problem, Peterson's solution, synchronization hardware, semaphores, classical synchronization problems, deadlock system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlocks, memory management strategies, swapping, contiguous memory allocation, paging, page table structure, segmentation, virtual memory, demand paging, copy-on-write, page replacement algorithms, allocation of frames, and	15 Hours



	thrashing.	
Unit 4	Unit IV: File Systems and Secondary Storage Management File concept, file attributes and operations, file access methods, directory structures, file protection, file system structure, file system implementation, and file allocation methods, overview of mass-storage structure, disk structure, and disk scheduling algorithms, disk management, swap space management, and RAID structure.	15 Hours

Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Operating Systems: A Concept-Based Approach	D. M. Dhamdhare	McGraw Hill Education	3rd Edition	2017
2	Operating Systems	Harvey M. Deitel, Paul J. Deitel, David R. Choffnes	Pearson	3rd Edition	2004
3	Operating Systems	Achyut S. Godbole	McGraw Hill Education	3rd Edition	2017

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Operating Systems: A Concept-Based Approach	Andrew S. Tanenbaum, Herbert Bos	McGraw Hill Education	3rd Edition	2017
2	Operating Systems	Harvey M. Deitel, Paul J. Deitel, David R. Choffnes	Pearson	3rd Edition	2004

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web Link
1	Operating Systems	Prof. P. Dasgupta	NPTEL	https://nptel.ac.in/courses/106105214
2	Operating Systems and System Programming	Prof. P. Dasgupta	NPTEL	https://onlinecourses.nptel.ac.in
3	Operating Systems	Georgia Institute of Technology	Coursera	https://www.coursera.org/learn/os-power-user

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Class	M.C.A. Sem. – I
Course Code and Course Title	0PMCPC104, Software Engineering & Project Management
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	48/00/00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	30 / 10 / 60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0PMCPC104_1	Explain software engineering concepts, Git/GitHub, and software development practices.	L2
0PMCPC104_2	Analyze software requirements, project planning, and software design techniques.	L4
0PMCPC104_3	Apply Agile methodologies, Jira, software testing, and collaborative development practices.	L3
0PMCPC104_4	Evaluate software quality, project risks, and industry software engineering practices.	L5

Course Contents:		
Unit 1	Unit I: Software Engineering Foundations, Git, GitHub and Professional Practices Introduction to Software Engineering, Software Crisis, Characteristics of Software, SDLC, Software Process Models (Waterfall, Incremental, Spiral, Prototype, V-Model), Agile Development, Software Quality Attributes, Software Engineering Best Practices, Team Roles and Responsibilities. Version Control Systems, Git Fundamentals, Git Commands (Clone, Commit, Push, Pull, Branch, Merge), GitHub Repository Management, Branching and Collaboration, Pull Requests, Code Reviews and Coding Standards, GitHub Workflow, Open Source Contribution. VS Code IDE, AI Tools (GitHub Copilot, ChatGPT, Claude), Responsible AI and Prompt Engineering, Technical Documentation, Project Proposal and Report Writing Case Study: GitHub-Based Collaborative Software Development.	12 Hours
Unit 2	Unit II: Requirement Engineering, Software Design and Project Planning Requirement Engineering Process, Functional and Non-Functional Requirements, Requirement Gathering Techniques, Feasibility Study, Software Requirement Specification (SRS), Introduction to UML. Software Project Management, Project Life Cycle, Project Planning and Scheduling, WBS, Gantt Charts, COCOMO Model, Risk Management, Resource Allocation, Team Management, Project Communication. Case Study: SRS Preparation, Software Design and Project Planning.	12 Hours
Unit 3	Unit III: Agile Methodology, Agile Testing and Industry Development Workflow Agile Manifesto and Principles, Agile Software Development Life Cycle (SDLC), Scrum Framework, Scrum Roles, Scrum Events, Scrum Artifacts, Kanban, Agile Project Management, Agile Testing, Difference between Traditional and Agile Testing, Agile Testing Principles, Agile Testing Quadrants, Test-Driven Development (TDD), Continuous Testing, Automated Testing, Jira Dashboard, Issue Tracking, Sprint	12 Hours

	Planning, Sprint and Backlog Management, Developer Task Lifecycle using Jira, Industry Agile Workflow, Task Assignment in Jira, Git Branch Creation, Development using VS Code, Coding Standards, API Testing using Postman, Case Study: Agile Project Management using Scrum and Jira.	
Unit 4	Unit IV: Software Quality and Project Risk Management: Software Quality Software and System Quality Management: Overview of ISO 9001, SEI Capability Maturity Model, Six Sigma, Formal Technical Reviews, Tools and Techniques for Quality Control, Pareto Analysis, and Software Metrics: Understanding software Metrics, definitions of Metrics, attributes of measures, metrics for different types of projects. Risk Management and Reliability Issues- Risk Management: Identify IT Project Risk, Risk Analysis and Assessment, Risk Strategies, Risk Monitoring and Control, Risk Response and Evaluation. Software Reliability: Reliability Metrics, Reliability Growth Modeling.	12 Hours

Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Software Engineering: A Practitioner's Approach	Roger S. Pressman & Bruce R. Maxim	McGraw-Hill	9th Edition	2019
2	Software Engineering	Ian Sommerville	Pearson Education	10th Edition	2015
3	Agile Project Management with Scrum	Ken Schwaber	Microsoft Press	1st Edition	2004

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Scrum: The Art of Doing Twice the Work in Half the Time	Jeff Sutherland	Crown Business	1st Edition	2014
2	Pro Git	Scott Chacon & Ben Straub	Apress	2nd Edition	2014
3	Software Testing Principles and Practices	Srinivasan Desikan & Gopalaswamy Ramesh	Pearson Education	1st Edition	2006
4	Continuous Delivery	Jez Humble & David Farley	Addison-Wesley	1st Edition	2010
5	Docker Deep Dive	Nigel Poulton	Independently Published	Latest Edition	—
6	Head First Software Development	Dan Pilone & Russ Miles	O'Reilly Media	1st Edition	2008
7	AWS Certified Cloud Practitioner Study Guide	Ben Piper & David Clinton	Sybex	2nd Edition	2020



E-Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web Link
1	Software Engineering	Prof. Rajib Mall	NPTEL	NPTEL – Software Engineering
2	Agile with Atlassian Jira	Atlassian Team	Coursera	Coursera – Agile with Jira
3	Introduction to Git and GitHub	Google	Coursera	Coursera – Git and GitHub
4	GitHub Foundations Learning Path	GitHub Team	GitHub Skills	GitHub Skills
5	Jira Fundamentals	Atlassian Team	Atlassian University	Atlassian University
6	AWS Cloud Practitioner Essentials	AWS Training Team	AWS Skill Builder	AWS Skill Builder

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Class	M.C.A. Sem. –I
Course Code and Course Title	0PMCOE105, Statistical and Mathematical Foundation
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	24/00/00
Credits	02
Evaluation Scheme: ISE / MSE / ESE	10/10/30

Course Outcomes (COs):		Bloom's Level
Upon successful completion of this course, the student will be able to:		
0PMCOE106_1	Apply measures of dispersion to analyze the variability and distribution of data.	L3
0PMCOE106_2	Analyze the relationship between variables using correlation techniques and interpret the results.	L4
0PMCOE106_3	Apply probability distributions and regression techniques for statistical modeling and prediction.	L3
0PMCOE106_4	Apply statistical classification techniques for analyzing and predicting data classes.	L3
0PMCOE106_5	Apply propositional and predicate logic to solve logical reasoning and inference problems.	L3
0PMCOE106_6	Apply graph theory concepts for graph representation, manipulation, and traversal.	L3

Course Contents:		
Unit 1	Measures of Dispersion Range, Sample Standard Deviation, Variance, Coefficient of Variation, Interquartile Range. Quartiles and Quantiles. Boxplots. Correlation Concept of Correlation between Two Variables, Types of Correlation, Scatter Diagram and its Utility, Pearson's Coefficient of Correlation, Spearman's Coefficient of Correlation.	06 Hours
Unit 2	Probability Distribution and Regression Probability Distribution: Binomial Distribution, Poisson Distribution, Normal Distribution, Skewness, Kurtosis. Regression: Simple Linear Regression Model, Fitting the Linear Regression Model, Introduction to Multiple Linear Regression, Multiple Regression Assumptions, Diagnostics and Efficacy Measures, Fitting the Multiple Regression Model.	06 hours
Unit 3	Classification Logistic Regression: Estimating the Regression Coefficients and Making Predictions, Logistic Regression with Several Variables, Case-Control Sampling and Logistic Regression, Logistic Regression with More than Two Classes. Linear Discriminant Analysis (LDA): Using Bayes' Theorem for Classification,	06 Hours



	Discriminant Functions, Fisher's Discriminant Plots, Naive Bayes Approach, Quadratic Discriminant Analysis, K-Nearest Neighbour Algorithm.	
Unit 4	Logic Propositional Calculus—Statements and Notation, Connectives: Negation, Conjunction, Disjunction, Conditional, Biconditional, Statement Formulae and Truth Tables, Well-Formed Formulae, Theory of Inference for Statement Calculus, Predicate Calculus, Rules of Inference, Inference Theory for Predicate Calculus. Graph Theory Basic Concepts of Graphs, Storage Representation and Manipulation of Graphs, Traversing of Graphs.	06 Hours

Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Fundamentals of Statistics	S. C. Gupta	Himalaya Publishing House	8th Revised	2026
2	Business Analytics: The Science of Data-Driven Decision Making	U. Dinesh Kumar	Wiley India Pvt. Ltd.	2nd	2021
3	Discrete Mathematics and Its Applications	Kenneth H. Rosen	McGraw-Hill Education	8th	2019
4	Discrete Mathematical Structures	Bernard Kolman, Robert C. Busby, Sharon Cutler Ross	Pearson Education	6th	2008

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Multivariate Data Analysis	Joseph F. Hair Jr., Barry J. Babin, William C. Black, Rolph E. Anderson	Pearson	8th	2019
2	Discrete Mathematical Structures with Applications to Computer Science	J. P. Tremblay, P. Manohar	Tata McGraw-Hill	1st	1975
3	Elements of Discrete Mathematics: A Computer Oriented Approach	C. L. Liu, D. P. Mohapatra	Tata McGraw-Hill	3rd	2008
4	Discrete Mathematics for Computer Scientists and Mathematicians	J. L. Mott, Abraham Kandel, Theodore P. Baker	Pearson Education	2nd	2006



E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web Link
1.	Business Statistics	By Dr. P. M. Shiva Prasad	SWAYAM & NPTEL	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec26_mg23
2.	Foundations of Mathematical Statistics	By Dr. Aneesh Kumar.K	SWAYAM & NPTEL	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec26_ma09
3.	Applied Business Statistics	By Dr. Ananth Krishnamurthy	SWAYAM & NPTEL	https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg196
4.	Statistics for Business, Engineering and Social Sciences: I	By Shubhabrata Das	SWAYAM & NPTEL	https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg195

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Class	MCA , Sem.-I
Lab Code and Lab Title	0PMCPC106, Python Programming Lab
Prerequisite/s	
Teaching Scheme: Lecture/Tutorial/Practical	0/0/4
Credits	02
Evaluation Scheme: ISE / ESE	20/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0PMCPC101_1	Apply Python programming fundamentals, data types, control structures, and object-oriented programming concepts to develop Python programs.	L3
0PMCPC101_2	Develop modular Python programs using functions, modules, exception handling, and file handling.	L3, L6
0PMCPC101_3	Develop Python applications using multithreading, database connectivity, and Tkinter GUI programming.	L3, L6
0PMCPC101_4	Develop web applications using the Django framework with MVT architecture, forms, models, and CRUD operations	L3, L6

List of Experiments:

Expt. No.	Title of Experiment
1	Study and implementation of Python installation, IDE, and
2	Write a Python program to demonstrate variables, standard data types, input/output, type conversion, and operators (arithmetic, relational, logical, assignment, membership, and identity).
2	Write a Python program to demonstrate decision-making statements and looping constructs by finding the largest of three numbers, generating the Fibonacci series, and calculating the factorial of a given number.
3	Write a Python program to check whether a given number is Prime, Armstrong, or Palindrome.
4	Write a Python program to perform operations on standard data types including List, Tuple, Set, and Dictionary (creation, insertion, deletion, searching, updating, and traversal).



5	Write a Python program to perform string operations.
6	Write a Python program to demonstrate user-defined functions, default arguments, keyword arguments, variable-length arguments, lambda functions, and recursion.
7	Write a Python program to create a user-defined module, import it into another program, and demonstrate the use of built-in modules and packages.
8	Write a Python program to demonstrate exception handling using try-except, multiple exceptions, else, finally, and user-defined exceptions.
9	Write a Python program to perform file handling operations including create, read, write, append, file positioning using seek(), and directory management operations.
10	Write a Python program to demonstrate Object-Oriented Programming concepts including classes, objects, constructors, inheritance, method overriding, operator overloading, and encapsulation.
11	Write Python programs using NumPy and Pandas to perform array operations, create DataFrames, read/write CSV files, and basic data analysis.
12	Write Python programs using Matplotlib to visualize data using line, bar, pie, histogram, and scatter plots.
13	Write Python programs using OpenCV
14	Develop a GUI-based application using Tkinter with SQLite database connectivity to perform CRUD (Create, Read, Update, Delete) operations.
15	Install the Django framework and develop a Django application to display " Hello, Django! ", your Name, Roll Number, and Course using URL routing and views.

Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Python Programming: Using Problem Solving Approach	Reema Thareja	Oxford University Press	2nd	2019
2	Core Python Programming	Dr. R. Nageswara Rao	Dreamtech Press	2nd	2019
3	Learning Python	Mark Lutz	O'Reilly Media	5th	2013
4	Django for Beginners	William S. Vincent	WelcomeToCode	5th	2024



Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Python Crash Course	Eric Matthes	No Starch Press	Second	2019
2	Learning Python	Mark Lutz	O'Reilly Media	Fifth	2013
3	Python Programming: An Introduction to Computer Science	John Zelle	Franklin, Beedle & Associates	Third	2017
4	Django 5 By Example	Antonio Melé	Packt Publishing	5th	2024

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web Link
1	The Joy of Computing using Python	Prof. Sudarshan Iyengar	NPTEL/SWAYAM	https://onlinecourses.nptel.ac.in
2	Programming, Data Structures and Algorithms Using Python	Prof. Madhavan Mukund	NPTEL/SWAYAM	https://onlinecourses.nptel.ac.in
3	Python for Everybody	Dr. Charles Severance	Coursera	https://www.coursera.org
4	Web Application Technologies and Django	Charles Russell Severance	Coursera	https://www.coursera.org/specializations/django?utm_source=chatgpt.com


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Class	MCA, Sem.-I
Course Code and Course Title	0PMCPC107 Advanced DBMS Lab
Prerequisite/s	
Teaching Scheme: Lecture/Tutorial/Practical	0/0/4
Credits	02
Evaluation Scheme: ISE / ESE	20/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0PMCPC102_1	Explain the concepts of DBMS, RDBMS, data models, normalization, transaction management, and apply SQL statements to design, retrieve, and manipulate relational databases.	L1, L2, L3
0PMCPC102_2	Develop PL/SQL programs using variables, control structures, cursors, exception handling, procedures, functions, packages, and triggers to solve database programming problems.	L2, L3, L4
0PMCPC102_3	Analyze database architectures; distributed and parallel databases, security mechanisms, backup and recovery techniques, performance optimization, and database administration to recommend suitable database solutions.	L2, L4, L5
0PMCPC102_4	Evaluate NoSQL database models and implement MongoDB operations, including CRUD, indexing, aggregation, replication, sharding, and migration strategies from relational databases.	L3, L4, L5

List of Experiments:

Expt. No.	Title of Experiment
1.	SQL Data Types and Table Creation 1. Create a Student table with appropriate data types and constraints. 2. Perform DDL operations: ALTER, RENAME, TRUNCATE, and DROP on the Student table. 3. Explain the differences between DDL, DML, DQL, DCL, and TCL commands with suitable examples.
2.	Constraints and TCL 1. Apply PRIMARY KEY, FOREIGN KEY, UNIQUE, CHECK, DEFAULT, and NOT NULL constraints while creating tables. 2. Demonstrate COMMIT, ROLLBACK, and SAVEPOINT using suitable examples. 3. Create Department and Employee tables with appropriate constraints, insert valid and invalid records, and observe the behaviour of integrity constraints.
3.	SQL Operators and Functions 1. Write SQL queries using arithmetic, comparison, logical, and special operators. 2. Demonstrate String, Numeric, Date-Time, and Aggregate functions. 3. Write SQL queries using IN, BETWEEN, LIKE, ANY, ALL, and EXISTS operators.



4.	Joins, Set Operations and Subqueries 1. Perform INNER, LEFT OUTER, RIGHT OUTER, SELF, and CROSS joins on Employee and Department tables. 2. Demonstrate UNION, UNION ALL, INTERSECT and MINUS operations. 3. Write nested and correlated subqueries to retrieve meaningful information.
5	Views, Indexes, Sequences and Embedded SQL 1. Create and modify SQL Views. 2. Create indexes and sequences; demonstrate their usage. 3. Develop a simple Embedded SQL program to retrieve data from a database.
6	PL/SQL Basics 1. Write a PL/SQL program to display "Welcome to PL/SQL". 2. Develop PL/SQL programs using variables, constants, operators, and expressions. 3. Write a PL/SQL block to calculate the total and average marks of a student.
7	PL/SQL Control Structures 1. Write a PL/SQL program to demonstrate branching statements(If, If-Else, Nesting, Ladder) 2. Develop a PL/SQL program using a CASE statement to display grade based on marks. 3. Write PL/SQL programs using LOOP, WHILE LOOP, and FOR LOOP.
8	PL/SQL Cursors and Exception Handling 1. Demonstrate the use of Implicit and Explicit Cursors. 2. Write a PL/SQL program using a Parameterized Cursor. 3. Implement exception handling using predefined and user-defined exceptions.
9	Stored Program Units 1. Create a Stored Procedure to insert employee details. 2. Create a Function to calculate annual salary. 3. Create Row-Level and Statement-Level Triggers for employee data validation.
10	MongoDB Basics and CRUD Operations 1. Create a MongoDB database CollegeDB and collections Students and Courses . 2. Perform CRUD operations using insertOne(), find(), updateOne(), and deleteOne(). 3. Explain the structure of BSON documents and collections with suitable examples.
11	MongoDB Queries and Aggregation 1. Demonstrate MongoDB query operators (\$gt, \$lt, \$eq, \$in, \$and, \$or). 2. Retrieve documents using Sorting and Projection. 3. Perform aggregation using \$match, \$group, \$sort, and \$project.
12	Indexing, Replication, Sharding and Migration 1. Create indexes in MongoDB and explain their impact on query performance. 2. Explain Replication and Sharding with suitable diagrams and examples. 3. Convert a relational database schema (e.g., Student–Course–Enrollment) into a MongoDB document model and discuss the migration process from RDBMS to NoSQL.

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	McGraw-Hill Education	7th Edition,	2019.



2	Database Systems: Design, Implementation and Management	Carlos Coronel, Steven Morris	Cengage Learning	13th Edition	2018
3	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence	Pramod J. Sadalage, Martin Fowler	Addison - Wesley	1st Edition	2012
4	Fundamentals of Database Systems	Ramez Elmasri, Shamkant B. Navathe	Pearson	7th Edition,	2017

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Distributed Database Systems,	M. Tamer Özsu, Patrick Valduriez	Springer,	Second	2019
2	Designing Data-Intensive Applications,	Martin Kleppmann	O'Reilly.	Third	2017
3	An Introduction to Database Systems,	C. J. Date	Pearson.	Second	2019
4	Seven Databases in Seven Weeks,	Eric Redmond, Jim R. Wilson	Pragmatic Bookshelf.	Second	2015

E- Learning Resources:

Sr. No.	Title	Course Instructor	Platform	Web Link
1	Database Management System	Prof. S. Sudarshan	NPTEL	https://nptel.ac.in/courses/106105175
2	MongoDB Basics	MongoDB University	MongoDB University	https://learn.mongodb.com
3	MongoDB Documentation	MongoDB Inc.	MongoDB Docs	https://www.mongodb.com/docs
4	SQL and Database Tutorials	W3Schools Team	W3Schools	https://www.w3schools.com/sql

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MCA-I

SEMESTER-II

Class	M.C.A. Sem. – II
Course Code and Course Title	0PMCPCT201, Data Structure Using Python
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	48/00/00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	30 / 10 / 60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0PMCPCT201_1	Apply data structure concepts, algorithm analysis, searching, and sorting techniques to solve computational problems using Python.	L3
0PMCPCT201_2	Implement linear data structures such as stacks, queues, and linked lists using Python	L3
0PMCPCT201_3	Implement non-linear data structures including trees, hashing, and graphs to organize and process data efficiently	L3
0PMCPCT201_4	Apply file organization techniques and develop Python applications using appropriate data structures and algorithms for real-world problems.	L3, L6

Course Contents:		
Unit 1	Introduction to Data Structures and Algorithm Analysis Introduction to Data Structures: Data Management Concepts, Data Types – Primitive and Non-Primitive, Types of Data Structures – Linear and Non-Linear, Abstract Data Types (ADT). Algorithm Analysis: Characteristics of Algorithms, Time and Space Complexity, Asymptotic Notations (Big-O, Omega and Theta), Recursive Algorithms. Searching and Sorting: Linear Search, Binary Search, Bubble Sort, Selection Sort and Insertion Sort.	12 Hours
Unit 2	Stack and Queue Stack: Definitions and Concepts, Stack Operations (Push, Pop, Peek), Implementation of Stack using Python Lists, Applications of Stack – Parenthesis Matching, Infix to Postfix Conversion, Prefix and Postfix Expression Evaluation. Queue: Definitions and Concepts, Queue Operations, Implementation using Python Lists and collections.deque, Circular Queue, Priority Queue, Double Ended Queue (Deque), Applications of Queue.	12 Hours
Unit 3	Linked Lists and Trees Linked Lists: Singly Linked List, Doubly Linked List, Circular Linked List, Operations (Insertion, Deletion, Traversal and Searching), and Applications of Linked Lists. Trees: Definitions and Concepts, Binary Tree, Representation of Binary Tree, Binary Tree Traversals (Preorder, Inorder, Postorder), Binary Search Tree (BST), AVL Tree, Applications of Trees.	12 Hours



Unit 4	Hashing, Graphs and File Structures Hashing: Hash Table Concepts, Hash Functions, Collision Resolution Techniques (Linear Probing, Quadratic Probing and Chaining), and Applications of Hashing using Python Dictionaries. Graphs: Graph Representation using Adjacency Matrix and Adjacency List, Breadth First Search (BFS), Depth First Search (DFS), Dijkstra's Shortest Path Algorithm. File Structures: Concepts of Fields, Records and Files, Sequential, Indexed and Random File Organization, Indexing Concepts, Hashing for File Organization, Multi-key File Organization.	12 Hours
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Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Data Structures and Algorithms in Python	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser	Wiley	First	2013
2	Problem Solving with Algorithms and Data Structures Using Python	Bradley N. Miller, David L. Ranum	Franklin, Beedle & Associates	Third	2011
3	Python Data Structures and Algorithms	Benjamin Baka	Packt Publishing	First	2017
4	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	MIT Press	Fourth	2022

E- Learning Resources

Sr. No	Title	Course Instructor	Platform	Web Link
1	Programming, Data Structures and Algorithms Using Python	Prof. Madhavan Mukund	NPTEL/SWAYAM	https://onlinecourses.nptel.ac.in
2	Data Structures and Algorithms Using Python	Prof. Naveen Garg	NPTEL/SWAYAM	https://onlinecourses.nptel.ac.in
3	Python Data Structures	Dr. Charles R. Severance	Coursera (University of Michigan)	https://www.coursera.org/learn/python-data
4	Data Structures and Algorithms in Python	freeCodeCamp	YouTube	https://www.youtube.com/@freecodecamp

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Class	M.C.A. Sem. – II
Course Code and Course Title	0PMCP202, Data Communication and Networking
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	48/00/00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	30 / 10 /60

Course Outcomes (COs):		Bloom's Level
Upon successful completion of this course, the student will be able to:		
0PMCP103_1	Describe the fundamental concepts of data communication, network architectures, and transmission media, multiplexing, and switching techniques used in computer networks.	L2
0PMCP103_2	Analyze the layered architecture of computer networks, reference models, and application layer protocols to understand communication services and protocol functionality.	L4
0PMCP103_3	Apply transport, network, and data link layer protocols, routing mechanisms, addressing schemes, and error control techniques for reliable data communication.	L3
0PMCP103_4	Evaluate network security threats, vulnerabilities, authentication techniques, and cryptographic mechanisms to recommend secure communication practices.	L5

Course Contents:		
	Fundamentals of Data Communication and Computer Networks Evolution of Computer Networks, Need and Importance of Networking, Components of Data Communication (Sender, Receiver, Message, Transmission Medium, Protocol), Network Topologies, Network Architectures, Client-Server Architecture, Peer-to-Peer Architecture, Categories of Networks (LAN, MAN, WAN), Wireless Networks, Mobile Ad Hoc Networks (MANETs).	
Unit 1	Transmission Media and Communication Techniques: Guided Transmission Media (Twisted Pair Cable, Coaxial Cable, Fiber Optic Cable), Unguided Transmission Media (Radio Waves, Microwaves, Infrared Communication, Satellite Communication), Multiplexing Techniques (Frequency Division Multiplexing, Time Division Multiplexing), Switching Techniques (Circuit Switching and Packet Switching).	12 Hours



Unit 2	Network Reference Models and Communication Protocols Network Reference Models: OSI Reference Model, TCP/IP Reference Model, Layer-wise Architecture and Functions, Comparison of OSI and TCP/IP Models. Application, Presentation and Session Layers: Application Layer Services, Domain Name System (DNS), Hypertext Transfer Protocol (HTTP), Simple Mail Transfer Protocol (SMTP), File Transfer Protocol (FTP), Remote Login Services, Web Services, Network Management Services, Presentation Layer Functions (Data Encoding, Encryption and Compression), Session Layer Functions (Session Management, Token Management and Synchronization).	12 Hours
Unit 3	Transport, Network and Data Link Layer Protocols Transport Layer: Functions of the Transport Layer, TCP Protocol, UDP Protocol, Connection-Oriented and Connectionless Services. Network Layer: Functions of the Network Layer, Internet Protocol (IP), IPv4 Addressing Concepts, Routing Fundamentals, Shortest Path Routing, Flooding, Distance Vector Routing. Data Link Layer: Services of the Data Link Layer, Framing, Flow Control, Error Detection and Error Correction Techniques, Data Link Layer Protocols, Stop-and-Wait Protocol, Sliding Window Protocol, Performance Considerations in Data Communication.	12 Hours
Unit 4	Network Security and Vulnerability Management Introduction to Network Security: Security Goals, Security Challenges, Network Threats and Vulnerabilities. Network Attacks: Malware, Viruses, Worms, Trojan Horse, Ransomware, Sniffing, Spoofing, Denial of Service (DoS), Distributed Denial of Service (DDoS), Botnets and Keyloggers. Vulnerability Management: Vulnerability Assessment, Identification of Network Vulnerabilities, Common Security Weaknesses, Security Controls. Secure Communication: Authentication Mechanisms, Access Control Techniques, Introduction to Cryptography, Secure Communication Practices and Network Security Best Practices.	12 Hours

Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Data Communications and Networking	Behrouz A. Forouzan	McGraw Hill Education	5th Edition	2013
2	Computer Networks	Andrew S. Tanenbaum and	Pearson Education	5th Edition	2011



		David J. Wetherall			
3	Computer Networks	Larry L. Peterson and Bruce S. Davie	Morgan Kaufmann (Elsevier)	5th Edition	2011
4	Data and Computer Communications	William Stallings	Pearson Education	11th Edition	2020

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Computer Networking: A Top-Down Approach	James F. Kurose and Keith W. Ross	Pearson Education	8th Edition	2021
2	Network Security Essentials: Applications and Standards	William Stallings	Pearson Education	7th Edition	2017
3	TCP/IP Illustrated, Volume 1: The Protocols	W. Richard Stevens and Kevin R. Fall	Addison-Wesley Professional	2nd Edition	2011
4	Cryptography and Network Security: Principles and Practice	William Stallings	Pearson Education	8th Edition	2022

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web Link
1	Computer Networks and Internet Protocol	Prof. Sujay Ghosh	NPTEL	https://nptel.ac.in/courses/106105183
2	Computer Networks	Prof. D. Manjunath	NPTEL	https://nptel.ac.in/courses/106106091
3	Computer Networks	Prof. Indranil Sengupta	NPTEL	https://nptel.ac.in/courses/106105081
4	Computer Networking	Cisco Networking Academy	Cisco Skills for All	https://www.netacad.com/course/s/networking


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Class	M.C.A. Sem. – II
Course Code and Course Title	0PMCPC303, Software Testing
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	24/00/00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	10 / 10 / 30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0PMCPC302_1	Understand the fundamentals, principles, strategies, and techniques of software testing.	L2
0PMCPC302_2	Apply software testing methods to design test cases and test plans for desktop, web, and mobile applications.	L3
0PMCPC302_3	Analyze different levels of testing and evaluate software quality using appropriate testing techniques.	L4
0PMCPC302_4	Explain web application testing and Agile testing concepts, including Agile principles, testing quadrants, and automated testing.	L2

Course Contents:		
Unit 1	Basics of Software Testing; Faults, Errors and Failures; Testing Objectives; Principles of Testing; Testing and Debugging; Testing Metrics and Measurements; Verification and Validation; Software Testing Life Cycle (STLC)	6 Hours
Unit 2	Testability and characteristics of testable software; Test Characteristics; Test Case Design for Desktop, Mobile and Web Applications using Excel; White Box Testing – Basis Path Testing and Control Structure Testing; Black Box Testing – Boundary Value Analysis (BVA) and Equivalence Partitioning (EP); Differences between White Box and Black Box Testing	6 Hours
Unit 3	Strategic Approach to Software Testing; Test Strategies for Conventional Software; Unit Testing; Integration Testing – Top-Down and Bottom-Up; System Testing; Acceptance Testing; Performance Testing; Regression Testing; Load/Stress Testing; Security Testing; Internationalization Testing; Alpha and Beta Testing; Usability and Accessibility Testing; Configuration Testing; Compatibility Testing	6 Hours
Unit 4	Dimensions of Quality; Errors within Web Application Environment; Web Application Testing Strategy; Test Planning; Testing Process; Agile Testing; Traditional vs. Agile Testing; Agile Principles and Values; Agile Testing Quadrants; Automated Testing in Agile	6 Hours



Reference Books

Sr. No.	Title of the Book	Author(s)	Publisher
1	Software Engineering – A Practitioner's Approach (7th Edition)	Roger S. Pressman	Tata McGraw Hill
2	Effective Methods of Software Testing (3rd Edition)	William E. Perry	Wiley Publishing Inc.
3	Managing the Testing Process: Practical Tools and Techniques for Managing Hardware and Software Testing	Rex Black	Microsoft Press
4	Agile Testing: A Practical Guide for Testers and Agile Teams (1st Edition)	Lisa Crispin, Janet Gregory	Addison-Wesley Professional
5	Software Testing: Principles and Practices	Srinivasan Desikan, Gopalaswamy Ramesh	Pearson

E Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web Link
1	Software Testing Tutorial	Neso Academy	YouTube	https://www.youtube.com/@nesoacademy
2	Software Testing Full Course	Naresh i Technologies	YouTube	https://www.youtube.com/@nareshit
3	Software Testing Basics	SDET-QA	YouTube	https://www.youtube.com/@sdetqa
4	Agile Software Development	University of Virginia	Coursera	https://www.coursera.org
5	Software Testing Fundamentals	Udemy Instructors	Udemy	https://www.udemy.com
6	Selenium & Automation Testing	Selenium Team	Selenium Documentation	https://www.selenium.dev/documentation
7	Software Testing Tutorials	Guru99	Guru99	https://www.guru99.com/software-testing.html
8	Software Testing Course	Great Learning Academy	Great Learning	https://www.mygreatlearning.com/academy


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Class	M.C.A. Sem. – II
Course Code and Course Title	OPMCPE204.1, PE-I Artificial Intelligence and Machine Learning Fundamentals
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	48/00/00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	30 / 10 /60

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
OPMCPE204.1_1	Explain the fundamental concepts of Artificial Intelligence, intelligent agents, knowledge representation, logical reasoning techniques, and AI ethics.	L2
OPMCPE204.1_2	Apply AI problem-solving techniques and explain the fundamentals of machine learning, search algorithms, learning paradigms, and the machine learning workflow using appropriate AI development tools.	L3
OPMCPE204.1_3	Analyze supervised machine learning algorithms for regression and classification, and evaluate model performance using appropriate evaluation metrics.	L4
OPMCPE204.1_4	Analyze unsupervised learning techniques, dimensionality reduction methods, recommendation systems, and the basic concepts of TensorFlow and Keras for AI applications.	L4

Course Contents:		
Unit I	Foundations of Artificial Intelligence Introduction to Artificial Intelligence: Definition, History, Evolution, and Applications, Types of AI (based on functionality and based on capability) Overview of AI, ML, DL, and Data Science Relationship among AI, ML, DL, and Data Science, Key differences and similarities. Intelligent Agents and Agent Environments: Concept of intelligent agents, Agent architecture, Agent function and agent program, Performance measure, Environment characteristics, Types of intelligent agents, Applications of intelligent agents, Knowledge Representation, Propositional Logic and First-Order Logic, Forward and Backward Chaining, AI Ethics	12 Hours
Unit II	AI Problem Solving and Machine Learning Fundamentals Problem Solving using Search Techniques: Introduction to AI problem solving, Problem formulation, State space representation, Initial state, goal state, operators, and Search tree and search graph, Performance measures of search algorithms (Completeness, Optimality, Time complexity, Space complexity). Real-world applications of search techniques Uninformed Search (BFS, DFS), Heuristic Search (Best First Search, Hill Climbing, A*), Introduction to Machine Learning: Definition and characteristics ,AI vs Machine Learning , Need for Machine Learning ,	12 Hours



	Applications of Machine Learning, Types of Machine Learning: Supervised Learning, Unsupervised Learning, Semi-supervised Learning, Reinforcement Learning, Real-life examples of each learning type, Machine Learning Workflow, Data Collection and Data Preprocessing, Model Evaluation Concepts, AI Development Tools (Jupyter, NumPy, Pandas, Scikit-learn)	
Unit III	Supervised Machine Learning Introduction to Supervised Learning: Regression: Linear Regression, Multiple Linear Regression Classification: Logistic Regression, Decision Trees, Naïve Bayes, K-Nearest Neighbour (KNN), Support Vector Machine (SVM) Model Evaluation: Confusion Matrix, Accuracy, Precision, Recall, F1-Score, Cross Validation, Overfitting and Underfitting	12 Hours
Unit IV	Unsupervised Learning Introduction to Unsupervised Learning: Definition, characteristics, applications Clustering: K-Means, Hierarchical Clustering, DBSCAN Dimensionality Reduction (PCA): Need, Working principle, principle components, advantages, applications Recommendation Systems: Introduction, importance, types, applications, challenges. Introduction to TensorFlow and Keras (Concept only)	12 Hours

Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Pearson	4th	2021
2	Machine Learning with Python	Andreas C. Müller, Sarah Guido	O'Reilly Media	1st	2016
3	Introduction to Artificial Intelligence and Machine Learning	Chandra S.S.V.	Wiley India	2nd	2020
4	Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow	Aurélien Géron	O'Reilly Media	3rd	2023



Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivashankar B. Nair	McGraw-Hill Education	3rd	2009
2	Introduction to Machine Learning with Python	Andreas C. Müller, Sarah Guido	O'Reilly Media	1st	2016
3	Neural Networks and Learning Machines	Simon Haykin	Pearson	3rd	2009
4	Data Mining: Practical Machine Learning Tools and Techniques	Ian H. Witten, Eibe Frank, Mark A. Hall, Christopher J. Pal	Morgan Kaufmann	4th	2016

E- Learning Resources

Sr No	Title	Course Instructor	Platform	Web Link
1	Machine Learning Specialization	Andrew Ng	Coursera	https://www.coursera.org/specializations/machine-learning-introduction
2	AI For Everyone	Andrew Ng	Coursera	https://www.coursera.org/learn/ai-for-everyone
3	Machine Learning Crash Course	Google AI	Google Developers	https://developers.google.com/machine-learning/crash-course
4	Introduction to Machine Learning	Sebastian Thrun, Katie Malone	Udacity	https://www.udacity.com/course/intro-to-machine-learning--ud120


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Class	M.C.A. Sem. II
Course Code and Course Title	0PMCPE205.2, PE-I :Data Engineering Foundations & Analytics
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	48 / 00 / 00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	30 /10 /60

Course Outcomes (COs):		Bloom's Level
Upon successful completion of this course, the student will be able to:		
0PMCPE205.2_1	Explain the Data Science lifecycle, methodologies, and applications in various domains	L2
0PMCPE205.2_2	Acquire, preprocess, clean, transform, and integrate data from multiple sources using SQL, Python libraries, APIs, and web scraping techniques for analytical applications.	L3
0PMCPE205.2_3	Perform Exploratory Data Analysis (EDA), statistical analysis, and data visualization using Python and Business Intelligence tools to derive meaningful insights and support decision-making.	L4
0PMCPE205.2_4	Apply fundamental Machine Learning concepts, workflows, feature engineering, and model evaluation techniques to develop and assess predictive models for real-world datasets	L3

Course Contents:		
	Foundations of Data Science	
Unit 1	Introduction to Data Science and Importance , Evolution of Data Science, Data Science vs Traditional Data Analysis, Data Science vs Artificial Intelligence, Machine Learning and Big Data, Components of Data Science , Data Science Ecosystem, Roles and Responsibilities of Data Scientists, Data Science Lifecycle, Business Problem Identification and Problem Formulation, Data Science Process Models (CRISP-DM and OSEMN), Data Collection, Data Preparation, Data Exploration, Data Modeling, Model Evaluation and Deployment Overview, Applications of Data Science (Healthcare, Finance and Banking, Retail and E-Commerce, Manufacturing, Agriculture, Social Media, Education, Smart Cities and IoT), Challenges in Data Science , Data Ethics, Responsible AI, Data Privacy and Security, Future Trends in Data Science, Case Study	12 Hours



Unit 2	Data Acquisition and Preprocessing Introduction to Data Acquisition, Types of Data Sources (Structured, Semi-Structured and Unstructured), Internal and External Data Sources, Data Acquisition Techniques, Data Collection through Databases, APIs and Web Services, Web Scraping using BeautifulSoup and Scrapy, Browser Automation using Selenium, Data Collection from Cloud Storage Sources, Data Quality Issues, Data Cleaning Techniques, Handling Missing Values, Outlier Detection and Treatment, Noise Reduction Techniques, Data Integration and Data Consolidation, Data Transformation Techniques, Feature Scaling , SQL for Data Science , Introduction to Python Libraries for Data Science (NumPy, Pandas, Requests, BeautifulSoup, Scrapy, Selenium, OpenPyXL and SQLite3), Case Study.	12 Hours
Unit 3	Exploratory Data Analysis and Statistical Visualization Introduction to Exploratory Data Analysis (EDA) – Objectives, Importance, EDA Workflow, Types of Data Analysis. Data Profiling and Data Quality Assessment – Data Characteristics, Data Types, Summary Statistics, Missing Values, Duplicate Records and Outlier Analysis. Descriptive Statistics, Correlation, Covariance and Correlation Matrix. Data Visualization Principles, Data Visualization using Matplotlib – Line Chart, Bar Chart, Histogram, Pie Chart, Scatter Plot and Box Plot. Advanced Visualization using Seaborn – Distribution Plot, Pair Plot, Violin Plot, Heatmap and Correlation Heatmap. Business Intelligence and Dashboard Development – Introduction to Power BI, Tableau, Interactive Dashboards, Dashboard Design Principles and KPI Visualization. Business Reporting and Data Storytelling – Report Generation, Visualization Interpretation, Executive Dashboards, Decision Support using Visual Analytics. Case Study – Exploratory Data Analysis and Visualization of a Real-World Dataset using Python and Power BI/Tableau.	12 Hours
Unit 4	Machine Learning Foundations Introduction to Machine Learning , Evolution and Importance of Machine Learning, Types of Machine Learning (Supervised, Unsupervised, Semi-Supervised and Reinforcement Learning), Machine Learning Applications, Regression Concepts and Applications, Classification Concepts and Applications, Clustering Concepts, Association Rule Mining Basics, Machine Learning Workflow, Data Preparation for Machine Learning, Feature Engineering Basics, Feature Selection Techniques, Data Splitting (Training, Validation and Testing), Model Training and Testing, Model Evaluation Techniques, Performance Metrics for Classification (Accuracy, Precision, Recall, F1-Score and ROC-AUC), Performance Metrics for Regression (MAE, MSE, RMSE and R ² Score), Bias-Variance Tradeoff, Overfitting and Underfitting, End-to-End Machine Learning Pipeline, Introduction to Model Deployment, Case Study.	12 Hours

Text Books



Sr. No.	Title	Author(s)	Publisher	Latest Edition
1	Data Science from Scratch: First Principles with Python	Joel Grus	O'Reilly Media	2nd Edition
2	Python for Data Analysis	Wes McKinney	O'Reilly Media	3rd Edition
3	Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow	Aurélien Géron	O'Reilly Media	3rd Edition
4	Practical Statistics for Data Scientists	Peter Bruce, Andrew Bruce, Peter Gedeck	O'Reilly Media	2nd Edition

Reference Books

Sr. No.	Title	Author(s)	Publisher	Latest Edition
1	Introduction to Data Mining	Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar	Pearson	2nd Edition
2	Data Mining: Concepts and Techniques	Jiawei Han, Micheline Kamber, Jian Pei	Morgan Kaufmann (Elsevier)	3rd Edition
3	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer	Latest Edition
4	An Introduction to Statistical Learning with Applications in Python	Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Jonathan Taylor	Springer	2nd Edition

E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web Link
1	Data Science for Engineers	Prof. Ragnathan Rengaswamy	NPTEL/SW AYAM	https://onlinecourses.nptel.ac.in
2	Machine Learning Specialization	Andrew Ng	Coursera	https://www.coursera.org/specializations/machine-learning-introduction
3	Python for Data Science, AI & Development	IBM	Coursera	https://www.coursera.org/learn/python-for-applied-data-science-ai
4	Kaggle Learn: Python, Pandas & Machine Learning	Kaggle Team	Kaggle Learn	https://www.kaggle.com/learn

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Class	M.C.A. Sem. –II
Course Code and Course Title	0PMCPE204.3: PE-I- Frontend Development using React
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	48/00/00
Credits	04
Evaluation Scheme: ISE / MSE / ESE	30 /10 /60

Course Outcomes (COs):		Bloom's Level
Upon successful completion of this course, the student will be able to:		
0PMCPE204.3_1	Create and understand structured web pages using HTML5 elements, semantic tags, multimedia, tables, and forms.	L2,L3, L6
0PMCPE204.3_2	Develop responsive user interfaces using CSS3 styling techniques, Flexbox, Grid, and Media Queries.	L3, L6
0PMCPE204.3_3	Develop interactive web pages using JavaScript programming constructs, DOM manipulation, event handling, and ES6 features.	L3,L6
0PMCPE204.3_4	Develop responsive front-end web applications using React components, state management, API integration, and React Bootstrap.	L6

Course Contents:		
Unit 1	Web Technologies and HTML5 Fundamentals Introduction to Web Technologies – Internet, World Wide Web (WWW), Website and Webpage, Static and Dynamic Websites, Web Browsers, Web Servers, Client-Server Architecture, URL and Domain Name Concepts. Introduction to HTML5 – Features of HTML5, Structure of HTML Document, Basic HTML Elements, And Text Formatting Elements. HTML5 Page Development – Lists, Hyperlinks, Images, Multimedia Elements (Audio and Video), Tables. Semantic HTML5 Elements – Header, Footer, Section, Article, Aside, Navigation (Nav), Main. HTML Forms – Form Element, Labels, Text Fields, Password Fields, Radio Buttons, Check Boxes, Text Area, Select and Option, Submit and Reset Buttons, HTML5 Input Types, Placeholder, Required Attribute, Basic Validation Attributes.	12 Hours
Unit 2	CSS3 and Responsive User Interface Design Introduction to CSS – Types of CSS (Inline, Internal, External), CSS Syntax, CSS Comments. CSS Selectors – Element Selector, Class Selector, ID Selector, Universal Selector, Group Selector, Attribute Selector. Colors and Backgrounds – Color Values, Background Color, Background Image, Background Repeat, Background Position, Background Size.	12 Hours



	Text and Font Styling – Font Family, Font Size, Font Style, Font Weight, Text Alignment, Text Decoration, Text Transformation. CSS Box Model – Content, Padding, Border, Margin. Layout and Positioning – Display Property, Position Property, Float, Overflow, Visibility. CSS3 Styling and Effects – Transform, Transition, Basic Animation using @keyframes. Responsive Web Design – Viewport Concept, Mobile-First Approach, Media Queries, Breakpoints. Flexbox Layout – Flex Container, Flex Items, Flex Direction, Flex Wrap, Justify Content, Align Items. CSS Grid Layout – Grid Container, Grid Items, Grid Rows and Columns, Grid Gap, Grid Areas. Responsive Elements – Responsive Images, Responsive Navigation Menus, Responsive Forms.	
Unit 3	JavaScript and Modern Front-End Programming Introduction to JavaScript – Features and Applications of JavaScript, Client-Side Scripting, Embedding JavaScript in HTML, Inline JavaScript, Internal JavaScript, External JavaScript. Variables and Data Types – Variables, Constants, Primitive and Non-Primitive Data Types. Operators and Expressions – Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Conditional Operators. Control Structures – Decision Making Statements, Looping Statements. Functions – Function Declaration, Function Expression, Arrow Functions, Scope of Variables. Arrays and Objects – Array Creation and Manipulation, Array Methods (map(), filter(), forEach()), Object Creation, Properties and Methods. Document Object Model (DOM) – DOM Structure, Element Selection, DOM Manipulation. Event Handling – Mouse Events, Keyboard Events, Form Events. Form Validation – Client-Side Form Validation Techniques. Modern JavaScript (ES6) – let and const, Template Literals, Destructuring, Spread Operator, Modules (Import and Export).	12 Hours
Unit 4	Front-End Development using React Introduction to React – Features of React, Single Page Applications (SPA), Virtual DOM, React Architecture. React Environment Setup – Node.js, npm, React Project Setup using Vite, Project Structure. JSX – JSX Syntax, Embedding Expressions in JSX. React Components – Functional Components, Component Composition, Reusable Components. Props and State – Passing Data using Props, State Management using useState Hook. Event Handling in React – Handling User Events and Form Events. Conditional Rendering – Conditional Display of Components and Content. Lists and Keys – Rendering Collections using map(), Key Attributes. Forms in React – Controlled Components, Form Handling, Basic Form Validation. Styling React Applications – Inline Styling, External CSS, CSS Modules,	12 Hours



	Introduction to React Bootstrap, React Bootstrap Components (Container, Row, Col, Button, Card, Form). Modern React Features – useState Hook. API Integration in React – Introduction to APIs, Fetch API, Fetching and Displaying Data, Basic Error Handling.	
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Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	HTML5 Black Book	DT Editorial Services	Dreamtech Press	2nd Edition	2016
2	Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics	Jennifer Niederst Robbins	O'Reilly Media	5th Edition	2018
3	Learning React: Modern Patterns for Developing React Apps	Alex Banks, Eve Porcello	O'Reilly Media	2nd Edition	2020
4	Responsive Web Design with HTML5 and CSS	Ben Frain	Packt Publishing	4th Edition	2022

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Web Technologies Black Book	Kogent Learning Solutions Inc.	Dreamtech Press	1st Edition	2009
2	HTML and CSS: Design and Build Websites	Jon Duckett	Wiley	1st Edition	2011
3	Murach's HTML and CSS	Zak Ruvalcaba, Anne Boehm	Murach Books	5th Edition	2021
4	React Explained: Your Step-by-Step Guide to React	Zac Gordon	Independently Published	2nd Edition	2021

E- Learning Resources



Sr. No.	Title	Course Instructor	Platform	Web Link
1	MDN Web Docs – HTML, CSS and Web Development Tutorials	Mozilla Contributors	Mozilla Developer Network (MDN)	https://developer.mozilla.org/en-US/
2	HTML, CSS and Bootstrap Tutorials	W3Schools Team	W3Schools	https://www.w3schools.com
3	React - The Complete Guide (incl. Next.js, Redux)	Maximilian Schwarzmüller	Udemy	https://www.udemy.com/course/react-the-complete-guide
4	React Official Documentation	React Team	React Official Documentation	https://react.dev/

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Class	M.C.A, Sem. – II
Course Code and Course Title	0PMCVS205, Aptitude Techniques & Soft Skills
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	24/00/0
Credits	02
Evaluation Scheme: ISE / MSE / ESE	10 /10 /30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0PMCVS206_1	Apply quantitative aptitude techniques to solve mathematical, numerical, and analytical problems for competitive examinations and campus placements.	L3
0PMCVS206_2	Analyze verbal and non-verbal reasoning problems using logical thinking and appropriate problem-solving techniques.	L4
0PMCVS206_3	Demonstrate effective communication, interpersonal, leadership, teamwork, and professional skills for workplace success.	L3
0PMCVS206_4	Prepare for campus recruitment by developing company-specific resumes, participating in group discussions, interviews, and professional networking activities.	L6

Unit	Contents	Hours
Unit 1	Quantitative Aptitude Fundamentals: Introduction to quantitative aptitude and its importance in competitive examinations and campus recruitment. Number System, Simplification and Approximation, Percentages, Ratio and Proportion, Averages, Profit and Loss, Simple and Compound Interest, Time and Work, Time, Speed and Distance, Mixtures and Alligations, Algebra (Linear and Quadratic Equations, Logarithms, Progressions), Data Sufficiency, and practice of aptitude questions.	6 Hours
Unit 2	Logical and Analytical Reasoning: Introduction to logical reasoning and analytical thinking. Verbal Reasoning including Analogies, Classification, Coding-Decoding, Number and Alphabet Series, Blood Relations, Direction Sense, Ranking, Syllogisms, Statement and Conclusion, Decision Making, and Data Sufficiency. Non-Verbal Reasoning including Figure Series, Figure Analogy, Mirror and Water Images, Embedded Figures, Paper Folding and Cutting, Cube and Dice Problems, Spatial Visualization, and Pattern Recognition.	6 Hours



Unit 3	Soft Skills and Personality Development: Introduction to Soft Skills, Hard Skills vs. Soft Skills, Personality Development, Self-Discovery, SWOT Analysis, Goal Setting, Positive Attitude, Communication Skills, Interpersonal Skills, Emotional Intelligence, Leadership, Teamwork, Critical Thinking, Problem Solving, Time Management, Stress Management, Workplace Ethics, Professional Etiquette, Email Etiquette, Grooming, and Body Language.	6 Hours
Unit 4	Employability Skills and Campus Recruitment Preparation: Resume Writing, ATS-Friendly Resume, Company-Specific Resume Preparation (TCS, Infosys, Wipro, Accenture, Capgemini, Cognizant, etc.), Cover Letter Writing, LinkedIn Profile, Group Discussion, Self-Introduction, HR and Technical Interview Preparation, Mock Interviews, Aptitude Test Strategies, and Placement Readiness.	6 Hours

Reference Books

Sr. No.	Title	Author	Publisher	Edition
1	Quantitative Aptitude for Competitive Examinations	R. S. Aggarwal	S. Chand Publishing	Latest
2	Quantitative Aptitude	Abhijit Guha	McGraw-Hill Education	Latest
3	A Modern Approach to Verbal & Non-Verbal Reasoning	R. S. Aggarwal	S. Chand Publishing	Latest
4	Soft Skills: Know Yourself and Know the World	Dr. Alex K.	S. Chand Publishing	Latest
5	Business Communication	Meenakshi Raman & Prakash Singh	Oxford University Press	Latest
6	Soft Skills: Enhancing Employability – Connecting Campus with Corporate	M. S. Rao	I.K. International Publishing	Latest



E- Learning Resources

Sr. No.	Title	Platform	Web Link
1	Aptitude Preparation	NPTEL	https://nptel.ac.in
2	Soft Skills and Employability	SWAYAM	https://swayam.gov.in
3	Quantitative Aptitude	Coursera	https://www.coursera.org
4	Interview Skills and Career Development	LinkedIn Learning	https://www.linkedin.com/learning
5	Aptitude, Logical Reasoning & Interview Preparation	IndiaBIX	https://www.indiabix.com
6	Placement Preparation and Aptitude	GeeksforGeeks	https://www.geeksforgeeks.org
7	Career Edge – Young Professional	TCS iON	https://learning.tcsionhub.in

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Class	M.C.A. Sem. – II
Course Code and Course Title	0PMCP206, Program Elective-I Data Structure Using Python Lab
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	00/00/04
Credits	02
Evaluation Scheme: ISE / ESE	20 / 30

Course Outcomes (COs)

Upon successful completion of this course, the student will be able to:

CO Code	Course Outcome (CO)	Bloom's Level
0PMCAPCP207_1	Apply data structure concepts, algorithm analysis, searching, and sorting techniques to solve computational problems using Python.	L3
0PMCAPCP207_2	Implement linear data structures such as stacks, queues, and linked lists using Python.	L3
0PMCAPCP207_3	Implement non-linear data structures including trees, hashing, and graphs using Python.	L3
0PMCAPCP207_4	Develop Python applications using file organization techniques and appropriate data structures to solve real-world problems.	L3, L6

List of Experiments

Sr. No.	Practical Name
1	Write a program to implement Linear Search and Binary Search algorithms and compare their performance.
2	Write a program to implement Bubble Sort, Selection Sort, and Insertion Sort using Python.
3	Write a recursive program to solve problems such as Factorial, Fibonacci Series, and Binary Search.
4	Write a program to implement Stack operations (Push, Pop, Peek) using Python.
5	Write a program to demonstrate Stack Applications: Parenthesis Matching, Infix to Postfix Conversion, and Postfix Expression Evaluation.
6	Write a program to implement Queue, Circular Queue, Deque, and Priority Queue using Python.
7	Write a program to implement Singly Linked List operations (Insertion, Deletion, Traversal, and Searching).
8	Write a program to implement Doubly Linked List and Circular Linked List operations.
9	Write a program to implement a Binary Search Tree (BST) and perform Preorder, Inorder, and Postorder traversals.
10	Write a program to demonstrate Hashing using Python dictionaries and implement Collision Resolution Techniques (Linear Probing, Quadratic Probing, or Chaining).



11	Write a program to implement Graph Traversal Algorithms (BFS and DFS) and Dijkstra's Shortest Path Algorithm using an adjacency list.
12	Write a program to perform File Structure Operations using Python: Create, Read, Write, Append, Update, Sequential File Organization, and Record Processing.

Reference Books

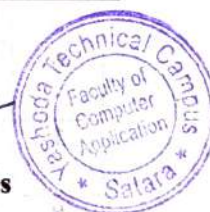
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Data Structures and Algorithms in Python	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser	Wiley	First	2013
2	Problem Solving with Algorithms and Data Structures Using Python	Bradley N. Miller, David L. Ranum	Franklin, Beedle & Associates	Third	2011
3	Python Data Structures and Algorithms	Benjamin Baka	Packt Publishing	First	2017
4	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	MIT Press	Fourth	2022

E- Learning Resources

Sr. No	Title	Course Instructor	Platform	Web Link
1	Programming, Data Structures and Algorithms Using Python	Prof. Madhavan Mukund	NPTEL/SWAYAM	https://onlinecourses.nptel.ac.in
2	Data Structures and Algorithms Using Python	Prof. Naveen Garg	NPTEL/SWAYAM	https://onlinecourses.nptel.ac.in
3	Python Data Structures	Dr. Charles R. Severance	Coursera (University of Michigan)	https://www.coursera.org/learn/python-data
4	Data Structures and Algorithms in Python	freeCodeCamp	YouTube	https://www.youtube.com/@freecodecamp


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Class	MCA , Sem.-II
Lab Code and Lab Title	0PMCPE207.1, Program Elective-I Artificial Intelligence and Machine Learning Fundamentals Lab
Prerequisite/s	0PMCPC101
Teaching Scheme: Lecture/Tutorial/Practical	0/0/4
Credits	02
Evaluation Scheme: ISE / ESE	20/30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0PMCPE207.1_1	Explain the fundamental concepts of Artificial Intelligence, intelligent agents, knowledge representation, logical reasoning techniques, and AI ethics.	L2
0PMCPE207.1_2	Apply AI problem-solving techniques and explain the fundamentals of machine learning, search algorithms, learning paradigms, and the machine learning workflow using appropriate AI development tools.	L3
0PMCPE207.1_3	Analyze supervised machine learning algorithms for regression and classification, and evaluate model performance using appropriate evaluation metrics.	L4
0PMCPE207.1_4	Analyze unsupervised learning techniques, dimensionality reduction methods, recommendation systems, and the basic concepts of TensorFlow and Keras for AI applications.	L4

List of Experiments:

Expt. No.	Title of Experiment
1	Install and configure the Python programming environment using Jupyter Notebook. Write a Python program to demonstrate basic input/output operations and import the NumPy, Pandas, Matplotlib, and Scikit-learn libraries.
2	Using the Student Performance dataset (Kaggle), perform data preprocessing by handling missing values, removing duplicate records, encoding categorical attributes, and applying feature scaling techniques.
3	Using the Student Performance dataset (Kaggle), create appropriate visualizations such as bar charts, line graphs, histograms, scatter plots, box plots, and pie charts to analyze student performance and attendance. Interpret the results.
4	Implement Breadth First Search (BFS) and Depth First Search (DFS) algorithms to find a path between two nodes in a graph representing a city map or campus navigation system. Compare the traversal order and execution results.
5	Implement the A* Search Algorithm to determine the shortest path in a maze or grid-based environment. Use an appropriate heuristic function and compare the obtained path with an uninformed search technique.
6	Build a Linear Regression model using a suitable dataset to predict house prices or student marks. Train the model, evaluate its performance, and visualize the regression line.
7	Develop a Decision Tree Classification model using a Student Performance or Loan Prediction dataset (Kaggle) to classify students as Pass/Fail or loan applications as Approved/Rejected. Evaluate the model using suitable performance metrics.
8	Apply the K-Means Clustering algorithm on the Mall Customer dataset to segment



	customers based on their annual income and spending score. Visualize the resulting clusters and interpret the findings. (Mall Customer Segmentation Dataset (Kaggle))
9	Apply Principal Component Analysis (PCA) on the Iris or MNIST dataset to reduce the dimensionality of the data. Visualize the transformed data and compare it with the original dataset. (Use Iris Dataset (Scikit-learn) or MNIST Dataset)
10	Develop a complete Machine Learning application by selecting an appropriate dataset. Perform data preprocessing, exploratory data analysis, model building, evaluation, and prediction. Prepare a report summarizing the methodology and results.

Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Pearson	4th	2021
2	Machine Learning with Python	Andreas C. Müller, Sarah Guido	O'Reilly Media	1st	2016
3	Introduction to Artificial Intelligence and Machine Learning	Chandra S.S.V.	Wiley India	2nd	2020
4	Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow	Aurélien Géron	O'Reilly Media	3rd	2023

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivashankar B. Nair	McGraw-Hill Education	3rd	2009
2	Introduction to Machine Learning with Python	Andreas C. Müller, Sarah Guido	O'Reilly Media	1st	2016
3	Neural Networks and Learning Machines	Simon Haykin	Pearson	3rd	2009
4	Data Mining: Practical Machine Learning Tools and Techniques	Ian H. Witten, Eibe Frank, Mark A. Hall, Christopher J. Pal	Morgan Kaufmann	4th	2016



E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web Link
1	Machine Learning Specialization	Andrew Ng	Coursera	https://www.coursera.org/specializations/machine-learning-introduction
2	AI For Everyone	Andrew Ng	Coursera	https://www.coursera.org/learn/ai-for-everyone
3	Machine Learning Crash Course	Google AI	Google Developers	https://developers.google.com/machine-learning/crash-course
4	Introduction to Machine Learning	Sebastian Thrun, Katie Malone	Udacity	https://www.udacity.com/course/intro-to-machine-learning--ud120

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Class	M.C.A. Sem. II
Course Code and Course Title	0PMCPE207.2 Program Elective-I -Data Engineering Foundations & Analytics Lab
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	0/0/4
Credits	02
Evaluation Scheme: ISE / ESE	20 / 30

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		Bloom's Level
0PMCPE207.2 _1	Explain the Data Science lifecycle, methodologies, and applications in various domains	L2
0PMCPE207.2 _2	Acquire, preprocess, clean, transform, and integrate data from multiple sources using SQL, Python libraries, APIs, and web scraping techniques for analytical applications.	L3
0PMCPE207.2 _3	Perform Exploratory Data Analysis (EDA), statistical analysis, and data visualization using Python and Business Intelligence tools to derive meaningful insights and support decision-making.	L4
0PMCPE207.2 _4	Apply fundamental Machine Learning concepts, workflows, feature engineering, and model evaluation techniques to develop and assess predictive models for real-world datasets	L3

List of Experiments

Sr No	Practical Title	Example Dataset / Activity
1	Installation and Familiarization with Python Data Science Environment	Install Anaconda, Jupyter Notebook, Google Colab. Perform basic operations using Numpy (arrays, matrices) and Pandas (Series, DataFrames) on the Iris Dataset .
2	Data Acquisition from Multiple Sources	Read data from CSV (Students.csv) , Excel (Sales.xlsx) , SQLite Database , and retrieve weather data using the OpenWeather API or JSONPlaceholder API .
3	Web Scraping and Data Collection	Extract product information (Name, Price, and Rating) from an e-commerce demo website using BeautifulSoup , or scrape quotes from quotes.toscrape.com using Scrapy/Selenium .
4	Data Cleaning and Preprocessing	Use the Titanic Dataset to handle missing values, remove duplicate records, detect outliers, perform feature scaling, label encoding, and data transformation.
5	SQL for Data Science	Create a Student Database in SQLite. Perform SELECT, WHERE, GROUP BY, ORDER BY, JOIN, Aggregate Functions , and import query results into Pandas for analysis.
6	Exploratory Data Analysis (EDA)	Perform EDA on the Titanic, Iris, or Mall Customers Dataset . Generate summary statistics, identify missing values, analyze correlations, and visualize distributions.
7	Data Visualization using Python	Create Line Charts, Bar Charts, Pie Charts, Histograms, Scatter Plots, Box Plots, Pair Plots, and Heatmaps using Matplotlib and Seaborn on the Superstore Sales Dataset .
8	Business Intelligence Dashboard	Develop an interactive dashboard using Power BI or Tableau for the Superstore Sales Dataset showing Sales, Profit, Category-wise Analysis, Region-wise Sales, and KPI Cards.



9	Basic Machine Learning Workflow	Build a Machine Learning pipeline using the Iris Dataset or Breast Cancer Dataset . Perform data splitting, feature selection, train a Decision Tree or Logistic Regression model, and evaluate using Accuracy and Confusion Matrix.
10	Mini End-to-End Data Science Project	Develop a complete project such as House Price Prediction , Student Performance Analysis , Customer Churn Prediction , or Loan Approval Prediction involving data collection, preprocessing, EDA, visualization, machine learning model development, evaluation, and report generation.

Practical	Dataset
P1	Iris Dataset
P2	Students.csv, Sales.xlsx, SQLite Database, Weather API
P3	quotes.toscrape.com / Books to Scrape / Fake Store API
P4	Titanic Dataset
P5	Student Database (SQLite)
P6	Titanic / Iris / Mall Customers Dataset
P7	Superstore Sales Dataset
P8	Superstore Sales Dataset
P9	Iris Dataset / Breast Cancer Wisconsin Dataset
P10	House Price Prediction / Customer Churn / Loan Approval / Student Performance Dataset

Text Books

Sr. No.	Title	Author(s)	Publisher	Latest Edition
1	Data Science from Scratch: First Principles with Python	Joel Grus	O'Reilly Media	2nd Edition
2	Python for Data Analysis	Wes McKinney	O'Reilly Media	3rd Edition
3	Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow	Aurélien Géron	O'Reilly Media	3rd Edition
4	Practical Statistics for Data Scientists	Peter Bruce, Andrew Bruce, Peter Gedeck	O'Reilly Media	2nd Edition



Reference Books

Sr. No.	Title	Author(s)	Publisher	Latest Edition
1	Introduction to Data Mining	Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar	Pearson	2nd Edition
2	Data Mining: Concepts and Techniques	Jiawei Han, Micheline Kamber, Jian Pei	Morgan Kaufmann (Elsevier)	3rd Edition
3	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer	Latest Edition
4	An Introduction to Statistical Learning with Applications in Python	Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Jonathan Taylor	Springer	2nd Edition

E- Learning Resources

Sr. No	Title	Course Instructor	Platform	Web Link
1	Data Science for Engineers	Prof. Ragunathan Rengaswamy	NPTEL/SW AYAM	https://onlinecourses.nptel.ac.in
2	Machine Learning Specialization	Andrew Ng	Coursera	https://www.coursera.org/specializations/machine-learning-introduction
3	Python for Data Science, AI & Development	IBM	Coursera	https://www.coursera.org/learn/python-for-applied-data-science-ai
4	Kaggle Learn: Python, Pandas & Machine Learning	Kaggle Team	Kaggle Learn	https://www.kaggle.com/learn


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Class	M.C.A. Sem. –II
Course Code and Course Title	0PMCPE207.3,PE-I 204.3- Frontend Development using React
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	24/00/00
Credits	02
Evaluation Scheme: ISE / ESE	20/30

Course Outcomes (COs):		Bloom's Level
Upon successful completion of this course, the student will be able to:		
0PMCPE207.3_1	Create structured web pages using HTML5 elements, semantic tags, multimedia, tables, and forms.	L2,L3, L6
0PMCPE207.3_2	Develop responsive user interfaces using CSS3 styling techniques, Flexbox, Grid, and Media Queries.	L3, L6
0PMCPE207.3_3	Develop interactive web pages using JavaScript programming constructs, DOM manipulation, event handling, and ES6 features.	L3,L6
0PMCPE207.3_4	Develop responsive front-end web applications using React components, state management, API integration, and React Bootstrap.	L6

List of Experiments:

Expt. No.	Title of Experiment
1	Install and configure the front-end development environment using Notepad++, organize project folders, and create basic HTML webpages to display "Welcome to MCA Department" and Department Information including its name, vision, mission, and programmes offered.
2	Create Personal and Academic Profile webpages using HTML, displaying personal details, hobbies, career objectives, educational qualifications, and achievements, while applying headings, paragraphs, text formatting tags, line breaks, horizontal rules, and comments.
3	Create MCA Department Website Navigation Pages by designing multiple webpages linked using internal, external, email, and image hyperlinks. Display courses, facilities, and activities using ordered, unordered, nested, and definition lists. Design a weekly timetable using tables with rowspan and colspan, and create an event gallery using images, audio, and video elements.
4	Create Student Registration and Feedback Forms using HTML5 by implementing appropriate input types, dropdown lists, radio buttons, checkboxes, text areas, and validation attributes.



5	Design and style any Webpages using CSS3 by applying Inline, Internal, and External CSS, selectors, fonts, colors, backgrounds, text styling, and CSS Box Model properties.
6	Develop a Responsive Webpages using Flexbox, CSS Grid, and Media Queries by designing a responsive homepage and optimizing the layout for desktop, tablet, and mobile devices. Apply CSS transforms, transitions, and basic animations to enhance user interaction.
7	Develop a Student Result Calculator using JavaScript to accept marks of multiple subjects and calculate total marks, percentage, grade, and result status using variables, operators, decision-making statements, functions, and arrays.
8	Design an online Student Registration Form using HTML and JavaScript with event handling and form validation for Name, Email ID, Mobile Number, and Password. Display appropriate validation messages during form submission using DOM manipulation techniques.
9	Create First React JS Application: a. Install Node.js and NPM b. Install VS Code c. Install React.js d. <code>npm create vite@latest app_name</code>
10	Create React applications-demonstrating state management using the useState Hook by implementing a Counter Application, Show/Hide Text functionality, Background Color Changer, User Information Form, Like Button, Student List Management, and Profile Information Update.
11	Implement React applications using the useEffect Hook to perform component initialization, timer management, API integration, event handling, document updates, browser event tracking, local storage operations, and dynamic user interface updates.
12	Implement React applications using Context API to share and manage global data such as themes, user information, language preferences, student information, and shopping cart data across multiple components. Integrate Context API with useState and useEffect Hooks to create reusable and maintainable React applications.



Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	HTML5 Black Book	DT Editorial Services	Dreamtech Press	2nd Edition	2016
2	Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics	Jennifer Niederst Robbins	O'Reilly Media	5th Edition	2018
3	Learning React: Modern Patterns for Developing React Apps	Alex Banks, Eve Porcello	O'Reilly Media	2nd Edition	2020
4	Responsive Web Design with HTML5 and CSS	Ben Frain	Packt Publishing	4th Edition	2022

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Web Technologies Black Book	Kogent Learning Solutions Inc.	Dreamtech Press	1st Edition	2009
2	HTML and CSS: Design and Build Websites	Jon Duckett	Wiley	1st Edition	2011
3	Murach's HTML and CSS	Zak Ruvalcaba, Anne Boehm	Murach Books	5th Edition	2021
4	React Explained: Your Step-by-Step Guide to React	Zac Gordon	Independently Published	2nd Edition	2021



E- Learning Resources

Sr. No.	Title	Course Instructor	Platform	Web Link
1	MDN Web Docs – HTML, CSS and Web Development Tutorials	Mozilla Contributors	Mozilla Developer Network (MDN)	https://developer.mozilla.org/en-US/
2	HTML, CSS and Bootstrap Tutorials	W3Schools Team	W3Schools	https://www.w3schools.com
3	React - The Complete Guide (incl. Next.js, Redux)	Maximilian Schwarzmüller	Udemy	https://www.udemy.com/course/react-the-complete-guide
4	React Official Documentation	React Team	React Official Documentation	https://react.dev/

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Class	M.C.A. Sem. II
Course Code and Course Title	0PMCPR208, Mini Project
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	00/00/04
Credits	02
Evaluation Scheme: ISE / ESE	20/30

Mini Project—(Semester II)

The project may be undertaken **in a group of not more than three students** under the supervision of a faculty mentor. Students shall identify a real-world problem and develop an innovative software solution using the knowledge and skills acquired throughout the MCA programme. The project should preferably be based on emerging technologies such as Artificial Intelligence, Machine Learning, Data Science, Cloud Computing, Cyber Security, Internet of Things (IoT), Block chain, Mobile Computing, Full Stack Development, Big Data Analytics, or any other contemporary computing domain approved by the Department.

The project shall be carried out under the supervision of a faculty mentor and shall be evaluated through continuous internal assessment and an End Semester Practical Examination. Students shall submit the project report in the prescribed format and successfully complete the presentation and viva-voce examination.

Project Assessment Scheme (50 Marks)

Assessment Component	Marks
Internal Assessment (IA)	20
End Semester Practical Examination (ESE)	30
Total	50

Internal Assessment Rubric (20 Marks)

Component	Marks Distribution	Marks
Attendance, Problem Definition, Feasibility Study	2+1+2	05
System Design & Progress Review	3+2	05
Software Development & Implementation Progress	5	05
Documentation, Presentation & Internal Viva	2+2+1	05
Total		20



End Semester Practical Examination Rubric (30 Marks)

Component	Marks Distribution	Marks
Software Implementation & Functionality	5+5	10
Innovation, Technical Complexity & Testing	1+1+1	3
Project Report	5	5
Project Demonstration & Presentation	5+2	7
Viva-Voce	5	5
Total		30

- Successful completion of the project, submission of the dissertation, project demonstration, and viva-voce examination are mandatory for the award of credits.
- The final synopsis and project report format will be provided to the students at the beginning of the semester.

Synopsis Report Content

Sr. No.	Description	Page No.
1	Title of the Project	
2	Introduction	
3	Problem Statement of existing System	
4	Proposed System- Need and Scope of the Proposed System	
5	Objectives of the Project	
6	System Requirements -Hardware & Software Requirements	
7	Database Design	
	Data Flow Diagram (DFD)	
	Entity Relationship Diagram (ERD)	
	Sequence Diagram	
8	System Modules	
9	Future Scope	
10	Conclusion	
11	References	

Project Report Formatting Rules

- 1) The project report shall be prepared on A4-size paper using Times New Roman font.
- 2) The body text shall be in 12-point font with 1.5 line spacing and justified alignment.



- 6) All figures, tables, charts, and diagrams shall be properly numbered, titled, and referred to in the text.
- 7) Page numbers shall be provided consistently throughout the report.
- 8) References and citations shall follow the prescribed referencing format.
- 9) The report shall be original and free from plagiarism.
- 10) The final report shall be reviewed and approved by the Project Guide before submission.
- 11) The detailed project report template and formatting guidelines will be provided to students at the beginning of the semester.

Final Project Report Content

Sr. No.	Description	Page No.
1	Title of the Project	
2	Introduction	
3	Problem Statement of existing System	
4	Proposed System- Need and Scope of the Proposed System	
5	Objectives of the Project	
6	System Requirements -Hardware & Software Requirements	
7	System Analysis and Design	
	Database Design and Data Dictionary	
	Data Flow Diagram (DFD)	
	Entity Relationship Diagram (ERD)	
	Use Case Diagram	
	Sequence Diagram	
	Activity Diagram	
	Deployment and Component Diagram	
8	System Modules (Input/output screenshot)	
9	Reports	
10	Future Scope	
11	Conclusion	
12	References	


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