Savitribai Phule Pune University, Pune

Faculty of Commerce and Management

Master of Computer Application (MCA) INTEGRATED

MCA-Integrated (5-Years course)

Programme Curriculum

(Pattern 2025)

(With Effect from Academic Year 2025-26)

5-year, 10 Semester Full time Programme Choice Based Credit System (CBCS) and Grading System Outcome Based Education Pattern Aligned with National Education Policy (NEP) 2020

MCA (Integrated) 1st year effective from A.Y. 2025 – 26

MCA (Integrated) 2nd year effective from A.Y. 2026 – 27

MCA (Integrated) 3rd year effective from A.Y. 2027 – 28

MCA (Integrated) 4th year effective from A.Y. 2028 – 29

MCA (Integrated) 5th year effective from A.Y. 2029 - 30

1. PREAMBLE:

1. The name of the programme shall be **Master of Computer Application (Integrated)**
2. The MCA (Integrated) Curriculum 2025 builds on the implementation of the Choice Based Credit System (CBCS). The curriculum takes the MCA (Integrated) programme to the next level in terms of implementing National Education Policy (NEP) and Outcome Based Education (OBE) along with the CBCS and Grading System.
3. The Institutes should assist in placements for MCA (Integrated) students by interacting with Industries. The institute's placement cell should focus on identifying industrial expectations and institutional preparation for meeting industrial needs.
4. Industry and academia should identify possible areas of collaboration and work together to cater to the rapidly changing scenario.
5. During each semester students can attempt to complete various certifications for better opportunities in the industry.

2. ELIGIBILITY CRITERIA:

Passed 10+2 examination with Mathematics/ Statistics/ Accountancy as compulsory subjects. Obtained at least 45% marks (40% marks in case of candidates belonging to reserved category) in the above subjects taken together.

3. ADMISSION PROCESS:

1. A Common Entrance Examination procedure will be adopted for admission to MCA(Integrated) First Year Course.
   a. Eligibility for Appearing MAH- B.BCA/BBA/BMS/BBM/Integrated MCA -CET.
      - Passed 10 + 2 (HSC) or its equivalent examination (As per the AICTE APH 2024 - 2028)
      - Candidates appearing for 10 + 2 (HSC) or its equivalent examination are also eligible to appear for CET
   b. Online registration of application and uploading of required documents by the Candidate for admission on the website.
2. Documents verification and confirmation of Application Form for Admission by online mode.
3. Display of the provisional merit list for Maharashtra State/All India candidates on website.
4. Submission of grievances if any, for all type of Candidates.
5. Display of the Final Merit lists of Maharashtra State/All India candidates on website.

4. MCA (INTEGRATED) PROGRAMME FOCUS:

The basic objective of the Master of Computer Application (Integrated) is to provide a steady stream of necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into rapidly expanding world of Information Technology

4. MCA (INTEGRATED) PROGRAMME HIGHLIGHTS:

- **Discipline-Specific Courses (Core Major Courses):**
  The MCA Integrated program places a strong emphasis on core major courses that form the foundation of computer science and applications. These courses provide in-depth knowledge and understanding of essential subjects such as programming languages, database management, software engineering, web development, data structures, algorithms, and computer networks.
- **Interdisciplinary Minor Courses (IDC):**
  The MCA Integrated program recognizes the importance of interdisciplinary learning and offers students the opportunity to explore other related fields. Through eight interdisciplinary minor courses, students can broaden their horizons and gain insights from areas such as mathematics, statistics, business management, or communication.
- **Generic/Open Elective Course (OE):**
  i. It is to be offered in I and/or II year
  ii. Faculty-wise baskets of OE shall be prepared by University/ Autonomous Colleges.
  iii. OE is to be chosen compulsorily from faculty other than that of the Major. Further, students will be able to earn a maximum 4 Credits in this Vertical through International/ National/ Zone/ State/ University level participation and achievements in co-curricular and academic activities.
- **Vocational Skill Course (VSC):**
  Wherever applicable vocational courses will include skills based on advanced laboratory practicals of Major and/or Minor. A student is required to successfully complete the 'vocational skill course' as mentioned in the schemes of

teaching, learning and evaluation, examination. This course must be a course corresponding to the major and/ or Minor subject selected by a student.

- **Ability Enhancement Courses (AEC**):
  AEC courses are designed to enhance students' abilities and competencies beyond their core subject knowledge. In the MCA Integrated program, students will engage in three AEC courses, which focus on areas such as communication skills, logical reasoning, analytical thinking, and entrepreneurial skills.
- **Skill Enhancement Courses (SEC**):
  In the rapidly evolving field of computer applications, it is essential for students to acquire industry- relevant skills. The MCA Integrated program offers three skill enhancement courses to help students develop specific technical skills in areas such as programming frameworks, software tools, data analytics, or cybersecurity.
- **Common Value-Added Courses (VAC):**
  The MCA Integrated program recognizes the importance of holistic development and incorporates three common value-added courses. These courses cover topics such as personality development, ethics, sustainability, and social responsibility. By participating in these courses, students cultivate a sense of social consciousness and ethical decision-making.
- **Value Education Course (VEC):**
  A student is required to undergo and successfully complete the Value Education Courses like yoga, environment, cleanliness etc.
- **Field Project (FP) / On the Job Training (OJT) /Community Engagement Project (CEP) / Research Project (RP):**
  A student is required to undergo and successfully complete this course under the guidance of a supervisor/ mentor assigned by the HEI. This course must be corresponding to the major. This course must be completed at the HEI where the student has admission and transfer of credit is not permissible for this type of course. The project and internship component consists of 16 weeks, ensuring students gain practical industry experience.
- **Department Electives (DSE):**
  To cater to individual interests and specialization within the field of computer applications, the MCA Integrated program offers four department electives. These elective courses allow students to delve deeper into specific areas of computer science, such as artificial intelligence, mobile app development, cloud computing, or data science. The number of hours of instruction for each DSE course may vary based on the chosen elective.
- **Indian Knowledge System (IKS):**
  Gain an understanding of the Indian Knowledge System. Develop an ability to apply the IKS to societal challenges faced today in areas such as holistic health, governance, public administration and sustainable living.
- **Co-Curricular Course (CC):**
  A student is required to select Co-Curricular Courses like NSS, Sports, Cultural etc. This course must be completed at the Higher Education Institute (HEI) where the student has taken admission and transfer of credit is not permissible for this type of course.
- **Community engagement and service (CEP):**
  By incorporating these diverse components into the MCA Integrated program, aim to provide students with a well-rounded education, equipping them with the necessary knowledge, skills, and practical experience to excel in the field of computer applications

6. OUTCOME BASED APPROACH TO EDUCATION (OBE):

As per the National Higher Education Qualification Frameworks (NHEQF), students are expected to possess the quality & characteristics of the graduate of programme of the study, including learning outcomes relating to the disciplinary areas, learning generic outcomes that are expected to be acquired by a graduate on completion of the Programme. OBE is an educational model that forms the base of a quality education system. There is no specified style of teaching or assessment in OBE. All educational activities carried out in OBE should help the students to achieve the set goals. The faculty may adapt the role of an instructor, trainer, facilitator, and/or mentor based on the outcomes targeted. OBE enhances the traditional methods and focuses on what the institute provides to the students. It shows success by making or demonstrating outcomes using statements 'able to do' in favor of students. It provides clear standards for observable and measurable outcomes.

FOUR LEVELS OF OUTCOMES FROM OBE

1. Programme Educational Objectives (PEOs)
2. Programme Outcomes (POs)
3. Programme Specific Outcomes (PSOs)
4. Course Outcomes (COs)

2. GRADUATE ATTRIBUTES

The graduate attributes include the learning outcomes that are specific to disciplinary areas relating to the chosen field(s) of learning within the broad multidisciplinary & interdisciplinary learning outcomes that graduates of all Programmes should acquire & demonstrate.

Graduate Attributes			
1.	Disciplinary Knowledge	7.	Global/Multicultural Competence
2.	Critical Thinking & Problem Solving	8.	Ethics & Human Values
3.	Creativity & Innovation	9.	Lifelong Learning
4.	Effective Communication	10.	Leadership Readiness
5.	Research-related skills	11.	Community Engagement & Social Responsibilities
6.	Cooperation & Teamwork	12.	Digital literacy

3. PROGRAMME EDUCATIONAL OBJECTIVES:

Programme Educational Objectives (PEOs) are defined for the aspiring students about what they will achieve once they join the Programme. PEOs are about professional and career accomplishment after 5 years of graduation. PEOs are written statements taken from different aspects like Knowledge, Skills & Ethics with focus on Career, Competency and Behavior. Three PEOs are recommended for the MCA (Integrated) Programme.

Program Educational Objectives (PEOs):	
PEO1.	Use Modern tools and technologies for software development.
PEO2.	Develop software solutions to problems across a broad range of application domains through analysis and design. Contribute to research of their chosen field and function and communicate effectively, to perform both individually and in a multi-disciplinary team.
PEO3.	Continuing the process of life-long learning through professional activities; adapting themselves with ease to new technologies, while exhibiting high ethical and professional standards.

4. MCA (INTEGRATED) PROGRAMME OUTCOMES (POS):

A Programme outcome is broad in scope and defines what the students will be able to do at the end of the Programme. POs are defined in line with the graduate attributes as specified above. POs are to be specific, measurable and achievable.

Programme Outcomes (POs):	
PO1	Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.
PO2	Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.
PO3	Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies.
PO4	Ability to devise and conduct experiments, interpret data and provide well informed conclusions.
PO5	Ability to select modern computing tools, skills and techniques necessary for innovative software solutions
PO6	Ability to apply and commit professional ethics and cyber regulations in a global economic environment.
PO7	Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.
PO8	Ability to understand management and computing principles with computing knowledge to manage projects in multidisciplinary environments.

PO9	Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.
PO10	Ability to recognize economic, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.
PO11	Ability to work as a member or leader in diverse teams in a multidisciplinary environment.
PO12	Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.

5. Programme Specific Outcomes

Programme Specific Outcomes (PSOs) are statements that describe what the graduates of a specific Programme should be able to do. A list of 3 PSOs have been defined for the MCA Integrated Programme.

Program Specific Outcomes (PSOs)	
PSO1.	Professionally skilled and trained in the field of computer science, they can solve complex, real-time problems, which help them grow personally and professionally**.**
PSO2.	Understanding modern computer technologies and their applications to solve complex and critical issues that benefit society and the environment.
PSO3.	Trained in performing effectively as an individual, a team, and as a team leader in a multidisciplinary environment using critical thinking skills.

MAPPING MATRIX OF PEOS WITH POS

Programme outcomes designed for the Integrated Master of Computer Application programme are mapped according to the programme educational objectives to encompass the broader career and professional achievements that graduates are anticipated to attain in the long run. The levels of mapping strength are indicated as High (3), Moderate (2) and Low (1).

MAPPING OF PEO WITH PO												
PEO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
PEO1	3	3	3	2	3	2	2	2	2	2	2	2
PEO2	3	3	3	3	3	2	2	2	2	2	2	2
PEO3	2	2	2	2	2	3	3	3	3	3	3	3
Level of correlation: 3-High, 2-Medium, 1-Low												

MAPPING OF PO WITH PSO												
PSO / PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
PSO1	3	3	3	2	3	2	2	2	1	2	2	3
PSO2	2	3	3	2	3	3	2	2	2	3	2	2
PSO3	1	2	2	1	2	2	3	3	3	2	3	3
Level of correlation: 3-High, 2-Medium, 1-Low												

6. GENERAL COURSE STRUCTURE & THEME: FIVE YEAR MCA (INTEGRATED) PROGRAMME

The 5-year MCA Integrated program will comprise a total of 224 credits. The following types of courses will be offered as part of this program:

- 24 Discipline-specific Major Courses (88 credits)
- 8 Discipline Specific Electives (30 credits)
- 1 Research Methodology (4 credit)
- 5 Minor Courses (18 credits)
- 6 Open Electives (12 credits)
- 4 Ability Enhancement Courses (8 credits)
- 3 Skills Enhancement Courses (6 credits)
- 2 Value Education Courses (4 credits)
- 4 Vocational Skill Courses (8 credits)
- 1 Indian Knowledge System (2 credits)
- 4 Co-curricular courses (8 credits)
- 1 Community Engagement and Project (2 credits)
- 2 On Job Training (16 credits)
- 2 Field Project (4 credits)
- 1 Research Project (6 credits)
- 1 MOOC's (8 Credits)

COURSE CODE AND DEFINITION:

Course code	Definitions	Course code	Definitions
L	Lecture	Minor	Minor subject
P	Practical	FP	Field Project
DSC	Discipline Specific Core Course	CEP	Community Engagement and Project
OE	Open Elective (Only for this Programme)	DSE	Discipline Specific Elective
VSC	Vocational Skill Courses	OJT	On Job Training: Internship/ Apprenticeship
SEC	Skill Enhancement courses	RM	Research methodology
AEC	Ability Enhancement Courses	RP	Research Project
VEC	Value Education Courses	MOOCs	Massive Open Online Course
IKS	Indian Knowledge System	CC	Co-curricular Course

Semester	Credit Points	CE	EE
Semester I	22	240	300
Semester II	22	200	360
Semester III	22	280	240
Semester IV	22	200	360
Semester V	22	200	360
Semester VI	22	200	360
Semester VII	22	240	300
Semester VIII	24	310	280
Semester IX	24	280	300
Semester X	22	350	200
Total	**224**	**2500**	**3060**
		Total Marks	**5560**

The final total assessment of the candidate is made in terms of an internal (concurrent) evaluation and an external (university) examination for each course.

Examination: Examinations shall be conducted at the end of the semester, i.e. during November/ December and in April/ May. However, supplementary examinations will also be held in November/ December and April/May.

MARKS/GRADE/GRADE POINT:

A grade is assigned to each head based on marks obtained by a student in evaluation of the course. These grades, their equivalent grade points are given in the following table.

Sr. No.	% of Max. Marks	Grade Point	Grade Letter
1	90 ≤ Marks ≤ 100	10	O (Outstanding)
2	75 ≤ Marks ≤ 89	9	A+ (Excellent)
3	60 ≤ Marks ≤ 74	8	A (Very Good)
4	55 ≤ Marks ≤ 59	7	B+ (Good)
5	50 ≤ Marks ≤ 54	6	B (Above Average)
6	45 ≤ Marks ≤ 49	5	C (Average)
7	40 ≤Marks ≤ 44	4	D (Pass)
8	Marks < 40	0	F (Fail)
9	Nil	0	Ab(Absent)
10	--	0	FX (Detained, Repeat the Course)
11	--	0	IC (Incomplete Course-Absent for Exam but continue for the course
12	--	0	AC(Audit Course Completed)
13	--	--	CAN (Audit Course not Completed)

Suggested components for Concurrent Evaluation (CE) are:

1. Class Test
2. Open Book Test
3. Group Discussion
4. Scrap Book
5. Role Play / Story Telling
6. Learning Diary
7. In-depth Viva
8. Quiz
9. Certification
10. Written Home Assignment
11. Small Group Project & Internal Viva-Voce
12. Literature Review / Book Review
13. Case Study / Situation Analysis - (Group Activity or Individual Activity)
14. Field Visit / Study tour and report of the same
15. Individual Term Paper / Thematic Presentation
16. Industry Analysis - (Group Activity or Individual Activity)
17. Model Development / Simulation Exercises - (Group Activity or Individual Activity)

Institutes can decide the type, method and frequency of Concurrent Evaluation for each course and execute accordingly. Detailed record of the Concurrent Evaluation shall be maintained by the Institute. The same shall be made available to the University, on demand.

Choice based Credit System (CBCS) and Grading:

The detailed document about Choice based Credit System for PG Programme is available on university websites. The Grading methodology is also available on the university website. University reserves rights to revise CBCS and grading system from time to time.

Medium of Instruction: The medium of Instruction will be English.

Clarification of Syllabus: It may be necessary to clarify certain points regarding the course. The BOS should meet to study and clarify any difficulties from the Institutes, as and when required.

Revision of Syllabus: As computer technology is changing very fast, revision of the syllabus should be considered every 5 years.

Attendance:

The student must meet the requirement of 75% attendance per semester per course for grant of the term. The Director shall have the right to withhold the student from appearing for examination of a specific course if the above requirement is not fulfilled. Since the emphasis is on continuous learning and concurrent evaluation, it is expected that the students study all- round the semester. Therefore, there shall not be any preparatory leave before the University examinations.

ATKT Rules:

The ATKT rules mentioned in CBCS handbook (available on SPPU website) is application to MCA (Integrated) course.

Maximum Duration for completion of the Programme:

The candidates shall complete the MCA (Integrated) WITHIN 5 YEARS from the date of admission, by earning the requisite credits. The student will be finally declared as failing if she/he does not pass in all credits within a total period of 7 years. After that, such students will have to seek fresh admission as per the admission rules prevailing at that time.

Exit option:

Following EXIT options are available with the students:

Exit Option	Minimum Credit Requirements
Undergraduate Certification - After successful completion of First Year Award of UG Certification in Bachelor of Computer Application (BCA) with 44 credits and an additional 04 credits (for either courses by Microsoft/CCNA/Salesforce/Google/AWS/Oracle/ RedHat etc. or Swayam/ NPTEL/MKCL equivalent to core NSQF course or an Internship) or else Continue with Major and Minor	44
Undergraduate Diploma - After successful completion of Second Year Award of UG Diploma in Bachelor of Computer Applications (BCA) with 88 credits and an additional 08 credits (for either a course by Microsoft/ CCNA/ Salesforce/ Google/ AWS/ Oracle/ RedHat etc. or Swayam/ NPTEL/MKCL MOOC course equivalent to core course or an internship) or else Continue with Major and Minor	88
Bachelor's Degree (BCA) - After successful completion of Third Year Award of Bachelor's Degree in Computer Applications (BCA) with 132 credits and an additional 08 credits (for either a course by Microsoft/ CCNA/ Salesforce/ Google/ AWS/ Oracle/ RedHat etc. or Swayam/ NPTEL/MKCL MOOC course equivalent to core course or an internship) or else Continue with Major and Minor	132
Bachelor's Degree (BCA) with Honors- After successful completion of Fourth Year OR Bachelor's Degree (BCA) with Honors (Research)- After successful completion of Fourth Year	176

Procedure for EXIT:

Those students want to exit the course are required to submit application for the same before two months of exiting the programme. The concern college/Institute after receiving the application from concern student is required to complete the said additional credits (4/8) within the stipulated time.

Scaling Down of CE/INT Scores: The marks obtained by the student for the CE/INT ***shall be scaled down***, to the required extent, if percentage of the marks of CE/INT exceeds the percentage of marks scored in the End Semester University Examination by 25% for the respective courses.

1. STRUCTURE AND DETAIL SYLLABUS OF MCA (INTEGRATED) PROGRAMME:

Integrated MCA-I Semester - I							
Type	**Course Code**	**Title**	**Credit**	**Teaching Hours per week**		**Marks**	
				T	**P**	**Internal**	**External**
DSC	BCP-101-MJ	Basics of C Programming	4	4	--	40	60
DSC	CPL-102-MJ	C Programming Lab	2	--	2	40	
VSC	HWT-103-MJP	HTML and Web Technology Lab I	2	--	2	40	--
SEC	FOC-104-MJ	Fundamentals of Computer	2	2	--	--	60
AEC	DMA-105-MJ	Discrete Mathematics - I	2	2	--	--	60
VEC	ESS-106-MJ	Environment Science and Sustainability	2	2	--	40	--
IKS	IKS-107-MJ	Indian Knowledge System	2	2	--	40	--
CC	LIA-108-MJ	Liberal Activities - I	2	--	2	40	--
OE	MAF-110-MJ	Management Fundamentals	2	2	--	--	60
	POA-111-MJ	Principles of Accounting-I					
OE	DGM-112-MJ	Digital Marketing - I	2	2	--	--	60
	PFP-113-MJ	Personals Financial Planning-I					
		Total Credits	**22**	16	6	**240**	**300**

Integrated MCA-I Semester - II							
Type	**Course Code**	**Title**	**Credit**	**Teaching Hours per week**		**Marks**	
				T	**P**	**Internal**	**External**
DSC	OOP-151-MJ	Object Oriented Programming using C++	4	4	--	40	60
DSC	CLA-152-MJP	C++ Lab	2	--	2	40	--
Minor	SWE-153-MN	Software Engineering	4	4	--	40	60
VSC	WTL-154-MJP	Web Technology Lab-II	2	--	2	40	--
SEC	OSL-155-MJ	Operating System with Linux	2	2	--	--	60
AEC	DMT-156-MJ	Discrete Mathematics - II	2	2	--	--	60
CC	LIA-157-MJ	Liberal Activities - II	2	2	--	40	--
OE	MAM-160-MJ	Marketing Management	2	2	--	--	60
	POA-161-MJ	Principles of Accounting-II					
OE	DGM-162-MJ	Digital Marketing - II	2	2	--	--	60
	PFP-163-MJ	Personals Financial Planning-II					
		Total Credits	**22**	18	4	**200**	**360**

Integrated MCA-II Semester - III							
Type	**Course Code**	**Title**	**Credit**	**Teaching Hours per week**		**Marks**	
				T	**P**	**Internal**	**External**
DSC	DFS-201-MJ	Data & File Structures	4	3	1	40	60
DSC	CNT-202-MJ	Computer Networks	4	4	--	40	60
Minor	MIS-203-MN	Management Information System	4	4	--	40	60
VSC	WTL-204-MJP	Web Technology Lab-III	2	--	2	40	--
AEC	OAT-205-MJ	Office Automation Tools	2	--	2	40	--
CC	LIA-206-MJP	Liberal Activities - III	2	--	2	40	--
VEC	IIC-257-MJ	Introduction to Indian Constitution	2	2	--	40	--
OE	END-210-MJ	Entrepreneurship Development	2	2	--	--	60
	EMC-211-MJ	Ecommerce & M-Commerce					
		Total Credits	**22**	**15**	**07**	**280**	**240**

Integrated MCA-II Semester - IV							
Type	**Course Code**	**Title**	**Credit**	**Teaching Hours per week**		**Marks**	
				T	**P**	**Internal**	**External**
DSC	DMS-251-MJ	Database Management Systems	4	4	--	40	60
DSC	DML-252-MJP	Database Management Systems Lab	2	--	2	--	60
DSC	JPR-253-MJ	Java Programming	4	4	--	40	60
DSC	JPL-254-MJP	Java Programming Lab	2	--	2	--	60
Minor	OSE-255-MN	Object Oriented Software Engineering	4	4	--	40	60
AEC	PDT-256-MJP	Personality Development	2	2	--	40	--
CC	LIA-257-MJP	Liberal Activities - IV	2	--	2	40	--
OE	BOT-260-MJ	Basics of Tally	2	--	2	--	60
	AEX-261-MJ	Advanced Excel					
		Total Credits	**22**	**14**	**08**	**200**	**360**

Integrated MCA-III Semester - V							
Type	**Course Code**	**Title**	**Credit**	**Teaching Hours per week**		**Marks**	
				T	**P**	**Internal**	**External**
DSC	AJP-301-MJ	Advanced Java Programming	4	3	1	40	60
DSC	PYP-302-MJ	Python Programming	4	3	1	40	60
SEC	CYS-303-MJ	Cyber Security	2	2	--	--	60
Minor	AMT-304-MN	Agile Methodologies	4	4	--	40	60
VSC	WTL-305-MJP	Web Technology Lab-IV	2	--	2	40	-
FP	FPR-306-FP	Field Project	2	--	2	-	60
DSE	STQ-310-MJ	Software Testing and Quality Assurance	4	4	-	40	60
	DAL-311-MJ	Data Analytics-I					
		Total Credits	**22**	**16**	**06**	**200**	**360**

Integrated MCA-III Semester - VI							
Type	**Course Code**	**Title**	**Credit**	**Teaching Hours per week**		**Marks**	
				T	**P**	**Internal**	**External**
DSC	MAD-351-MJ	Mobile Application Development	4	4	--	40	60
DSC	MAD-352-MJP	Mobile Application Development Lab	4	--	4	40	60
DSC	CCT-353-MJ	Cloud Computing	4	4	--	40	60
DSC	CCL-354-MJP	Cloud Computing Lab	4	--	4	40	60
Minor	SPM-355-MN	Software Project Management	2	2	--	--	60
DSE	MLL-360-MJP	Machine Learning Lab	4	--	4	40	60
	DAL-361-MJP	Data Analytics Lab-II					
		Total Credits	**22**	**10**	**12**	**200**	**360**

Integrated MCA-IV Semester - VII							
Type	**Course Code**	**Title**	**Credit**	**Teaching Hours per week**		**Marks**	
				T	**P**	**Internal**	**External**
DSC	DAA-401-MJ	Design and Analysis of Algorithm	4	4	--	40	60
DSC	DAA-402-MJP	Design and Analysis of Algorithm Lab	2	--	2	40	--
RM	RMT-403-MJ	Research Methodology	4	4	--	40	60
DSC	AIT-404-MJ	Artificial Intelligence	4	4	--	40	60
DSC	LAI-405-MJP	Lab on Artificial Intelligence	2	--	2	40	---
FP	FPR-407-FP	Field Project	2	--	2	-	60
DSE	ATL-410-MJP	Automation Testing Lab	4	--	4	40	60
	BDA-411-MJP	Big Data Analytics Lab					
Total Credits			**22**	**12**	**10**	**240**	**300**

Integrated MCA-IV Semester - VIII							
Type	**Course Code**	**Title**	**Credit**	**Teaching Hours per week**		**Marks**	
				T	**P**	**Internal**	**External**
DSC	MLE-451-MJ	Machine Learning	4	4	--	40	60
DSC	MLL-452-MJP	Machine Learning Lab	2	--	2	40	--
DSC	BAC-453-MJ	Business Analytics Concepts & Applications	4	4	--	40	60
RP	RPR-454-RP	Research Project	6	--	6	50	100
DSE	ISE-460-MJ	Information Security	4	4	--	40	60
	IOT-461-MJ	Internet of Things					
DSE	ISL-462-MJ	Information Security Lab	4	4	-	100	
	ITL-463-MJ	Internet of Things Lab					
Total Credits			**24**	**16**	**8**	**310**	**280**

Integrated MCA-V Semester - IX							
Type	**Course Code**	**Title**	**Credit**	**Teaching Hours per week**		**Marks**	
				T	**P**	**Internal**	**External**
DSC	AML-501-MJ	Advance Machine Learning	4	4	--	40	60
DSC	AML-502-MJP	Advance Machine Learning Lab	2	--	2	40	--
DSC	ERP-503-MJ	Enterprise Resource Planning	4	4	--	40	60
OJT	IJT-504-OJT	Internship On Job Training (OJT)	4	--	4	40	60
DSE	BCT-510-MJ	Block Chain Technology	4	4	--	40	60
	DEV-511-MJ	Deveops					
DSE	BCD-512-MJP	Block Chain Development Lab	2	--	2	40	--
	DEV-513-MJP	Deveops Lab					
DSE	DMW-514-MJ	Data Mining And Warehousing	4	4	--	40	60
	NLP-515-MJ	Natural Language Processing					
		Total Credits	**24**	**16**	**08**	**280**	**300**

Integrated MCA-V Semester - X							
Type	**Course Code**	**Title**	**Credit**	**Teaching Hours per week**		**Marks**	
				T	**P**	**Internal**	**External**
MOOCS	MOC-551-MJP	MOOCS-Online Certificate Courses	8	--	8	200	--
OJT	INT-552-OJT	Industrial Training (On Job Training)	12	--	12	100	200
CEP	CES-553-MJP	Community Engagement and Service	2	--	2	50	--
		Total Credits	**22**	**--**	**22**	**350**	**200**

Semester I		
BCP-101-MJ - Basics of C Programming		
Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 04	Examination Scheme: Internal (TH): 40 Marks External (TH): 60 Marks Total : 100 Marks

Course Objectives:

- The objective of this course is to provide a broad overview of problem-solving techniques and use of c language programming to solve these problems.
- To Know the Basics of Programming and to understand how to use programming in day-to-day Applications.
- Explain use of appropriate data types, control statements.
- Demonstrate ability to use top-down program design.

Course Outcomes:

At the end of the course, students will be able to

CO1: Recall fundamental concepts of C programming, including syntax, data types, operators

CO2: Apply appropriate control structures to solve problems such as decision making and repetitive tasks.

CO3: Analyze the concept of function scope, recursion, and the importance of modular programming.

CO4: Evaluate the effectiveness of different data handling techniques (e.g., arrays, pointers, string) in solving particular problems.

CO5: Explain the difference between structures and unions and their memory allocation.

Course Contents

Unit No.	Contents	No of Sessions
Unit No.1 Introduction to Programming in C	1.1 History 1.2 Compilers and Interpreters 1.3 Structures of 'C' Programming 1.4 C Tokens, Keywords, Identifiers, Variables 1.5 Constant, Data Types, Variables and constants 1.6 Precedence and Associativity 1.7 Types of operators- arithmetic operators, relational operators, logical operators, Bit wise operators, increment, decrement operators, assignment operators, compound assignment operator, conditional expression, special operators. 1.8 Input and Output statements 1.9 Pre-processor directives in C	06 Hrs
Unit No.2 Control Structures	2.1 Decision making structures 2.2 If, if else 2.3 Nested If -else 2.4 Switch 2.5 Control structures 2.6 While 2.7 Do-while 2.8 For 2.9 Nested for loop 2.10 Other statements: break, continue. goto and exit.	06 Hrs
Unit No.3 Functions	3.1 Basic types of Function-Built in Functions, User Define Functions 3.2 Declaration and Definition 3.3 Return Keyword 3.4 Function argument (formal arguments, local arguments) 3.5 Function with default argument 3.6 Parameter passing, Call by value, Call by reference 3.7 Storage classes 3.8 Recursion	06 Hrs
Unit No.4 Array, Pointers and String	4.1 Array declaration, initialization 4.2 Types - one, two and multidimensional 4.3 What is Pointer? Pointer declaration, initialization. 4.4 Pointers arithmetic, Arrays of pointers, pointer to function. 4.5 Declaration and initialization	06 Hrs

	4.6 Standard library functions 4.7 Manipulating Strings 4.8 Strings and pointers	
Unit No.5 Structure and Union	5.1 Structure Basics 5.2 Creating structures 5.3 Accessing structure members (dot Operator) 5.4 Array of structures 5.5 Nested structures 5.6 Union: Difference between structure and union.	06 Hrs

Reference Books:

1. Cormen, Leiserson, Rivest, Stein, "Introduction to algorithms"
2. Brian W. Kernighan, Dennis M. Ritchie , "The C Programming Language", ISBN:9788120305960, PHI Learning
3. R.G. Dromey, "How to Solve it by Computer", ISBN: 9788131705629, Pearson Education
4. Behrouz A. Forouzan, RichardF. Gilberg, "A Structured Programming Approach Using C", ISBN:9788131500941, Cengage Learning India
5. E. Balaguruswamy, "Programming in ANSI C", ISBN: 9781259004612, Tata Mc-Graw Hill Publishing Co Ltd.-New Delhi

Semester I

CPL-102-MJP - C Programming Lab

Teaching Scheme: Practical Sessions: Total 30 Hours	Credit: 02	Examination Scheme: Internal (PR): 40 Marks Total :40 Marks

Course Objectives:

- The objective of this course is to provide a broad overview of problem solving techniques and use of c language programming to solve these problems.
- To Know the Basics of Programming and to Understand how to use programming in day to day Applications.
- Explain use of appropriate data types, control statements.
- Demonstrate ability to use top-down program design.

Course Outcomes:

- CO1: Understand fundamental concepts of C programming, including syntax, data types, operators
- CO2: Develop C programs using control structures for decision-making and iteration
- CO3: Analyze the concept of function scope, recursion, and the importance of modular programming.
- CO4: Evaluate the effectiveness of different data handling techniques (e.g., arrays, pointers, string) in solving particular problems.
- CO5: Describe the memory allocation differences between structures and unions.

Guidelines for Instructor's Manual

The instructor shall frame at least 15 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.

Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of DVD containing student's programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on overall performance of students. For each lab assignment, the instructor will assign grade/marks based on parameters such as timely completion, understanding, neatness etc. with appropriate

Sr. No.	Assignment List
1	Write a Simple Program to Take Input from the User and Display Output on the Screen.
2	Create a program that demonstrates the use of arithmetic and relational operators by comparing two user-provided numbers and displaying the results of various operations.
3	Write and Execute a Program on Use of Bitwise Operators
4	Assignment on use of while loops

5	Assignment on use of for loops
6	Assignment on nested loops
7	Assignment on exit, goto, continue, break
8	Assignment on menu driven programs.
9	Assignment on writing C programs in modular way (use of user defined functions)
10	Assignment on call by value
11	Assignment on call by reference
12	Assignment on recursive functions
13	Assignment on use of arrays (1-D array) and functions
14	Assignment on use of multidimensional array (2-D arrays) and functions
15	Assignment on Standard Library Function
16	Define a structure to represent a student with fields for name, age, and grade. Write a program to input and display these details.
17	Create a structure to represent a book with fields for title, author (as another structure), and publication year. Implement a program to input and display the book details.
18	Create a structure to represent a book with fields for title, author (as another structure), and publication year. Implement a program to input and display the book details.
19	Implement a program to print the size of a structure and a union with the same members. Compare and explain the differences in size.

Semester I

HWT-103-MJP - HTML and Web Technology Lab I

Teaching Scheme: Practical Sessions: Total 30 Hours	Credit: 02	Examination Scheme: Internal (PR): 40 Marks Total :40 Marks

Course Objectives:

- To understand the basic structure and elements of HTML for creating web pages.
- To apply CSS for styling and layout design in web development.
- To explore and implement CSS preprocessors like LESS and Sass for efficient styling.
- To develop responsive and visually appealing web page layouts.
- To enhance reusability, maintainability, and scalability of web designs through advanced CSS features

Course Outcomes:

CO1: Create basic web pages using HTML elements such as headings, lists, tables, forms, and images - Apply CO2: Apply CSS to style text, backgrounds, and layouts for creating visually appealing designs - Apply
CO3: Develop structured web layouts using CSS box models, grid systems, and responsive techniques - Analyze
CO4: Implement dynamic and reusable styles using LESS features such as variables, mixins, and nesting - Analyze
CO5: Design modular and scalable web pages using Sass functions, mixins, and responsive frameworks - Create

Guidelines for Instructor's Manual

The instructor shall frame at least 15 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.
Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on overall performance of students. For each lab assignment, the instructor will assign grade/marks based on parameters such as timely completion, understanding, neatness etc. with appropriate

Sr. No.	Assignment List
1	Basic HTML Page Creation: Create a simple HTML page with headings, paragraphs, and lists
2	Hyperlink Implementation: Add internal and external links to an HTML document.
3	Image Embedding: Insert and style images And Form within an HTML page.
4	Table Creation: Design a table to display structured data.
5	Style a Web Page with Basic CSS ● Apply CSS to style text, backgrounds, and margins of a simple HTML page.
6	Create a Box Layout ● Use CSS to create a layout with multiple boxes (e.g., a three-column layout) with different background colors and padding.
7	Design a Basic Button with Hover Effects ● Style a button with different states (normal, hover, active) using CSS.
8	Develop a Simple Footer Layout ● Create a footer with multiple columns and style it with CSS for a clean and organized appearance.
9	Use LESS Variables for Colors ● Define and apply variables in LESS for colors to standardize the color scheme across multiple elements.
10	Implement a LESS Mixins for Buttons ● Create a mixin in LESS for button styles and use it to apply consistent button styling.
11	Apply Nesting in LESS ● Use LESS nesting to write CSS for a simple navigation menu, demonstrating how nested rules are structured.
12	Build a Responsive Layout with LESS ● Develop a basic responsive layout using LESS, with media queries for different screen sizes
13	Create and Use Sass Variables ● Define variables in Sass for colors, fonts, and sizes, and apply them to style a simple HTML page.
14	Implement Sass Mixins for Reusable Styles ● Develop mixins in Sass for common styling patterns, such as border-radius or box-shadow.
15	Design a Simple Grid System with Sass ● Build a basic grid system using Sass, applying it to create a simple layout with columns.
16	Apply a Basic Sass Function for Color Manipulation ● Use a Sass function to adjust color brightness or contrast and apply it to different elements on a page.

Reference Books:

1. **"HTML and CSS: Design and Build Websites"** by Jon Duckett
2. **"Responsive Web Design with HTML5 and CSS"** by Ben Frain
3. "Mastering LESS" by Pradeep Gohil
4. "Sass for Web Designers" by Dan Cederholm (Indian Edition)

Semester I		
FOC-104-MJ - Fundamentals of Computer		
Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To understand the basic concepts, components, and evolution of computer systems.
- To learn about computer hardware, software, and various computer languages.
- To gain knowledge of data representation and number systems used in computing.
- To understand memory management concepts and develop algorithms using flowcharts.
- To explore fundamentals of computer networks and internet technologies.

Course Outcomes:

CO1: Describe the evolution, components, and types of computer systems - Remembering
CO2: Explain software, hardware, and data representation using number systems - Understanding CO3: Apply concepts of memory management and design basic algorithms using flowcharts - Applying
CO4: Analyze different types of computer networks, topologies, and communication methods - Analyzing
CO5: Demonstrate understanding of internetworking, services, and applications - Understanding / Applying

Course Contents

Unit No.	Contents	No of Sessions
Unit No.1 Introduction to Computer Systems	1.1 History and Generations of Computers 1.2 Definition and Characteristics of a Computer 1.3 Block Diagram of Computer System 1.4 Types of Computers (Analog, Digital, Hybrid, Super, Mini, Micro) 1.5 Applications of Computers in Various Fields	06 Hrs
Unit No.2 Computer Components and Languages	2.1 Hardware, Software, and Firmware - Definitions and Differences 2.2 System Software and Application Software 2.3 Translators: Compiler, Interpreter, Assembler 2.4 Loader and Linker 2.5 Computer Languages - Machine, Assembly, High-level Languages	06 Hrs
Unit No.3 Data Representation and Number Systems	3.1 Introduction to Number Systems - Decimal, Binary, Octal, Hexadecimal 3.2 Conversion between Number Systems 3.3 Binary Arithmetic (Addition, Subtraction, Multiplication, Division) 3.4 Representation of Characters (ASCII, Unicode) 3.5 Importance of Data Representation in Computing	06 Hrs
Unit No.4 Memory Management and Program Design	4.1 Memory Management Concepts 4.2 Types of Memory - Primary (RAM, ROM, PROM, EPROM) 4.3 Secondary Memory - Magnetic Disk, Hard Disk, CD, Pen Drive 4.4 Algorithms and Program Development Steps 4.5 Flowcharts - Symbols, Logic Design, and Examples	06 Hrs
Unit No.5 Networking Fundamentals and Internet Concepts	5.1 Definition and Importance of Computer Networks 5.2 Types of Networks - LAN, MAN, WAN 5.3 Network Topologies - Star, Tree, Bus, Ring, Mesh, Fully Connected 5.4 Wired and Wireless Networks 5.5 Internet - History, Working, Applications, and Services	06 Hrs

Reference Books:

1. Fundamentals of computer - V. Raja Raman, (PHI Publication)**/SBW**10:812034011
2. Computer Networks - Andrew S. Tanenbaum , Fourth Edition. **/SBWnumber**0130661023
3. Computer and studies a first course - Roger Hunt and John Shelley, (PHI Publication)**/SBW**10:0131646737
4. Cloud Computing for Dummies -Hurwitz Judith S. and Daniel Kirsch.

Semester I

DMA-105-MJ - Discrete Mathematics - I

Teaching Scheme:	Credit: 02	Examination Scheme:
Theory Sessions: Total 30 Hours		External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To introduce fundamental concepts of logic, propositions, and methods of reasoning.
- To develop understanding of set theory and its applications in computer science.
- To familiarize students with matrix operations and determinants for problem solving.
- To explain the concept of relations, their properties, and their role in data organization.
- To enable students to understand and apply different types of functions in mathematical modeling.

Course Outcomes:

CO1: Explain fundamental concepts of logic and construct truth tables for logical expressions - Understand CO2: Apply set theory operations and use Venn diagrams to solve related problems - Apply
CO3: Perform matrix operations and compute determinants to solve mathematical problems - Apply CO4: Analyze relations and their properties for practical data and structural applications - Analyze
CO5: Interpret and apply different types of functions in mathematical and computational contexts - Apply / Analyze

Course Contents

Unit No.	Contents	No of Sessions
Unit No.1 Fundamentals of Logic	1.1 Introduction to Logic - Meaning, Propositions, Logical Operators (Negation, Conjunction, Disjunction) 1.2 Implication, Double Implication, Equivalence, Logical Equivalence of Statements 1.3 Truth Tables, Construction of Truth Tables, Tautology, Contradiction 1.4 Arguments - Valid and Invalid Arguments, Normal Forms using Truth Table	06 Hrs
Unit No.2 Set Theory and Operations	2.1 Meaning of a Set, Methods of Describing Sets - Tabular Form, Set Builder Form 2.2 Types of Sets - Finite, Infinite, Equal, Overlapping, Disjoint, Complementary 2.3 Operations on Sets - Union, Intersection, Difference 2.4 Laws of Set Theory - De Morgan's Laws, Venn Diagrams, Cartesian Product of Two Sets, Introduction to Groups and Semigroups	06 Hrs
Unit No.3 Matrices and Determinants	3.1 Basics of Matrices - Meaning, Order, and Types of Matrices (Zero, Column, Square, Diagonal, Scalar, Unit, Symmetric, Skew-Symmetric) 3.2 Matrix Operations - Transpose, Addition, Subtraction, Multiplication, Singular and Non-Singular Matrices 3.3 Determinants - Evaluation of Second and Third Order Determinants, Minor, Cofactor, Adjoint, and Inverse of a Matrix (Adjoint Method)	06 Hrs
Unit No.4 Relations and Their Properties	4.1 Meaning and Definition of Relations, Representation of Relations 4.2 Properties of Relations - Reflexive, Symmetric, Transitive 4.3 Equivalence Relations, Congruence Relations, and Closures of Relations 4.4 n-ary Relations and Their Applications	06 Hrs
Unit No.5 Functions and Their Types	5.1 Meaning of a Function, Methods of Describing a Function, Domain, Codomain, Range 5.2 Types of Functions - One-One, Onto, Many-One, Constant, Identity, Polynomial, Linear, Rational 5.3 Exponential, Logarithmic, Explicit, Implicit, Even and Odd Functions 5.4 Composite Functions and Inverse Functions	06 Hrs

Reference Books:

1. Sancheti&Kapoor, Business Mathematics ,Sultan Chand & Co. New Delhi.
2. Anand Sharma ,Business Mathematics & Analytics Himalaya Publishing
3. Dr.Ramnath Dixit and Dr.Jinendra Jain Business Mathematics Himalaya Publishing
4. G. S. S. BhishmaRao, Mathematical Foundation of Computer Science, Scitech publication, India Pvt. LTD. Edition 2nd ISBN 0 – 07 – Y85493 –9
5. Tremblay, Discrete Mathematics, TATA Mcgraw Hill ISBN 13:9780074631133

Semester I

ESS-106-MJ - Environment Science and Sustainability

Teaching Scheme:	Credit: 02	Examination Scheme:
Theory Sessions: Total 30 Hours		Internal (TH): 40 Marks Total : 40 Marks

Course Objectives:

- To understand the basics of environmental science and ecology.
- To learn key concepts of sustainability and human-environment interaction.
- To analyze the impact of human activities on the environment.
- To explore sustainable and green business practices.
- To evaluate global environmental challenges and solutions.

Course Outcomes:

CO1: Explain key concepts of environmental science, ecology, and sustainability - Understand CO2: Analyze human impact on the environment through population growth and pollution - Analyze CO3: Apply principles of resource and waste management for environmental protection - Apply CO4: Evaluate sustainable business practices, CSR, and circular economy models - Evaluate
CO5: Assess global environmental challenges and propose sustainable solutions - Create / Evaluate

Course Contents

Unit No.	Contents	No of Sessions
Unit No.1 Introduction to Environmental Science and Ecology	1.1 Overview of environmental science 1.2 Concept and scope of ecology 1.3 Human-environment relationships 1.4 Principles of resource management	06 Hrs
Unit No.2 Sustainability and Environmental Awareness	2.1 Concept of sustainability and sustainable development 2.2 Environmental ethics and awareness 2.3 Environmental education and community involvement 2.4 Case studies on sustainability initiatives	06 Hrs
Unit No.3 Environmental Impact of Human Activities	3.1 Population growth and resource consumption 3.2 Pollution - air, water, and soil 3.3 Waste management and recycling practices 3.4 Climate change and global warming	06 Hrs
Unit No.4 Sustainable Business and Green Practices	4.1 Corporate Social Responsibility (CSR) and sustainability 4.2 Green business models and circular economy 4.3 Environmental certifications and green standards 4.4 Sustainable entrepreneurship and innovation	06 Hrs
Unit No.5 Global Environmental Challenges and Solutions	5.1 Biodiversity and conservation 5.2 Water and energy resource management 5.3 International environmental agreements and global cooperation 5.4 Role of businesses and individuals in environmental protection	06 Hrs

Reference Books:

1. Cunningham, W. P., & Cunningham, M. A. (2020). Environmental Science: A Global Concern. McGraw-Hill Education.
2. Rajagopalan, R. (2016). Environmental Studies: From Crisis to Cure. Oxford University Press.
3. Harris, J. M. (2017). Environmental and Natural Resource Economics: A Contemporary Approach. Routledge.
4. Das, S. (2018). Sustainable Development and Environmental Management. Sage Publications India Pvt. Ltd.

Semester I

IKS-107-MJ - Indian Knowledge System

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: Internal (TH): 40 Marks Total : 40 Marks

Course Objectives:

- To understand the origin, scope, and relevance of Indian Knowledge Systems.
- To learn the ethical and philosophical foundations of Indian traditions.
- To explore leadership and management principles from Indian epics and texts.
- To appreciate the richness of Indian art, culture, and creative expressions.
- To examine ancient India's trade, commerce, and technological advancements.

Course Outcomes:

CO1: Explain the origin, scope, and significance of Indian Knowledge Systems - Understand
CO2: Interpret ethical and philosophical concepts such as Dharma, Artha, Kama, and Moksha - Understand / Analyze CO3: Analyze leadership and management principles from Indian epics and classical texts - Analyze
CO4: Appreciate the diversity of Indian art, culture, and creative heritage - Evaluate
CO5: Assess the contributions of ancient India in trade, commerce, and technological development - Evaluate / Apply

Course Contents

Unit No.	Contents	No of Sessions
Unit No.1 Introduction to Indian Knowledge Systems	1.1 Definition, scope, and relevance of IKS 1.2 Historical evolution and influence of dynasties and empires 1.3 Overview of key texts: Vedas, Upanishads, Epics, and Puranas 1.4 Importance of Indian scientific and technical texts: Arthashastra, Charaka Samhita, Sushruta Samhita, etc.	06 Hrs
Unit No.2 Ethical and Philosophical Foundations	2.1 Concepts of Dharma, Artha, Kama, and Moksha 2.2 Introduction to Indian ethical systems - Yamas and Niyamas 2.3 Philosophical schools: Vedanta, Buddhism, and Jainism 2.4 Moral and spiritual values from ancient texts	06 Hrs
Unit No.3 Leadership and Management in Indian Epics	3.1 Leadership lessons from Ramayana - Rama's integrity and Hanuman's devotion 3.2 Leadership lessons from Mahabharata - Krishna's strategic leadership, Yudhisthira's ethics, Draupadi's courage 3.3 Introduction to Arthashastra - Historical background and relevance in modern governance 3.4 Kautilya's insights on administration, diplomacy, and economics	06 Hrs
Unit No.4 Indian Art, Culture, and Creativity	4.1 The 64 types of Indian arts - performing, visual, and creative 4.2 Overview of Bharata's Natyashastra - dance, drama, and music 4.3 Indian art heritage - painting, sculpture (Ajanta, Ellora, Khajuraho) 4.4 Influence of art and aesthetics in social and spiritual life	06 Hrs
Unit No.5 Trade, Commerce, and Technological Advancements	5.1 Ancient Indian trade and industry - textiles, metallurgy, ceramics, and crafts 5.2 Economic systems and market organization in ancient India 5.3 Transportation and travel - chariots, bullock carts, camel caravans, naval trade 5.4 Major ports, imports, and exports - global trade connections of ancient India	06 Hrs

Reference Books:

1. Radhakrishanan, S. (2009). *Indian Philosophy* (Vol. 1 & 2). Oxford University Press.
2. Chatterjee, S., & Datta, D. (1984). *An Introduction to Indian Philosophy*. University of Calcutta.
3. Paranjpe, A. C. (1998). *Self and Identity in Modern Psychology and Indian Thought*. Springer.
4. Sharma, R. N. (1999). *Foundations of Indian Psychology*. Abhinav publications.
5. Chopra, P. N., Puri B. N., Das, M. N., A social, Cultural and Economic History of India, Vol- I College Book House, Trivendrum, 1974. Concept Publishing Company, New Delhi. Cultures, pp.3180-3186.D. K. Print world

Semester I

MAF-110-MJ - Management Fundamentals

Teaching Scheme:	Credit: 02	Examination Scheme:
Theory Sessions: Total 30 Hours		External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To be able to understand the Foundations of Management
- To learn the Processes of Forecasting, Planning, and Organizing.
- To develop Skills in Coordination and Decision-Making.

Course Outcomes:

CO1 - Understand the Fundamentals of Management
CO2 - Apply Managerial Functions and Levels in Organizations
CO3 - Analyze Planning and Decision-Making Processes
CO4 - Demonstrate Organizational Structure and Coordination Skills CO5
- Evaluate Contemporary Management Practices

Course Contents

Unit No.	Contents	No of Sessions
Unit No.1 Fundamentals of Management	1.1 Introduction, Definition, and Nature of Management 1.2 Characteristics and Importance of Management 1.3 Management as a Science, Art, and Profession 1.4 Role of Management in IT and Modern Organization	6 Hrs
Unit No.2 Functions and Levels of Management	2.1 Managerial Functions: Planning, Organizing, Staffing, Directing, Controlling 2.2 Levels of Management: Top, Middle, and Lower 2.3 Roles and Responsibilities of Managers at Each Level 2.4 Managerial Skills for Technical Managers	6 Hrs
Unit No.3 Planning and Decision Making	3.1 Meaning, Definition, and Importance of Planning 3.2 Steps and Essentials of Effective Planning 3.3 Types of Plans and Planning Tools 3.4 Decision Making: Meaning, Process, and Techniques 3.5 Relationship between Planning and Decision Making	6 Hrs
Unit No.4 Organizing and Coordination	4.1 Meaning, Definition, and Objectives of Organizing 4.2 Principles of Organization Structure 4.3 Coordination: Nature, Need, and Importance 4.4 Techniques for Effective Coordination 4.5 Organizational Design in IT Projects	6 Hrs
Unit No.5 Contemporary Management Functions	5.1 Staffing: Meaning, Process, and Importance 5.2 Directing: Leadership, Motivation, and Communication 5.3 Controlling: Process and Techniques 5.4 Emerging Trends in Management (Agile, Remote Teams, Digital Management Tools)	6 Hrs

Reference Books:

1. Principles of Management: T. Ramasamy, Himalaya.
2. Principles of Management: Dr. K Natarajan &Dr. K. P. Ganeshan. Himalaya.
3. Management Process: Koontz& O'Donnell, Tata-McGraw-Hill publishers Delhi.
4. Management of System: By A. K. Gupta & J. K. Sharma, Mac-Millan Publication, Delhi.
5. Principles of Management: Prakash Kothari, B. J. Lathi, Atharv Publication, Jalgaon.
6. Management & Organizational Behavior-By P. SubbaRao, Himalaya publication.
7. Business Organization & Management-By R.N. Gupta, Sultan Chand &Sons publication, Delhi

Semester I

POA-111-MJ - Principles of Accounting-I

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To introduce the fundamental concepts and objectives of book-keeping and accountancy
- To develop understanding of basic accounting principles, concepts, conventions, and standards (AS & IFRS)
- To explain the double-entry system of accounting and classification of accounts
- To enable students to identify and apply key accounting terminologies and concepts
- To equip students with the skills to record journal entries and maintain books of original entry

Course Outcomes:

CO1: Explain the meaning, objectives, and importance of book-keeping and accountancy - Understand
CO2: Demonstrate understanding of accounting concepts, conventions, and standards - Understand CO3: Apply double entry principles and record accounting transactions accurately - Apply
CO4: Interpret accounting terms and concepts in financial reporting - Apply
CO5: Prepare journal entries and record business transactions including GST adjustments - Apply / Analyze

Course Contents

Unit No.	Contents	No of Sessions
Unit No.1 Introduction to Book-Keeping and Accountancy	1.1 Meaning, Definition, and Objectives of Book-keeping and Accountancy 1.2 Importance of Book-keeping 1.3 Difference between Book-keeping and Accountancy 1.4 Basis of Accounting System 1.5 Advantages and Limitations of Financial Accounting 1.6 Users of Accounting Information 1.7 Qualitative Characteristics of Accounting Information 1.8Basic Accounting Terminologies	6 Hrs
Unit No.2 Accounting Principles, Concepts and Standards	2.1 Meaning and Definition of Accountancy 2.2 Accounting Concepts, Conventions, and Principles 2.3 Fundamental Accounting Assumptions 2.4 Overview of Accounting Standards (AS) and International Financial 2.5 Reporting Standards (IFRS) 2.6 Importance and Need for Harmonization in Accounting	6 Hrs
Unit No.3 Double Entry System and Classification of Accounts	3.1 Meaning and Definition of Double Entry Book-keeping 3.2 Advantages of Double Entry System 3.3 Methods of Recording Accounting Information (Single, Double, Indian Methods) 3.4 Classification of Accounts 3.5 Golden Rules of Debit and Credit (Traditional Approach) 3.6 Modern Approach to Accounting Rules 3.7 Accounting Equations and Illustrations	6 Hrs
Unit No.4 Accounting Concepts and Common Accounting Terms	4.1 Key Accounting Concepts 4.1.1 Entity Concept 4.1.2 Dual Aspect Concept 4.1.3 Accounting Period Concept 4.1.4 Going Concern Concept 4.1.5 Cost Concept 4.1.6 Money Measurement Concept 4.1.7 Matching Concept 4.1.8 Realization Concept 4.1.9 Accrual Concept 4.1.10 Rupee Value Concept 4.2 Common Accounting Terms 4.2.1 Debtors, Creditors, Bills Receivable, Bills Payable 4.2.2Credit Note, Debit Note, Petty Cash 4.2.3Contra Entry, Trade Discount, Cash Discount, Suspense Account	6 Hrs
Unit No.5 Journal and Recording of Transactions	5.1 Meaning, Importance, and Utility of Accounting Documents 5.2 Meaning and Definition of Journal 5.3 Importance and Utility of Journal 5.4 Specimen and Format of Journal 5.5 Recording of Journal Entries (Including Transactions with GST) 5.6 Practical Illustrations	6 Hrs

Reference Books:

1. Robert N. Anthony, David F. Hawkins, Kenneth A. Merchant. Accountancy- text and cases. McGraw Hill Education (India) Private Limited, New Delhi.
2. Fundamentals of Accounting by Dr. S.N. Maheshwari, Dr.S.K. Maheshwari- Vikas Publishing House(ISBN-139788180544491).
3. Financial accounting: By Jane Reimers (Pearson Education) ISBN: 9780136115274.
4. Book - Keeping and Accountancy Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune - 411 004
5. Principles & Practice of Accountancy (All India) - Gupta R.L. & Gupta V.K.: A widely used Indian classic, designed for students of B.Com/CA foundation etc. Authors: R.L. Gupta & V.K. Gupta. Edition: "All India" version (recent editions). Sultan Chand & Sons+1
6. Principles of Accounting [for Various Universities] - (Indian Publication): A more general introductory text for various Indian universities; good for basics like bookkeeping, accounting concepts, etc.
7. Financial Accounting, 13th Edition - Bhushan Kumar Goyal & H.N. Tiwari: More advanced and up-to-date edition covering Indian Accounting Standards/Ind-AS etc. Authors: Bhushan Kumar Goyal & H.N. Tiwari.

Semester I		
DGM-112-MJ - Digital Marketing - I		
Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To understand the fundamentals and scope of digital marketing.
- To learn the basics of search engines and SEO techniques.
- To apply advanced SEO strategies for improving online visibility.
- To explore social media marketing tools and engagement methods.
- To develop effective content strategies and manage online reputation.

Course Outcomes:

CO1: Explain the fundamentals, importance, and scope of digital marketing in the modern business environment - Understand
CO2: Apply basic SEO techniques and tools to enhance website ranking and visibility - Apply
CO3: Analyze advanced SEO strategies and evaluate their effectiveness in digital campaigns - Analyze
CO4: Utilize social media platforms and tools to plan and manage marketing campaigns - Apply
CO5: Develop and manage content strategies while maintaining a strong online brand reputation - Create

Course Contents

Unit No.	Contents	No of Sessions
Unit No.1 Fundamentals of Digital Marketing	1.1 Overview of Digital Marketing 1.2 Key Differences between Digital and Traditional Marketing 1.3 Importance of Digital Marketing in the Modern Business Environment 1.4 The Digital Marketing Landscape 1.5 Digital Marketing Channels and Types 1.6 The Digital Consumer and Customer Journey 1.7 Digital Marketing Strategy and Planning	6 Hrs
Unit No.2 Search Engines and SEO Basics	2.1 Understanding Search Engines and How They Work 2.2 SEO Fundamentals and Importance 2.3 On-Page SEO Techniques 2.4 Off-Page SEO Techniques 2.5 SEO Tools for Analysis and Monitoring 2.6 Common SEO Mistakes to Avoid	6 Hrs
Unit No.3 Advanced SEO and Digital Visibility	3.1 Technical SEO Overview 3.2 Keyword Research and Optimization 3.3 Link Building Strategies 3.4 Local SEO and Voice Search 3.5 Measuring SEO Performance and Analytics 3.6 Future Trends in SEO	6 Hrs

Unit No.4 Social Media Marketing	4.1 The Role of Social Media in Digital Marketing 4.2 Social Media Platforms Overview (Facebook, Instagram, LinkedIn, YouTube, X/Twitter) 4.3 Social Media Advertising and Campaign Planning 4.4 Social Media Analytics and Reporting 4.5 Influencer Marketing 4.6 Online Community Building and Engagement	6 Hrs
Unit No.5 Content Strategy and Online Reputation Management	5.1 Content Creation and Curation Strategies 5.2 Content Marketing Types and Formats (Blogs, Videos, Infographics) 5.3 Social Media Listening Tools 5.4 Managing Brand Reputation Online 5.5 Future Trends in Content and Social Media Marketing	6 Hrs

Reference Books:

1. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).
2. Menon, Arpita; Media Planning and Buying; McGraw Hill (1st Edition, 2010)
3. Arnold, George; Media Writer's Handbook: A Guide to Common Writing and Editing Problems; McGraw-HillEducation; (5thedition, 2008)
4. Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page(3rd Edition, 2014).

Semester I

PFP-113-MJ - Personals Financial Planning-I

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To understand the basic concepts of finance and financial planning.
- To learn the importance of savings and various investment avenues.
- To analyze different types of risks and the role of portfolio management.
- To gain knowledge of credit, debt management, and responsible borrowing.
- To explore various financial instruments and evaluate their suitability for investment.

Course Outcomes:

CO1: Explain the fundamental concepts of finance and financial planning in achieving personal and professional financial goals - Understand

CO2: Demonstrate importance of savings and identify suitable investment options for different financial objectives - Apply

CO3: Analyze various types of risks and apply portfolio diversification techniques to manage investment risks - Analyze

CO4: Evaluate credit and debt management strategies for maintaining good financial health - Evaluate

CO5: Design an appropriate investment portfolio using financial instruments such as bonds, mutual funds, digital assets - Create

Course Contents

Unit No.	Contents	No of Sessions
Unit No.1 Introduction to Finance and Financial Planning	1.1 Meaning and Concept of Finance 1.2 Meaning and Importance of Financial Planning 1.3 Financial Goals - Types of Financial Goals 1.4 Types of Investors 1.5 Financial Planning Strategies 1.6 Budgeting of Income and Payments 1.7 Role of Financial Discipline in Planning	6 Hrs
Unit No.2 Savings and Investment Fundamentals	2.1 Meaning and Benefits of Savings 2.2 Objectives and Importance of Investment 2.3 Types of Investment 2.4 Steps in Investment Process 2.5 Relationship between Savings and Investment 2.6 Short-term vs. Long-term Investments	6 Hrs

Unit No.3 Risk and Portfolio Management	3.1 Concept and Nature of Risk 3.2 Types of Risk (Business, Market, Financial, etc.) 3.3 Risk and Return Relationship 3.4 Portfolio Formation and Diversification 3.5 Benefits and Limitations of Portfolio Diversification	6 Hrs
Unit No.4 Credit and Debt Management	4.1 Building and Maintaining Good Credit 4.2 Credit Basics and Debt Management 4.3 Sources of Debt and Borrowing 4.4 Credit Report and Credit Score - Components and Importance 4.5 Strategies for Responsible Borrowing	6 Hrs
Unit No.5 Investment Options and Financial Instruments	5.1 Basics of Investment Instruments 5.2 Bonds - Concept, Features, and Gold Bonds (Benefits & Drawbacks) 5.3 Real Estate - Meaning, Characteristics, and Types 5.4 Mutual Funds - Types, Advantages, and Disadvantages 5.5 Investment in Fixed Income Instruments 5.6 Digital Currency - Types, Advantages, and Risks	6 Hrs

Reference Books:

1 Halan, M. "*Let's Talk Money: You've Worked Hard for It, Now Make It Work for You*" Harper Collins Publishers, New York.
2 *Indian Institute of Banking & Finance. "Introduction to Financial Planning"* Taxmann Publication, New Delhi.
3 Keown A.J. "Personal Finance" Pearson, New York.
4 Madura, J. "Personal Finance", Pearson
5 Pandit , A. "*The Only Financial Planning Book that You Will Ever Need" Network 18 Publications Ltd.*, Mumbai.
6 Sinha, M. "Financial Pfanning: *A Ready Reckoner*" McGraw Hill Education, New York.
7 Tripathi, V. "*Fundamentals of Investment*" Taxmann Publication, New Delhi.

Semester II

OOP-151-MJ - Object Oriented Programming using C++

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 04	Examination Scheme: Internal (TH): 40 Marks External (TH): 60 Marks Total : 100 Marks

Course Objectives:

- To understand the principles and benefits of the Object-Oriented Paradigm.
- To learn the syntax and structure of the C++ programming language.
- To explore the concepts of classes, objects, inheritance, and polymorphism.
- To develop the ability to solve problems using OOP techniques in C++.
- To enhance skills in writing, testing, and debugging C++ programs.

Course Outcomes:

CO1: Explain the fundamental concepts and need of Object-Oriented Programming. - Understand CO2: Apply basic programming constructs, pointers, and functions in C++. - Apply
CO3: Develop and implement classes, objects, and constructors to model real-world entities. - Apply
CO4: Analyze and implement inheritance and polymorphism to achieve reusability and extensibility in programs. - Analyze
CO5: Design generic, robust, file-based C++ applications using templates, exception handling, file operations. - Create

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Object-Oriented Programming	1.1 Introduction to Object-Oriented Paradigm 1.2 Need for Object-Oriented Programming 1.3 Characteristics of OOP (Encapsulation, Abstraction, Inheritance, Polymorphism) 1.4 Difference between Structured Programming and OOP	06 Hrs

Unit 2: C++ Fundamentals and Control Structures	2.1 Input/Output in C++ (cin, cout, iostream) 2.2 Control & Conditional Statements (if, else, switch, loops) 2.3 Pointer Variables (Declaration, Initialization, Dereferencing, Arrays, Pointer Arithmetic) 2.4 Functions and Components (Parameter Passing by Value, Reference, Pointer, Recursion)	06 Hrs
Unit 3: Classes, Objects, and Constructors	3.1 Class Declaration (Data Members, Member Functions) 3.2 Constructors (Default, Parameterized, Copy) 3.3 Destructors 3.4 Friend Class and Friend Function 3.5 Difference between Class and Structure	06 Hrs
Unit 4: Inheritance and Polymorphism	4.1 Inheritance: Definition, Concept, and Types (Single, Multiple, Multilevel, Hierarchical, Hybrid) 4.2 Visibility Modes (Public, Private, Protected) 4.3 Virtual Base Class 4.4 Operator Overloading (Unary, Binary, Friend Function, Rules) 4.5 Function Overloading 4.6 Virtual Functions and Pure Virtual Functions (Polymorphism, Overriding, Abstract Classes)	06 Hrs
Unit 5: Templates, Exception & File Handling	5.1 Function Templates (Generic Programming) 5.2 Exception Handling Constructs (try, catch, throw) 5.3 File Handling Concepts (File Modes, File Streams, Read and Write Functions)	06 Hrs

Reference Books:

1. Object-Oriented Programming in C++ - E. Balagurusamy, Tata McGraw-Hill.
2. C++: The Complete Reference - Herbert Schildt, McGraw-Hill Education.
3. Programming in C++ - Ashok N. Kamthane, Pearson Education.
4. The C++ Programming Language - Bjarne Stroustrup, Addison-Wesley.

Semester II

CLA-152-MJP - C++ Lab

Teaching Scheme: Practical Sessions: Total 30 Hours	Credit: 02	Examination Scheme: Internal (PR): 40 Marks Total :40 Marks

Course Objectives:

- To understand the principles and benefits of the Object-Oriented Paradigm.
- To learn the syntax and structure of the C++ programming language.
- To explore the concepts of classes, objects, inheritance, and polymorphism.
- To develop the ability to solve problems using OOP techniques in C++.
- To enhance skills in writing, testing, and debugging C++ programs.

Course Outcomes:

CO1: Understand the basic programming skills including variables, control structures, functions, and arithmetic operations etc. - Understand

CO2: Understand and apply OOP principles like encapsulation, inheritance, and polymorphism, including implementing classes with constructors/destructors, function overloading, and operator overloading. - Understand and Apply

CO3: Learn advanced techniques including dynamic memory management, exception handling, and file operations, enabling effective memory management and error handling. - Understand and Apply

CO4: Understand basic data structures such as arrays and strings. - Understand

CO5: Understand Pointer and Memory Management. - Understand

Guidelines for Instructor's Manual

The instructor shall frame at least 15 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.

Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of the shared drive containing students' programs maintained by the lab in-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on overall performance of students. For each lab assignment, the instructor will assign grade/marks based on parameters such as timely completion, understanding, neatness etc. with appropriate

Sr. No.	Assignment List
1	Write a program to check whether a number is even or odd using if-else.
2	Write a program to calculate the sum and average of three numbers using control structure.
3	Write a program to determine whether a number is prime or composite.
4	Write a program to calculate the sum, difference, product, and quotient of two integers.
5	Write a program to demonstrate use of function overloading. (e.g., area of a circle, rectangle, and triangle).
6	Write a program to demonstrate encapsulation using of class.
7	Write a program to demonstrate the use of different types of constructors and a destructor in a class.
8	Write a program to demonstrate single inheritance.
9	Write a program to demonstrate multiple inheritance.
10	Write a program to demonstrate use of unary operator overloading.
11	Write a program to demonstrate use of binary operator overloading.
12	Write a program to demonstrate use of friend function.
13	Write a program to demonstrate use of virtual function.
14	a) Write a program to demonstrate the use of a pointer to pointer. b) Write a program to create pointers that point to objects and access their members. c) Write a program to demonstrate the use of pointers to functions.
15	Write a program to demonstrate use of Exception Handling.
16	a) Write a program to find the largest and smallest elements from an array. b) Write a program to sort an array in ascending and descending order.
17	Write a program to concatenate two strings and find the length of a string.
18	Write a program to calculate the factorial of a number using recursion
19	Write a program that demonstrates different types of polymorphism (e.g. method overriding).
20	Write a program to demonstrate use of File Handling.
21	Write a program to allocate and deallocate memory dynamically using pointers.

Semester II

SWE-153-MN - Software Engineering

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 04	Examination Scheme: Internal (TH): 40 Marks External (TH): 60 Marks Total : 100 Marks

Course Objectives:

- To understand the principles and benefits of the Object-Oriented Paradigm.
- To learn the syntax and structure of the C++ programming language.
- To explore the concepts of classes, objects, inheritance, and polymorphism.
- To develop the ability to solve problems using OOP techniques in C++.
- To enhance skills in writing, testing, and debugging C++ programs.

Course Outcomes:

CO1: Explain the basic system concepts and SDLC phases. - Understand
CO2: Analyze business requirements and conduct feasibility studies. - Analyze
CO3: Apply modeling techniques (DFD, ERD, Use Case) to system analysis. - Apply
CO4: Design system architecture and database components effectively. - Apply
CO5: Evaluate system implementation, testing, and maintenance strategies. - Evaluate

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Systems and SDLC	1.1 Introduction to System Concepts: Definition and characteristics of a system, Types of systems (open, closed, physical, abstract), Subsystems and system boundaries 1.2 System Development Life Cycle (SDLC): Phases – Planning, Analysis, Design, Implementation, and Maintenance 1.3 Advantages and Limitations of SDLC, Role of System Analysts and Stakeholders	06 Hrs
Unit 2: Problem Identification and Feasibility Study	2.1 Identifying System Requirements 2.2 Feasibility Analysis: Technical, Economic, Legal, Operational, and Schedule Feasibility 2.3 Preparation of Feasibility Report and its Components	06 Hrs
Unit 3: System Modelling using DFD, ERD & Use Cases	3.1 Data Flow Diagrams (DFD): Symbols, Rules, Levels (Context, Level 0, Level 1), and Construction Techniques 3.2 Entity Relationship Diagrams (ERD): Entities, Attributes, Relationships, Cardinality, Participation, and Normalization (1NF-3NF) 3.3 Use Case Diagrams: Actors, Use Cases, Relationships (Include, Extend, Generalization), and Creating Use Cases for Scenarios	06 Hrs
Unit 4: System and Database Design	4.1 System Design Strategies: Structured vs. Object-Oriented Design, Modular Design (Coupling and Cohesion) 4.2 Input/Output Design: Principles and User Interface Design Guidelines 4.3 Database Design: Conceptual, Logical, and Physical Design, Normalization, Schema Implementation	06 Hrs
Unit 5: System Implementation, Testing, and Maintenance	5.1 System Testing: Types – Unit, Integration, System, and Acceptance Testing 5.2 Implementation Strategies: Direct Cutover, Parallel, Phased, and Pilot Implementation 5.3 Post-Implementation Review, Evaluation, and Maintenance Activities	06 Hrs

Reference Books:

1. “Systems Analysis and Design" by Kenneth E. Kendall, Julie E. Kendall
2. "Modern Systems Analysis and Design" by Jeffrey A. Hoffer, Joey F. George, and Joseph S. Valacich
3. "Systems Analysis and Design" by Alan Dennis, Barbara Haley Wixom, and Roberta M. Roth
4. “Fundamentals of Software Architecture” by Mark Richards & Neal Ford.

Semester II		
WTL-154-MJP - Web Technology Lab-II		
Teaching Scheme: Practical Sessions: Total 30 Hours	Credit: 02	Examination Scheme: Internal (PR): 40 Marks Total :40 Marks

Course Objectives:

- To understand the core concepts and syntax of JavaScript for creating interactive and dynamic web pages.
- To apply Node.js fundamentals to develop server-side logic, handle HTTP requests, and manage data effectively.
- To develop RESTful APIs using Express.js to enable communication between client and server applications.
- To utilize Bootstrap components and frameworks to design responsive, user-friendly, and mobile-compatible web interfaces.
- To integrate JavaScript, Node.js, Express.js, and Bootstrap to build and deploy full-stack web applications.

Course Outcomes:

CO1: Develop interactive and dynamic web applications using JavaScript to enhance front-end functionality. (Applying)
CO2: Implement server-side programming using Node.js and Express.js to build robust and scalable backend systems. (Applying)
CO3: Design responsive and visually appealing web pages using Bootstrap, ensuring cross-device and browser compatibility. (Applying)
CO4: Integrate client-side and server-side components to create seamless full-stack web applications. (Creating)
CO5: Deploy and test web applications to ensure functionality, performance, and user experience optimization. (Evaluating)

Guidelines for Instructor's Manual

The instructor shall frame at least 15 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.
Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of the shared drive containing students' programs maintained by the lab in-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on overall performance of students. For each lab assignment, the instructor will assign grade/marks based on parameters such as timely completion, understanding, neatness etc. with appropriate

Sr. No.	Assignment List
1	Basic JavaScript Program: Write a simple JavaScript program to perform arithmetic operations.
2	Control Structures: Implement a JavaScript program using if-else statements and loops
3	JavaScript Functions: Create and invoke functions that perform specific tasks.
4	Event Handling: Develop a web page where JavaScript responds to user events (e.g., button clicks).
5	Perform a practical on node js installation
6	Set Up a Basic Node.js Server • Create a basic HTTP server using Node.js that responds with "Hello, World!" to any request.
7	Create a REST API with Node.js • Develop a basic REST API using Node.js that performs CR (Create, Read) operations on a simple data set.
8	Create a REST API with Node.js • Develop a basic REST API using Node.js that performs UD (Update, Delete) operations on a simple data set.
9	Perform a practical on bootstrap setup
10	Bootstrap Grid Layout: Create a responsive web page layout using Bootstrap's grid system.
11	Bootstrap Components: Implement a navigation bar and modal using Bootstrap components.
12	Create a Bootstrap Form •Design a form using Bootstrap's form components with input and styling.

13	Set Up a Basic Express.js Server •Create a basic Express.js server that serves static files and handles basic routing.
14	Build a Simple Blog with Express.js • Develop a simple blogging application using Express.js with routes for viewing, adding
15	Build a Simple Blog with Express.js • Develop a simple blogging application using Express.js with routes for updating
16	Build a Simple Blog with Express.js • Develop a simple blogging application using Express.js with routes for deleting posts.

Semester II

OSL-155-MJ - Operating System with Linux

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total :60 Marks

Course Objectives:

- To understand the basic concepts, architecture, and functions of operating systems.
- To explore various operating system components such as process management, memory management, file systems, and device management.
- To gain knowledge of the Linux operating system, its structure, and its advantages over other operating systems.
- To learn and apply fundamental Linux commands for file handling, process control, and system management.
- To develop and implement basic shell programming applications for automating tasks and managing Linux environments.

Course Outcomes:

CO1: Explain the fundamental concepts, components, and types of operating systems. - Remembering, Understanding
CO2: Describe process management and scheduling concepts used in operating systems. - Understanding, Applying
CO3: Identify and compare Linux architecture, features, and distributions. - Understanding, Analyzing
CO4: Execute basic Linux commands for file, process, and system management. - Applying
CO5: Develop and implement basic shell scripts to automate tasks in Linux. - Applying, Creating

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Operating Systems	1.1 Definition, Need, and Functions of Operating System 1.2 Components of Operating System 1.3 Types of OS - Batch, Time Sharing, Distributed, Network, Real-Time	06 Hrs
Unit 2: Process Management	2.1 Concept of Process 2.2 Process States and Life Cycle 2.3 Process Control Block (PCB) 2.4 Scheduling Concepts - Preemptive and Non-preemptive 2.5 Inter-process Communication (Overview)	06 Hrs
Unit 3: Introduction to Linux Operating System	3.1 Architecture of Linux System 3.2 History and Features of Linux 3.3 Benefits and Distributions of Linux	06 Hrs
Unit 4: Linux Commands and File System	4.1 Introduction to Linux Shell and File System 4.2 Basic Linux Commands - pwd, cd, ls, mkdir, rmdir, rm, sort 4.3 File Handling Commands - more, less, cat, echo, wc 4.4 Process Commands - ps, kill 4.5 System Commands - cal, date, who, who am I, man	06 Hrs
Unit 5: Shell Programming	5.1 Introduction to Shell and Shell Scripting 5.2 Types of Shells 5.3 Writing and Executing Simple Shell Scripts 5.4 Variables, Control Structures (if, case, loops) 5.5 Practical Applications of Shell Scripts in System Administration	06 Hrs

Reference Books:
1. Peterson Silberschats, Galvin (2005), Operating System Concepts, Addition Wesley Publication. ISBN-10: 8126554274 ISBN-13: 978-8126554270 2. Peterson, (2007), Linux: Complete Reference, 6th Edition, TMH, ISBN: 9780070222946 3. Foster Johnson Welch, Anderson,(2006),Beginning Shell Scripting, Wiley India (Wrox), ISBN:9780764597916

Semester II		
DMT-156-MJ - Discrete Mathematics - II		
Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total: 60 Marks

Course Objectives:

- To strengthen understanding of fundamental concepts in discrete mathematics, emphasizing logic, set theory, relations, and functions.
- To develop the ability to apply combinatorial techniques and recurrence relations in solving real-world problems.
- To apply various statistical measures such as mean, median, mode, variance, and standard deviation, and represent data graphically.
- To understand and analyze the basic principles of probability theory and apply them to practical scenarios.
- To build a mathematical foundation for advanced topics such as data analysis, algorithms, and machine learning.

Course Outcomes:

CO1: Understand the basic concepts of population, sampling, and data types used in statistics. - Understand
CO2: Apply statistical techniques to summarize, analyze, and visualize data effectively. - Apply
CO3: Analyze and solve problems using combinatorial techniques and counting principles. - Analyze
CO4: Examine and compute probabilities for different types of random events and their interrelationships. - Analyze
CO5: Evaluate and apply probabilistic methods to real-world and computational problems. - Apply

Course Contents

Unit No.	Contents	No of Sessions
Unit–1: Introduction to Statistics	1.1 Population and Sample 1.2 Parameters and Statistics: Definition, Methods of Sampling, Types of Variables, and Applications 1.3 Classification of Data, Frequency Distribution, Cumulative and Relative Frequency Distribution	06 Hrs
Unit–2: Descriptive Statistics	2.1 Measures of Central Tendency - Mean, Median, Mode 2.2 Measures of Dispersion - Range, Quartile Deviation, Variance, Standard Deviation 2.3 Graphical Representation of Data - Histogram, Frequency Polygon, and Pie Chart	06 Hrs
Unit–3: Permutations and Combinations	3.1 Meaning and Importance of Permutation and Combination 3.2 Fundamental Principle of Counting 3.3 Determination of Number of Permutations and Combinations (for distinct and repeated objects)	06 Hrs
Unit–4: Probability and Random Events	4.1 Classical Definition of Probability 4.2 Events and Their Outcomes 4.3 Rules and Axioms of Probability 4.4 Joint and Conditional Probability, Independent Events	06 Hrs
Unit–5: Advanced Probability and Applications	5.1 Decision-Making under Uncertainty 5.2 Bayes Theorem and Its Applications 5.3 Real-World Applications of Probability in Data Science and Machine Learning	06 Hrs

Reference Books:

1. Michael Baron (2014) Probability and Statistics for Computer Scientists Second Edition, CRC press. ISBN: 978-1-4822-1410-9
2. Goon A.M., Gupta M.K., Dasgupta. B. (2001), Fundamentals of Statistics, Volume I and II, World Press, Calcutta.
3. Ross, S. (2005). Introduction to Probability Models, (6th Ed. Academic Press). ISBN 978 25 0-12-375686-2
4. Anand Sharma, (2008), Business Mathematics & Analytics, Himalaya Publishing house, ISBN NO.:1234029928

Semester II

MAM-160-MJ - Marketing Management

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To understand the fundamental concepts, principles, and functions of marketing in a dynamic business environment.
- To analyze the significance of market segmentation, targeting, and positioning strategies for effective marketing decisions.
- To explore consumer behavior and factors influencing customer decision-making processes.
- To develop the ability to design marketing mixes (Product, Price, Place, Promotion) aligned with organizational goals and market needs.
- To evaluate contemporary marketing trends and digital marketing practices for strategic business growth.

Course Outcomes:

CO1: Explain the fundamental principles, functions, and scope of marketing. - Understand CO2: Analyze the influence of environmental factors on marketing decisions. - Analyze
CO3: Apply segmentation, targeting, and positioning strategies for competitive advantage. - Apply CO4: Develop effective marketing mix strategies for diverse markets. - Apply
CO5: Evaluate promotional techniques and modern marketing trends for brand success. - Evaluate

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Marketing Concepts	1.1 Definition, Nature, Scope, and Importance of Marketing 1.2 Evolution and Core Concepts of Marketing 1.3 Selling vs. Marketing 1.4 Functions and Role of Marketing in Business 1.5 Role and Responsibilities of a Marketing Manager in the Current Scenario	06 Hrs
Unit 2: Marketing Environment	2.1 Concept and Importance of Marketing Environment 2.2 Micro-Environment and Macro-Environment Components 2.3 Environmental Scanning and its Significance 2.4 Influence of Economic, Social, Political, and Technological Factors on Marketing Decisions	06 Hrs
Unit 3: Market Segmentation, Targeting, and Positioning (STP)	3.1 Meaning, Concepts, Benefits, and Limitations of Market Segmentation 3.2 Bases for Segmenting Consumer and Industrial Markets 3.3 Targeting Strategies: Undifferentiated, Differentiated, and Concentrated Marketing 3.4 Product Positioning and Differentiation Strategies	06 Hrs
Unit 4: Marketing Mix Decisions	4.1 Concept and Significance of Marketing Mix (4Ps/7Ps) 4.2 Product Decisions - Levels of Product, Product Life Cycle (PLC), Product Strategies 4.3 Price Decisions - Objectives, Factors Affecting Pricing, Pricing Methods and Strategies 4.4 Place Decisions - Channels of Distribution, Functions and Factors Influencing Channel Choice	06 Hrs

Unit 5: Promotion and Emerging Trends in Marketing	5.1 Promotion - Nature, Objectives, and Importance 5.2 Elements of Promotional Mix - Advertising, Publicity, Public Relations, Sales Promotion, Personal Selling, and Direct Marketing 5.3 Overview of Digital Marketing, Social Media Marketing, and Relationship Marketing 5.4 Emerging Trends in Marketing - Green Marketing, Service Marketing, and Rural Marketing	06 Hrs

Reference Books:

1. Marketing Management- S.A. Sherlekar, Himalaya Publishing House.
2. Principles of Marketing (A South Indian Perspective)- Philip Kotler, Gary Amrstrong, Prafulla Agnihotri, Ehsan, Pearson.
3. Marketing Management - RajanSaxena - Tata McGraw Hill.
4. Basics of Marketing Management - R.B. Rudani - S. Chand & Company Ltd.
5. Marketing Management - Ramaswamy, Namakumari 4th edition - Macmillion.
6. Principles of Marketing, R.K. Mittal, A. Sharma, V.K. Global Pub. Pvt. Ltd, New Delhi.
7. Principles of Marketing M K Nabi, K C Raut, Vrinda Publications (P) Ltd

Semester II

POA-161-MJ - Principles of Accounting-II

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To understand the fundamental concepts, principles, and assumptions underlying financial accounting.
- To develop the ability to record, classify, and summarize business transactions using the accounting cycle.
- To prepare and interpret ledger accounts, trial balance, and financial statements for service and merchandising businesses.
- To analyze the components of income statements and balance sheets for assessing business performance.
- To apply accounting concepts and procedures for accurate financial reporting and decision-making.

Course Outcomes:

CO1: Explain the objectives, components, and process of personal financial planning. - Understand

CO2: Analyze personal tax laws and apply tax planning strategies within legal frameworks. - Analyze

CO3: Apply insurance and risk management principles to safeguard financial assets. - Apply

CO4: Develop retirement and estate plans for long-term financial security. - Apply

CO5: Evaluate and manage investment portfolios for optimal financial performance. - Evaluate

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Ledger and Subsidiary Books	1.1 Meaning, Definition, and Importance of Ledger 1.2 Specimen of Ledger 1.3 Posting of Entries from Journal/Subsidiary Books to Ledger 1.4 Balancing of Ledger Accounts 1.5 Preparation of Trial Balance	06 Hrs
Unit 2: Subsidiary Books and Their Applications	2.1 Meaning and Need for Maintaining Subsidiary Books 2.2 Types of Subsidiary Books - Cash Book, Purchase Book, Sales Book, Return Books, Journal Proper 2.3 Cash Book with Cash Column and Cash-Bank Columns 2.4 Simple and Analytical Petty Cash Book under Imprest System	06 Hrs
Unit 3: Rectification of Errors and Suspense Account	3.1 Meaning and Effects of Errors 3.2 Types of Errors 3.3 Detection and Rectification of Errors 3.4 Preparation and Use of Suspense Account	06 Hrs

Unit 4: Preparation of Final Accounts	4.1 Meaning, Objectives, and Importance of Final Accounts 4.2 Preparation of Trading Account 4.3 Preparation of Profit and Loss Account 4.4 Preparation of Balance Sheet	06 Hrs
Unit 5: Adjustments and Financial Accuracy	5.1 Accounting Adjustments and Their Importance 5.2 Adjustments: Closing Stock, Outstanding & Prepaid Expenses, Depreciation, Bad Debts, R.D.D., Discounts, Accrued Income, Income Received in Advance 5.3 Goods Distributed as Samples, Drawings, Interest on Capital and Drawings 5.4 Effect of Adjustments on Final Accounts	06 Hrs

Reference Books:

1. Robert N. Anthony, David F. Hawkins, Kenneth A. Merchant. Accountancy- text and cases. McGraw Hill Education (India) Private Limited, New Delhi.
2. Fundamentals of Accounting by Dr. S.N. Maheshwari, Dr.S.K. Maheshwari- Vikas Publishing House
3. (ISBN-139788180544491).
4. Financial accounting: By Jane Reimers (Pearson Education) ISBN: 9780136115274.
5. Book - Keeping and Accountancy Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune

Semester II

DGM-162-MJ - Digital Marketing - II

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total :60 Marks

Course Objectives:

- To understand the fundamentals of content and email marketing.
- To apply tools and techniques for effective digital campaigns.
- To explore mobile marketing and E-commerce strategies.
- To analyze and evaluate digital marketing performance using analytics.
- To create a comprehensive digital marketing plan integrating multiple channels.

Course Outcomes:

CO1: Explain the concepts, strategies, and importance of content marketing and email marketing in digital ecosystems - Understand

CO2: Design and implement effective content and email marketing campaigns using automation tools, segmentation, and analytics - Apply

CO3: Analyze various mobile marketing strategies and E-commerce promotion techniques to improve customer engagement and conversions - Analyze

CO4 - Evaluate different digital marketing platforms and optimization techniques (CRO, SEO, Mobile UX) for business growth - Evaluate

CO5: Develop and present a comprehensive digital marketing plan using analytics tools, interpreting data trends, and forecasting future digital strategies - Create

Course Contents

Unit No.	Contents	No of Sessions
Unit No.1 Content Marketing – Foundations and Strategy	1.1 The Role of Content in Digital Marketing 1.2 Types of Content (Blogs, Videos, Infographics, etc.) 1.3 Content Creation Process and Planning 1.4 Content Marketing Channels 1.5 SEO for Content Marketing 1.6 Repurposing and Syndicating Content	6 Hrs
Unit No.2 Email Marketing and Campaign Management	2.1 Building and Segmenting an Email List 2.2 Crafting Effective Email Campaigns 2.3 Email Marketing Automation 2.4 Tools for Email Campaigns (e.g., Mailchimp, Constant Contact) 2.5 A/B Testing in Email Marketing 2.6 Measuring Email Marketing Success	6 Hrs

Unit No.3 Mobile Marketing Strategies and Optimization	3.1 Mobile Marketing Strategies 3.2 Mobile Advertising Formats 3.3 Mobile SEO and User Experience Optimization 3.4 Location-Based Marketing and Mobile Engagement Techniques	6 Hrs
Unit No.4 E-Commerce Marketing and Conversion Optimization	4.1 Introduction to E-commerce Marketing 4.2 Role of Digital Marketing in E-commerce 4.3 Conversion Rate Optimization (CRO) 4.4 E-commerce Tools and Platforms 4.5 Integration of Payment Gateways and Analytics in E-commerce	6 Hrs
Unit No.5 Digital Analytics, Trends, and Future Directions	5.1 Digital Marketing Analytics 5.2 Importance of Data in Digital Marketing 5.3 Overview of Google Analytics 5.4 Tracking and Measuring Digital Campaigns 5.5 Advanced Data Analysis Techniques 5.6 Emerging Trends in Digital Marketing 5.7 Capstone Project and Presentation 5.7.1 Students work in groups to develop a comprehensive digital marketing plan 5.7.2 Presentation and peer/instructor evaluation	6 Hrs

Reference Books:

1 Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).
2 Menon, Arpita; Media Planning and Buying; McGraw Hill (1st Edition, 2010)
3 Arnold, George; Media Writer's Handbook: A Guide to Common Writing and Editing Problems; cGraw-HillEducation; (5thedition, 2008)
4 Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page(3rd Edition, 2014).

Semester II

PFP-163-MJ - Personals Financial Planning-II

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To understand the fundamental concepts and importance of personal financial planning in modern management practices.
- To analyze various investment avenues and their suitability for individual financial goals.
- To apply principles of risk assessment and portfolio management in personal investment decisions.
- To evaluate tax planning, retirement planning, and insurance as integral components of financial well-being.
- To develop the ability to create and manage a comprehensive personal financial plan for long-term financial security.

Course Outcomes:

CO1: Explain the objectives, components, and process of personal financial planning. - Understand CO2: Analyze personal tax laws and apply tax planning strategies within legal frameworks. - Analyze CO3: Apply insurance and risk management principles to safeguard financial assets. - Apply
CO4: Develop retirement and estate plans for long-term financial security. - Apply
CO5: Evaluate and manage investment portfolios for optimal financial performance. - Evaluate

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Personal Financial Planning	1.1 Overview of personal financial planning and its relevance in modern management practices 1.2 Objectives, process, and components of personal financial planning 1.3 Relationship between income, expenditure, savings, and investment 1.4 Role of financial advisors and planners	06 Hrs

Unit 2: Personal Tax Planning	2.1 Basics of taxation - Tax structure in India for personal taxation 2.2 Scope of personal tax planning, exemptions, and deductions under various heads of income 2.3 Comparison of special provisions under Section 115BAC and general provisions of the Income Tax Act, 1961 2.4 Concept of tax avoidance versus tax evasion	06 Hrs
Unit 3: Insurance and Risk Management	3.1 Introduction to insurance and its need in personal finance 3.2 Types of insurance - Life, Health, Property, Credit Life, and Professional Liability Insurance 3.3 Principles of risk assessment and management in financial planning	06 Hrs
Unit 4: Retirement and Estate Planning	4.1 Importance and goals of retirement planning 4.2 Process of retirement planning and calculation of retirement corpus 4.3 Overview of pension plans available in India and reverse mortgage schemes 4.4 Concept and importance of estate planning	06 Hrs
Unit 5: Investment and Portfolio Management	5.1 Overview of investment planning and portfolio diversification 5.2 Risk-return trade-off and asset allocation strategies 5.3 Evaluation of investment alternatives (Equity, Debt, Mutual Funds, Real Estate, Gold, etc.) 5.4 Monitoring and review of personal financial plans	06 Hrs

Reference Books:

1. Halan, M. "Let's Talk Money: You've Worked Hard for It, Now Make It Work for You" Harper Collins Publishers, New York.
2. Indian Institute of Banking & Finance. "Introduction to Financial Planning" Taxmann Publication, New Delhi.
3. Keown A.J. "Personal Finance" Pearson, New York.
4. Madura, J. "Personal Finance", Pearson
5. Pandit , A. "The Only Financial Planning Book that You Will Ever Need" Network 18 Publications Ltd., Mumbai.
6. Sinha, M. "Financial Pfanning: A Ready Reckoner" McGraw Hill Education, New York.
7. Tripathi, V. "Fundamentals of Investment" Taxmann Publication, New Delhi.

Semester III		
DFS-201-MJ - Data & File Structures		
Teaching Scheme: Theory Sessions: Total 30 Hours Practical Sessions: Total 15 Hours	Credit: 04	Examination Scheme: Internal (TH): 40 Marks External (TH): 60 Marks Total : 100 Marks

Course Objectives:

- To introduce fundamental concepts of data structures & algorithms, including abstract data types & complexity analysis.
- To develop the ability to design and implement linear data structures such as arrays, linked lists, stacks, and queues for problem solving.
- To enable students to understand and apply non-linear data structures like trees and graphs in real-world computing scenarios.
- To impart knowledge of searching, sorting, and hashing techniques to achieve efficient data organization and retrieval.
- To familiarize students with file structures and file organization methods for managing persistent data storage.

Course Outcomes:

CO1: Explain fundamental concepts of data structures and analyze algorithm efficiency using time and space complexity. – Understand, Analyze
CO2: Implement linear data structures using arrays and linked lists to solve computational problems. - Apply
CO3: Design and implement non-linear data structures such as trees and graphs. - Apply, Analyze
CO4: Apply searching, sorting, and hashing techniques for efficient data retrieval. – Apply, Evaluate
CO5: Analyze file organization methods and implement file structures for persistent data storage. - Analyze, Create

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Data Structures & Algorithms	1.1 Data, Data Types, and Abstract Data Types (ADT) 1.2 Primitive vs Non-Primitive Data Structures 1.3 Algorithm: Definition, Characteristics 1.4 Time and Space Complexity 1.5 Asymptotic Notations: Big-O, Big-Ω, Big-Θ	09 Hrs
Unit 2: Linear Data Structures	2.1 Arrays: Representation, Operations 2.2 Strings and Matrices 2.3 Linked Lists: Singly, Doubly, Circular Linked Lists 2.4 Operations (Insertion, Deletion, Traversal) 2.5 Applications of Linked Lists	09 Hrs
Unit 3: Stacks and Queues	3.1 Stack: Operations, Array & Linked List Implementation 3.2 Applications: Expression Evaluation, Recursion 3.3 Queue: Simple Queue, Circular Queue 3.4 Priority Queue, Deque 3.5 Applications of Queues	09 Hrs
Unit 4: Non-Linear Data Structures	4.1 Trees: Binary Tree, Binary Search Tree 4.2 Tree Traversals (Inorder, Preorder, Postorder) 4.3 Balanced Trees: AVL Tree (Basics) 4.4 Graphs: Representation (Adjacency Matrix/List) 4.5 Graph Traversal: BFS, DFS	09 Hrs
Unit 5: Searching, Sorting & File Structures	5.1 Searching Techniques: Linear Search, Binary Search 5.2 Sorting Techniques: Bubble, Selection, Insertion, Merge Sort, Quick Sort 5.3 Hashing: Hash Functions, Collision Resolution 5.4 File Structures: File Organization (Sequential, Indexed, Direct) 5.5 File Operations and Access Methods	09 Hrs

Reference Books:

1. Data Structures and File Structures – Vijay Singhal & Dinesh Verma

2. Data Structures Using C – Reema Thareja
3. Data Structures Using C/C++ – A. Tannenbaum, Y. Langsam & M. Augenstein
4. An Introduction to Data Structures with Applications – J.P. Tremblay & P.G. Sorenson
5. Fundamentals of Data Structures in C – Ellis Horowitz, Sartaj Sahni
6. Algorithms + Data Structures = Programs – Niklaus Wirth
7. Data Structures and Algorithm Analysis in C – Mark Allen Weiss
8. Data & File Structure (GTU) – Rohit Khurana
9. Data Management and File Structures – Mary Loomis

Semester III

CNT-202-MJ - Computer Networks

Teaching Scheme: Theory Sessions: Total 45 Hours	Credit: 04	Examination Scheme: Internal (TH): 40 Marks External (TH): 60 Marks Total : 100 Marks

Course Objectives:

- To provide fundamental knowledge of computer networks, networking models, and communication concepts.
- To understand the functions and protocols of different layers of the OSI and TCP/IP models.
- To explain data transmission techniques, error control, and flow control mechanisms.
- To familiarize students with routing, switching, and internetworking concepts.
- To introduce network security concepts and emerging networking technologies.

Course Outcomes:

CO1: Explain basic concepts, components, and types of computer networks. – Understand
CO2: Describe the functions and protocols of OSI and TCP/IP layers. - Understand, Apply
CO3: Analyze data transmission, error detection, and flow control techniques. - Analyze
CO4: Apply routing, switching, and internetworking concepts in networking scenarios. – Apply
CO5: Explain network security mechanisms and emerging trends in computer networks. - Understand

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Computer Networks	1.1 Data Communication: Components and Characteristics 1.2 Network Goals and Applications 1.3 Types of Networks: LAN, MAN, WAN 1.4 Network Topologies: Bus, Star, Ring, Mesh, Tree 1.5 Network Devices: Hub, Switch, Router, Gateway	09 Hrs
Unit 2: Network Models	2.1 OSI Reference Model – Layers and Functions 2.2 TCP/IP Model – Layers and Comparison with OSI 2.3 Physical Layer: Transmission Media (Guided & Unguided) 2.4 Data Link Layer: Framing, Error Detection (CRC), Flow Control	09 Hrs
Unit 3: Data Transmission & Transport Layer	3.1 Analog and Digital Transmission 3.2 Multiplexing Techniques (FDM, TDM) 3.3 Error Control Techniques 3.4 Transport Layer Services 3.5 TCP vs UDP, Port Numbers	09 Hrs
Unit 4: Network Layer & Routing	4.1 Network Layer Functions 4.2 Logical Addressing: IPv4 & IPv6 4.3 Routing Algorithms: Distance Vector, Link State 4.4 Congestion Control 4.5 Switching Techniques: Circuit, Packet, Message Switching	09 Hrs
Unit 5: Network Security &	5.1 Network Security Concepts 5.2 Encryption and Authentication	09 Hrs

Emerging Trends	5.3 Firewalls and Intrusion Detection Systems 5.4 Wireless Networks (Wi-Fi, Bluetooth) 5.5 Introduction to Cloud Networking & IoT	

Reference Books:

- Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Pearson Education, Edition: 5th / 6th
- Data Communications and Networking, Behrouz A. Forouzan, Publisher: McGraw-Hill Education, Edition: 5th
- Computer Networking: A Top-Down Approach, James F. Kurose, Keith W. Ross, Pearson Education, Edition: 8th
- Data and Computer Communications, William Stallings, Pearson Education, Edition: 10th
- Computer Networks and Internets, Douglas E. Comer, Pearson Education, Edition: 6th

Semester III

MIS-203-MN - Management Information System

Teaching Scheme: Theory Sessions: Total 45 Hours	Credit: 04	Examination Scheme: Internal (TH): 40 Marks External (TH): 60 Marks Total : 100 Marks

Course Objectives:

- To introduce the fundamental concepts, components, and role of Management Information Systems in organizations.
- To understand various types of information systems supporting managerial decision-making.
- To explain the planning, development, and implementation of MIS in organizations.
- To analyze the role of MIS in functional areas of management.
- To familiarize students with contemporary trends and challenges in MIS.

Course Outcomes:

CO1: Explain basic concepts, structure, and importance of MIS in organizations. – Understand
CO2: Identify and describe different types of information systems used at various management levels. - Understand
CO3: Analyze MIS development processes and system implementation strategies. - Analyze
CO4: Apply MIS concepts to functional areas such as finance, marketing, HR, and operations. – Apply
CO5: Evaluate emerging trends, ethical issues, and challenges related to MIS. – Evaluate

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Management Information System	1.1 Information, Data, and Knowledge 1.2 Definition, Objectives, and Components of MIS 1.3 Role of MIS in Decision Making 1.4 Management Levels and Information Requirements 1.5 MIS as a Support System	09 Hrs
Unit 2: Types of Information Systems	2.1 Transaction Processing Systems (TPS) 2.2 Management Information Systems (MIS) 2.3 Decision Support Systems (DSS) 2.4 Executive Information Systems (EIS) 2.5 Office Automation Systems (OAS)	09 Hrs
Unit 3: MIS Development and Implementation	3.1 MIS Planning and Development 3.2 System Development Life Cycle (SDLC) 3.3 Information System Design 3.4 Implementation, Testing, and Maintenance 3.5 Success and Failure Factors of MIS	09 Hrs
Unit 4: MIS in Functional Areas	4.1 Marketing Information System 4.2 Financial Information System 4.3 Human Resource Information System (HRIS) 4.4 Production & Operations Information System 4.5 Supply Chain & Logistics Information System	09 Hrs

Unit 5: Contemporary Issues and Trends in MIS	5.1 Enterprise Resource Planning (ERP) Systems 5.2 Business Intelligence and Analytics 5.3 E-Commerce and E-Business Systems 5.4 Information Security and Ethical Issues 5.5 Emerging Trends: Cloud Computing, AI in MIS	09 Hrs

Reference Books:

- Management Information Systems: Managing the Digital Firm, Kenneth C. Laudon, Jane P. Laudon, Pearson Education, Edition: 16th
- Management Information Systems, Gordon B. Davis, Margrethe H. Olson, McGraw-Hill Education, Edition: 2nd
- Management Information Systems, Sadagopan S., PHI Learning, Edition: 2nd
- Management Information Systems: Conceptual Foundations, Structure and Development, Gordon B. Davis, McGraw-Hill
- Management Information Systems for the Information Age, Stephen Haag, Maeve Cummings, McGraw-Hill Education, Edition: 9th

Semester III

WTL-204-MJP - Web Technology Lab-III

Teaching Scheme: Practical Sessions: Total 30 Hours	Credit: 02	Examination Scheme: Internal (PR): 40 Marks Total :40 Marks

Course Objectives:

- To strengthen advanced server-side and full-stack web development skills.
- To design and implement scalable web applications using modern frameworks.
- To understand database integration with backend applications.
- To apply authentication, security, and API best practices.
- To enhance problem-solving skills through real-world project implementation.

Course Outcomes:

CO1: Apply advanced JavaScript and backend concepts to build web applications. - Apply
CO2: Develop RESTful APIs with database integration. – Apply, Analyze
CO3: Implement authentication, authorization, and security mechanisms. - Apply
CO4: Design full-stack applications using modern frameworks and tools. - Apply, Create
CO5: Evaluate application performance, usability, and deployment strategies. - Evaluate

Guidelines for Instructor's Manual

The instructor shall frame at least 15 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.

Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on the overall performance of students. For each lab assignment, the instructor will assign grades/marks based on parameters such as timely completion of the task, conceptual understanding, correctness of implementation, code quality, neatness and documentation, and adherence to laboratory instructions, with appropriate weightage assigned to each parameter.

Regularity in lab attendance, active participation, ability to troubleshoot errors independently, and improvement over time shall also be considered during evaluation. The final assessment will reflect both process-oriented learning and successful completion of assigned experiments.

Sr. No.	Assignment List
1	Advanced JavaScript Concepts: Implement ES6 features such as arrow functions, promises, async/await

2	MongoDB Installation & Setup: Install MongoDB and perform basic CRUD operations
3	Node.js with MongoDB: Connect Node.js application with MongoDB database
4	Express.js REST API (CRUD): Develop a REST API performing full CRUD operations
5	Middleware Implementation: Implement custom middleware in Express.js
6	User Authentication: Implement user registration and login using JWT
7	Role-Based Authorization: Implement role-based access control (Admin/User)
8	File Upload Module: Implement file upload using Multer
9	API Security: Secure APIs using validation and authentication
10	Frontend Integration: Connect frontend (HTML/Bootstrap/React basic) with backend APIs
11	Error Handling & Logging: Implement centralized error handling and logging
12	Environment Configuration: Use environment variables and configuration files
13	Deployment Practical: Deploy application on cloud (Render / Railway / Heroku)
14	Mini Project – Design: Design a full-stack application (Blog / Inventory / LMS)
15	Mini Project – Implementation: Develop the complete application with CRUD & auth
16	Mini Project – Testing & Review: Test, document, and evaluate the application

Reference Books:

1. Web Technologies: HTML, JavaScript, PHP, Java, Uttam K. Roy, Oxford University Press
2. Node.js Design Patterns, Mario Casciaro, Luciano Mammino, Packt Publishing
3. Express in Action, Evan M. Hahn, Manning Publications
4. MongoDB: The Definitive Guide, Kristina Chodorow, Publisher: O'Reilly Media
5. Eloquent JavaScript, Marijn Haverbeke, Publisher: No Starch Press

Semester III

OAT-205-MJ - Office Automation Tools

Teaching Scheme: Practical Sessions: Total 30 Hours	Credit: 02	Examination Scheme: Internal (PR): 40 Marks Total :40 Marks

Course Objectives:

- To familiarize students with commonly used office automation software tools.
- To develop skills in document creation, data analysis, and presentations.
- To apply spreadsheet tools for data processing and decision support.
- To enhance professional communication using office automation features.
- To improve productivity through automation and collaboration tools.

Course Outcomes:

CO1: Explain the features and applications of office automation tools. - Understand
CO2: Create professional documents using word processing tools. – Apply
CO3: Analyze data using spreadsheets, formulas, and charts. - Analyze
CO4: Design effective presentations using presentation software. - Apply, Create
CO5: Evaluate productivity and collaboration using automation tools. - Evaluate

Guidelines for Instructor's Manual

The instructor shall frame at least 10 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.

Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on the overall performance of students. For each lab assignment, the instructor will assign grades/marks based on parameters such as timely completion of the task, conceptual understanding, correctness of implementation, code quality, neatness and documentation, and adherence to laboratory instructions, with appropriate weightage assigned to each parameter.

Regularity in lab attendance, active participation, ability to troubleshoot errors independently, and improvement over time shall also be considered during evaluation. The final assessment will reflect both process-oriented learning and successful completion of assigned experiments.

Sr. No.	Assignment List
1	Introduction to Office Automation: Study and report on features of MS Office / LibreOffice / Google Workspace
2	Word Processing – Basics: Create a formatted document using styles, headers, footers, and tables
3	Advanced Word Processing: Use mail merge, table of contents, and document review tools
4	Spreadsheet Basics: Create spreadsheets using formulas, functions, and formatting
5	Data Analysis in Spreadsheets: Apply charts, pivot tables, and conditional formatting
6	Presentation Design: Create a professional presentation with animations and transitions
7	Advanced Presentation: Insert multimedia, charts, and smart art
8	Office Automation with Templates: Design reusable templates for documents and spreadsheets
9	Email & Calendar Tools: Use email clients for professional communication and scheduling
10	Collaboration Tools: Share documents, track changes, and collaborate using cloud tools
11	Automation Features: Use macros / basic automation tools to improve productivity
12	Mini Project: Create a complete office automation solution for an organization

Reference Books:

1. Office Automation, V. Rajaraman, Prentice Hall of India
2. Microsoft Office 365 & Office 2019 Step by Step, Joan Lambert, Microsoft Press
3. LibreOffice 7.0 Guide, Jean Hollis Weber, The Document Foundation
4. Using Google Workspace, Jim Boyce, Publisher: McGraw-Hill Education
5. Computer Fundamentals, P. K. Sinha, Priti Sinha, BPB Publications

Semester III

IIC-257-MJ – Introduction to Indian Constitution

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: Internal (TH): 40 Marks Total : 40 Marks

Course Objectives:

- To introduce students to the historical background and philosophical foundations of the Indian Constitution.
- To understand the structure, features, and functioning of the Constitution of India.
- To explain Fundamental Rights, Duties, and Directive Principles of State Policy.
- To familiarize students with the structure and functions of the Union and State Governments.
- To develop awareness of constitutional values, citizenship, and responsibilities in a democratic society.

Course Outcomes:

CO1: Explain the historical evolution, philosophy, and salient features of the Indian Constitution - Understand

CO2: Describe Fundamental Rights, Directive Principles, and Fundamental Duties – Understand.

CO3: Analyze the structure, powers, and functions of Union and State Governments - Analyze

CO4: Explain the role of constitutional bodies and the judiciary in India – Understand, Analyze.

CO5: Apply constitutional values, rights, and duties in real-life civic and professional contexts – Apply.

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction and	1.1 Meaning and Importance of Constitution 1.2 Constitutionalism	06 Hrs

Historical Background	1.3 Historical Background of Indian Constitution 1.4 Constituent Assembly and Making of the Constitution 1.5 Salient Features of the Indian Constitution	
Unit 2: Fundamental Rights, Duties & DPSP	2.1 Fundamental Rights (Articles 12–35) 2.2 Right to Equality, Freedom, Religion, Constitutional Remedies 2.3 Directive Principles of State Policy 2.4 Fundamental Duties 2.5 Relationship between Fundamental Rights and DPSP	06 Hrs
Unit 3: Union Government	3.1 President: Powers and Functions 3.2 Prime Minister and Council of Ministers 3.3 Parliament: Lok Sabha & Rajya Sabha 3.4 Legislative Process 3.5 Emergency Provisions	06 Hrs
Unit 4: State Government & Constitutional Bodies	4.1 Governor: Powers and Functions 4.2 Chief Minister and Council of Ministers 4.3 State Legislature 4.4 Constitutional Bodies: 4.4.1 Election Commission 4.4.2 Comptroller and Auditor General (CAG) 4.4.3 Union Public Service Commission (UPSC)	06 Hrs
Unit 5: Judiciary, Federalism & Citizenship	5.1 Judiciary: Supreme Court and High Courts 5.2 Judicial Review and Judicial Activism 5.3 Federal System in India 5.4 Citizenship 5.5 Amendments to the Constitution	06 Hrs

Reference Books:

- **Introduction to the Constitution of India,** *D.D. Basu* , Publisher: *LexisNexis* Latest Edition
- **Indian Polity,** *M. Laxmikanth,* Publisher: *McGraw-Hill Education,* Latest Edition
- **Our Constitution,** *Subhash Kashyap,* Publisher: *National Book Trust (NBT)*
- **The Constitution of India,** *P.M. Bakshi,* Publisher: *Universal Law Publishing,* Latest Edition.
- **Indian Constitution: Origins and Evolution,** *Granville Austin,* Publisher: *Oxford University Press.*

Semester III

END -210-MJ – Entrepreneurship Development

Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To introduce the concepts, nature, and importance of entrepreneurship and entrepreneurial culture.
- To develop understanding of entrepreneurial traits, creativity, and innovation.
- To familiarize students with the process of identifying business opportunities and preparing business plans.
- To provide knowledge about financing, support institutions, and government initiatives for entrepreneurs.
- To create awareness about challenges, ethics, and sustainability in entrepreneurship.

Course Outcomes:

CO1: Explain the concepts, characteristics, and role of entrepreneurship in economic development - Understand

CO2: Identify entrepreneurial opportunities through creativity, innovation, and market analysis – Analyze.

CO3: Develop a basic business plan for a startup venture - Apply, Create.

CO4: Describe sources of finance, support institutions, and government schemes for entrepreneurs – Understand.

CO5: Evaluate challenges, ethical issues, and sustainability aspects of entrepreneurship – Evaluate

Course Contents		
Unit No.	**Contents**	**No of Sessions**
Unit 1: Introduction to Entrepreneurship	1.1 Meaning and Definition of Entrepreneurship 1.2 Evolution and Types of Entrepreneurs 1.3 Entrepreneur vs Manager 1.4 Role of Entrepreneurship in Economic Development 1.5 Entrepreneurial Culture and Mindset	06 Hrs
Unit 2: Creativity, Innovation & Opportunity Identification	2.1 Creativity and Innovation 2.2 Entrepreneurial Skills and Traits 2.3 Idea Generation Techniques 2.4 Opportunity Identification and Evaluation 2.5 Market Feasibility Analysis	06 Hrs
Unit 3: Business Planning & Startup Formation	3.1 Business Plan: Meaning and Importance 3.2 Components of a Business Plan 3.3 Startup Lifecycle 3.4 Legal Forms of Business Organization 3.5 Registration and Licensing in India	06 Hrs
Unit 4: Financing & Support Systems	4.1 Sources of Finance: Bootstrapping, Angel Investors, Venture Capital 4.2 Financial Institutions Supporting MSMEs 4.3 Government Schemes: Startup India, MSME, Make in India 4.4 Role of Incubation Centers and Accelerators	06 Hrs
Unit 5: Entrepreneurial Challenges, Ethics & Sustainability	5.1 Challenges Faced by Entrepreneurs 5.2 Risk and Uncertainty Management 5.3 Business Ethics and Social Responsibility 5.4 Sustainable Entrepreneurship 5.5 Women and Social Entrepreneurship	06 Hrs

Reference Books:

- **Entrepreneurship Development,** *S.S. Khanka,* Publisher: *S. Chand & Company Ltd,* Latest Edition
- **Entrepreneurship,** *Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd,* Publisher: *McGraw-Hill Education*
- **Entrepreneurship Development and Business Ethics,** *Vasant Desai,* Publisher: *Himalaya Publishing House*
- **Entrepreneurship: Theory and Practice,** *Donald F. Kuratko,* Publisher: *Cengage Learning*
- **Entrepreneurship and Small Business Management,** *Poornima M. Charantimath,* Publisher: *Pearson Education India*

Semester III		
END -211-MJ – Ecommerce & M-Commerce		
Teaching Scheme: Theory Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (TH): 60 Marks Total : 60 Marks

Course Objectives:

- To introduce fundamental concepts, models, and applications of E-Commerce and M-Commerce.
- To understand the technological infrastructure and architecture supporting electronic commerce.
- To explain online payment systems, security, and legal issues in electronic transactions.
- To analyze business strategies, digital marketing, and supply chain aspects of e-commerce.
- To familiarize students with mobile commerce technologies and emerging trends.

Course Outcomes:

CO1: Explain concepts, frameworks, and business models of E-Commerce and M-Commerce - Understand

CO2: Describe e-commerce architecture, technologies, and web infrastructure – Understand.

CO3: Analyze electronic payment systems, security mechanisms, and legal issues - Analyze.

CO4: Apply e-commerce strategies in online marketing, CRM, and supply chain – Apply.

CO5: Evaluate mobile commerce applications and emerging trends in digital business – Evaluate.

Course Contents		
Unit No.	**Contents**	**No of Sessions**
Unit 1: Introduction to E-Commerce	1.1 Meaning, Scope, and Evolution of E-Commerce 1.2 E-Commerce vs Traditional Commerce 1.3 Types of E-Commerce: B2B, B2C, C2C, C2B 1.4 E-Commerce Business Models 1.5 Advantages and Limitations of E-Commerce	06 Hrs
Unit 2: E-Commerce Architecture & Technologies	2.1 E-Commerce Framework and Architecture 2.2 Web Technologies: HTTP, HTML, Web Servers 2.3 Client-Server Architecture 2.4 Databases and Middleware 2.5 E-Commerce Platforms and Marketplaces	06 Hrs
Unit 3: Electronic Payment Systems & Security	3.1 Electronic Payment Systems 3.2 Credit Cards, Debit Cards, Smart Cards 3.3 Digital Wallets and UPI 3.4 E-Commerce Security Issues 3.5 Encryption, Digital Signatures, SSL	06 Hrs
Unit 4: E-Commerce Applications & Strategies	4.1 Online Marketing and Advertising 4.2 Customer Relationship Management (CRM) 4.3 Supply Chain Management (SCM) 4.4 E-Commerce in Banking, Retail, and Services 4.5 Social Commerce	06 Hrs
Unit 5: M-Commerce & Emerging Trends	5.1 Introduction to M-Commerce 5.2 Mobile Commerce Architecture 5.3 Mobile Payment Systems 5.4 Location-Based Services 5.5 Emerging Trends: AI in E-Commerce, Blockchain, Omni-Channel Commerce	06 Hrs

Reference Books:

- **E-Commerce: Business, Technology, Society,** *Kenneth C. Laudon, Carol Guercio Traver,* Publisher: *Pearson Education,* Latest Edition
- **Electronic Commerce,** *Gary P. Schneider,* Publisher: *Cengage Learning,* Latest Edition
- **E-Commerce and E-Business,** *Ravi Kalakota, Andrew B. Whinston,* Publisher: *Pearson Education*
- **Mobile Commerce: Technology, Theory and Applications,** *Brian E. Mennecke, Troy J. Strader,* Publisher: *Idea Group Publishing*
- **E-Commerce & M-Commerce,** *Vivek S. Bedekar,* Publisher: *Tech-Max Publications.*

Semester IV

DMS -251-MJ – Database Management System

Teaching Scheme: Theory Sessions: Total 45 Hours	Credit: 04	Examination Scheme: Internal (TH): 40 Marks External (TH): 60 Marks Total : 100 Marks

Course Objectives:

- To introduce fundamental concepts of databases, data models, and database system architecture.
- To understand relational database concepts, relational algebra, and database design principles.
- To develop proficiency in SQL for database creation, manipulation, and querying.
- To explain transaction management, concurrency control, and database recovery techniques.
- To familiarize students with advanced database concepts and modern database applications.

Course Outcomes:

CO1: Explain basic concepts, architecture, and data models of database systems - Understand.
CO2: Design relational databases using ER modeling and normalization techniques – Apply, Analyze.
CO3: Use SQL to define, manipulate, and retrieve data from relational databases – Apply.
CO4: Analyze transaction processing, concurrency control, and recovery mechanisms – Analyze.
CO5: Explain advanced database concepts and evaluate modern database applications – Understand, Evaluate.

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Database Systems	1.1 Database and DBMS: Definition and Characteristics 1.2 File System vs DBMS 1.3 Database Users and DBA 1.4 Database System Architecture 1.5 Data Models: Hierarchical, Network, Relational, Object-Oriented	09 Hrs
Unit 2: Relational Model & Database Design	2.1 Relational Model Concepts 2.2 Keys: Super, Candidate, Primary, Foreign 2.3 Relational Algebra and Relational Calculus (Basics) 2.4 Entity–Relationship (ER) Model 2.5 Database Design using ER Diagrams	09 Hrs
Unit 3: SQL and Relational Database Languages	3.1 SQL Overview 3.2 DDL, DML, DCL, TCL 3.3 SQL Constraints and Views 3.4 Joins and Subqueries 3.5 Stored Procedures and Triggers (Introduction)	09 Hrs
Unit 4: Normalization & Transaction Management	4.1 Functional Dependencies 4.2 Normal Forms: 1NF, 2NF, 3NF, BCNF 4.3 Transaction Concepts and Properties (ACID) 4.4 Concurrency Control Techniques 4.5 Deadlocks and Recovery Techniques	09 Hrs
Unit 5: Advanced DBMS Concepts	5.1 Indexing and File Organization 5.2 Distributed Databases 5.3 NoSQL Databases (Introduction) 5.4 Data Warehousing and Data Mining (Basics) 5.5 Database Security and Authorization	09 Hrs

Reference Books:

- **Database System Concepts,** *Abraham Silberschatz, Henry F. Korth, S. Sudarshan,* Publisher: *McGraw-Hill Education,* Latest Edition
- **Fundamentals of Database Systems,** *Ramez Elmasri, Shamkant B. Navathe,* Publisher: *Pearson Education,* Latest

Edition

- **An Introduction to Database Systems,** *C.J. Date,* Publisher: *Pearson Education,* Edition: *8th / Latest*
- **Database Management Systems,** *Raghu Ramakrishnan, Johannes Gehrke,* Publisher: *McGraw-Hill Education*
- **SQL, PL/SQL: The Programming Language of Oracle,** *(Optional / Practical), Ivan Bayross,* Publisher: *BPB Publications*

Semester IV		
DML-252-MJP - Database Management Systems Lab		
Teaching Scheme: Practical Sessions: Total 30 Hours	Credit: 02	Examination Scheme: Internal (PR): 60 Marks Total :60 Marks

Course Objectives:

- To understand fundamental database concepts and DBMS architecture through practical exposure.
- To apply relational model concepts and database design techniques using ER diagrams.
- To develop proficiency in SQL for database definition, manipulation, and control.
- To analyze and implement normalization and transaction management concepts.
- To explore advanced DBMS features such as indexing, security, and emerging database technologies.

Course Outcomes:

CO1: Explain basic DBMS concepts, architecture, and data models through practical exercises. - Understand
CO2: Design relational schemas and ER diagrams based on real-world requirements. – Apply, Analyze
CO3: Apply SQL commands to create, manipulate, and query relational databases. - Apply
CO4: Analyze normalization and transaction management mechanisms using practical cases. - Analyze
CO5: Implement and evaluate advanced DBMS features including indexing and security. - Apply, Evaluate

Guidelines for Instructor's Manual

The instructor shall frame at least 15 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.

Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of DVD containing students' programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on the overall performance of students. For each lab assignment, the instructor will assign grades/marks based on parameters such as timely completion of the task, conceptual understanding, correctness of implementation, code quality, neatness and documentation, and adherence to laboratory instructions, with appropriate weightage assigned to each parameter.

Regularity in lab attendance, active participation, ability to troubleshoot errors independently, and improvement over time shall also be considered during evaluation. The final assessment will reflect both process-oriented learning and successful completion of assigned experiments.

Sr. No.	Assignment List
1	DBMS Tool Installation: Install and configure MySQL / PostgreSQL
2	Study of DBMS Architecture: Identify database components and user roles
3	File System vs DBMS: Comparative practical study using sample data
4	ER Diagram Design: Draw ER diagram for a given real-world problem
5	Relational Schema Creation: Convert ER diagram into relational schema
6	Table Creation using DDL: Create tables with keys and constraints
7	Data Manipulation using DML: Perform INSERT, UPDATE, DELETE operations
8	SQL Queries: Execute SELECT queries with joins and subqueries
9	Views & Stored Programs: Create views and basic stored procedures
10	Normalization Practical: Normalize a dataset up to BCNF

11	Transaction Management: Implement COMMIT, ROLLBACK, SAVEPOINT
12	Concurrency Control: Demonstrate concurrent transactions and locking
13	Indexing: Create and analyze indexes
14	Database Security: Create users and assign privileges
15	NoSQL Overview: Study basic operations in MongoDB (intro)
16	Mini Project: Design and implement a complete database system

Reference Books:

1. Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill Education
2. Fundamentals of Database Systems, Ramez Elmasri, Shamkant B. Navathe, Pearson Education
3. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw-Hill Education
4. SQL, PL/SQL: The Programming Language of Oracle, Ivan Bayross, BPB Publications
5. MongoDB: The Definitive Guide, Kristina Chodorow, O'Reilly Media

Semester IV

JPR -253-MJ – Java Programming

Teaching Scheme: Theory Sessions: Total 45 Hours	Credit: 04	Examination Scheme: Internal (TH): 40 Marks External (TH): 60 Marks Total : 100 Marks

Course Objectives:

- To introduce object-oriented programming concepts using Java.
- To develop proficiency in Java syntax, data types, control structures, and core APIs.
- To understand exception handling, multithreading, and file handling in Java.
- To familiarize students with Java's GUI, event handling, and database connectivity.
- To enable students to design and develop Java-based applications following best practices.

Course Outcomes:

CO1: Explain object-oriented concepts and Java program structure - Understand.
CO2: Apply Java language constructs to develop console-based applications - Apply.
CO3: Implement exception handling, multithreading, and file I/O operations - Apply, Analyze.
CO4: Develop GUI-based applications and perform database connectivity using Java – Apply.
CO5: Design and evaluate complete Java applications using OOP principles - Create, Evaluate.

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Java & OOP Concepts	1.1 History and Features of Java 1.2 Java Programming Environment (JDK, JVM, JRE) 1.3 Java Program Structure 1.4 Object-Oriented Concepts: Class, Object, Encapsulation, Abstraction 1.5 Data Types, Variables, Operators	09 Hrs
Unit 2: Control Structures & Core Java	2.1 Decision Making Statements 2.2 Looping Statements 2.3 Arrays and Strings 2.4 Methods and Method Overloading 2.5 Constructors	09 Hrs
Unit 3: Inheritance, Interfaces & Exception Handling	3.1 Inheritance and Types 3.2 Method Overriding 3.3 Interfaces and Packages 3.4 Exception Handling (try–catch, throw, throws) 3.5 User-defined Exceptions	09 Hrs
Unit 4: Multithreading,	4.1 Multithreading Concepts and Lifecycle 4.2 Thread Synchronization	09 Hrs

I/O & GUI Programming	4.3 File Handling (Byte and Character Streams) 4.4 Java AWT and Swing 4.5 Event Handling	
Unit 5: Advanced Java & Application Development	5.1 Java Database Connectivity (JDBC) 5.2 Introduction to Servlets and JSP 5.3 Java Collections Framework 5.4 Introduction to JavaFX 5.5 Case Study: Java-based Application	09 Hrs

Reference Books:

- **Programming with Java,** *E. Balagurusamy,* Publisher: *McGraw-Hill Education,* Latest Edition
- **Java: The Complete Reference,** *Herbert Schildt,* Publisher: *McGraw-Hill Education,* Latest Edition
- **Core Java – Volume I: Fundamentals,** *Cay S. Horstmann, Gary Cornell,* Publisher: *Pearson Education,* Latest Edition
- **Head First Java,** *Kathy Sierra, Bert Bates,* Publisher: *O'Reilly Media,* Edition: *2nd*
- **Effective Java** *(Advanced / Reference), Joshua Bloch,* Publisher: *Addison-Wesley*

Semester IV

JPL-254-MJP - Java Programming Lab

Teaching Scheme: Practical Sessions: Total 30 Hours	Credit: 02	Examination Scheme: Internal (PR): 60 Marks Total :60 Marks

Course Objectives:

- To understand Java programming environment and object-oriented concepts through hands-on practice.
- To apply core Java syntax and control structures in program development.
- To implement inheritance, interfaces, and exception handling in Java applications.
- To develop programs using multithreading, file handling, and GUI components.
- To build simple database-driven and enterprise-level Java applications.

Course Outcomes:

CO1: Explain Java fundamentals, program structure, and OOP concepts through practical implementation. - Understand
CO2: Apply control structures, arrays, strings, and methods to solve programming problems. – Apply
CO3: Implement inheritance, interfaces, and exception handling mechanisms in Java programs. - Apply, Analyze
CO4: Develop Java programs using multithreading, file I/O, and GUI components. - Apply
CO5: Create basic Java applications using JDBC and server-side technologies. - Create

Guidelines for Instructor's Manual

The instructor shall frame at least 15 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.

Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on the overall performance of students. For each lab assignment, the instructor will assign grades/marks based on parameters such as timely completion of the task, conceptual understanding, correctness of implementation, code quality, neatness and documentation, and adherence to laboratory instructions, with appropriate weightage assigned to each parameter.

Regularity in lab attendance, active participation, ability to troubleshoot errors independently, and improvement over time shall also be considered during evaluation. The final assessment will reflect both process-oriented learning and successful completion of assigned experiments.

Sr. No.	Assignment List
1	Java Environment Setup: Install JDK and write a simple Java program

2	Basic Java Programs: Programs using data types, operators, and variables
3	Control Structures: Programs using if-else and looping statements
4	Arrays & Strings: Programs on one-dimensional and multi-dimensional arrays and strings
5	Methods & Constructors: Programs demonstrating method overloading and constructors
6	Inheritance: Programs using single, multilevel inheritance
7	Interfaces & Packages: Programs using interfaces and packages
8	Exception Handling: Programs using try-catch, throw, throws, and custom exceptions
9	Multithreading: Programs using Thread class and Runnable interface
10	Thread Synchronization: Programs demonstrating synchronization
11	File Handling: Programs using byte and character streams
12	GUI Programming: Develop GUI using AWT / Swing components
13	JDBC Connectivity: Java program to connect and perform CRUD operations on database
14	Java Collections: Programs using List, Set, and Map
15	Servlets / JSP: Develop a basic servlet or JSP application
16	Mini Project: Java-based application using OOP, JDBC, and GUI

Reference Books:

Programming with Java, E. Balagurusamy, McGraw-Hill
Core Java, Volume I – Fundamentals, Cay S. Horstmann, Pearson Education
Java: The Complete Reference, Herbert Schildt, McGraw-Hill Education
Java: The Complete Reference, Herbert Schildt, McGraw-Hill Education
Beginning Java Programming, Joyce Farrell, Cengage Learning

Semester IV

OSE -255-MN – Object Oriented Software Engineering

Teaching Scheme: Theory Sessions: Total 45 Hours	Credit: 04	Examination Scheme: Internal (TH): 40 Marks External (TH): 60 Marks Total : 100 Marks

Course Objectives:

- To introduce the principles of object-oriented software engineering and system development.
- To understand object-oriented analysis and design concepts using UML.
- To develop skills in modeling, designing, and documenting software systems.
- To explain software architecture, design patterns, and quality attributes.
- To familiarize students with testing, maintenance, and management of object-oriented systems.

Course Outcomes:

CO1: Explain object-oriented software engineering principles and development processes - Understand.
CO2: Apply object-oriented analysis techniques to model system requirements - Apply.
CO3: Design object-oriented system architecture and detailed designs using UML - Apply, Analyze.
CO4: Evaluate design patterns, architecture styles, and software quality attributes - Analyze, Evaluate.
CO5: Develop and assess object-oriented software solutions using best practices - Create, Evaluate.

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Object-Oriented Software Engineering	1.1 Software Engineering Overview 1.2 Object-Oriented Paradigm 1.3 Principles: Abstraction, Encapsulation, Inheritance, Polymorphism 1.4 OOSE Process Models 1.5 Agile and Iterative Development	09 Hrs
Unit 2: Object-Oriented Analysis	2.1 Requirements Engineering 2.2 Use Case Modeling 2.3 Identifying Objects and Classes	09 Hrs

	2.4 CRC Cards 2.5 Domain Modeling	
Unit 3: Object-Oriented Design & UML	3.1 Design Principles (SOLID) 3.2 Class Diagrams and Object Diagrams 3.3 Interaction Diagrams (Sequence, Collaboration) 3.4 State and Activity Diagrams 3.5 Package and Component Diagrams	09 Hrs
Unit 4: Software Architecture & Design Patterns	4.1 Software Architecture Concepts 4.2 Architectural Styles 4.3 Introduction to Design Patterns 4.4 Creational, Structural, Behavioral Patterns 4.5 Case Studies	09 Hrs
Unit 5: Testing, Maintenance & Project Management	5.1 OO Testing Strategies 5.2 Refactoring and Maintenance 5.3 Configuration Management 5.4 Software Quality Assurance 5.5 Project Planning and Estimation	09 Hrs

Reference Books:

- **Object-Oriented Software Engineering: A Use Case Driven Approach,** *Ivar Jacobson, Grady Booch, James Rumbaugh,* Publisher: *Addison-Wesley*
- **Applying UML and Patterns,** *Craig Larman,* Publisher: *Pearson Education*
- **Software Engineering,** *Ian Sommerville,* Publisher: *Pearson Education,* Latest Edition
- **Design Patterns: Elements of Reusable Object-Oriented Software,** *Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides,* Publisher: *Addison-Wesley*
- **UML Distilled,** *Martin Fowler,* Publisher: *Addison-Wesley*

Semester IV

PDT -256-MJP – Personality Development

Teaching Scheme: Theory Sessions: Total 45 Hours	Credit: 02	Examination Scheme: Internal (TH): 40 Marks Total : 40 Marks

Course Objectives:

- To develop self-awareness and understanding of personality traits and behavior.
- To enhance communication skills and interpersonal effectiveness.
- To build confidence, leadership qualities, and emotional intelligence.
- To improve professional skills such as presentation, teamwork, and workplace etiquette.
- To prepare students for career readiness, interviews, and lifelong personal growth.

Course Outcomes:

CO1: Explain concepts of personality, self-awareness, and individual differences - Understand.
CO2: Apply effective communication and interpersonal skills in personal and professional settings - Apply.
CO3: Demonstrate emotional intelligence, stress management, and positive attitude - Apply, Analyze.
CO4: Apply leadership, teamwork, and time management skills in group activities - Apply.
CO5: Evaluate personal strengths and develop a professional growth and career plan – Evaluate, Create.

Course Contents

Unit No.	Contents	No of Sessions
Unit 1: Introduction to Personality Development	1.1 Meaning and Importance of Personality 1.2 Determinants of Personality 1.3 Self-Awareness and Self-Concept 1.4 Attitude, Values, and Beliefs 1.5 Personality Types	06 Hrs

Unit 2: Communication & Interpersonal Skills	2.1 Verbal and Non-Verbal Communication 2.2 Listening Skills 2.3 Listening Skills 2.4 Interpersonal Relations 2.5 Group Discussion Techniques	06 Hrs
Unit 3: Emotional Intelligence & Stress Management	3.1 Emotional Intelligence: Concept and Models 3.2 Self-Motivation and Self-Regulation 3.3 Stress: Causes and Consequences 3.4 Stress Management Techniques 3.5 Positive Thinking and Confidence Building	06 Hrs
Unit 4: Leadership, Teamwork & Professional Etiquette	4.1 Leadership Styles and Qualities 4.2 Team Building and Collaboration 4.3 Time Management 4.4 Conflict Management 4.5 Professional Ethics and Workplace Etiquette	06 Hrs
Unit 5: Career Development & Life Skills	5.1 Goal Setting and Personal Effectiveness 5.2 Resume and Cover Letter Writing 5.3 Interview Skills and Body Language 5.4 Presentation Skills 5.5 Lifelong Learning and Career Planning	06 Hrs

Reference Books:

- **Personality Development**, Swami Vivekananda, Publisher: Advaita Ashrama
- **Personality Development and Soft Skills,** *Barun K. Mitra,* Publisher: *Oxford University Press*
- **Developing Personality,** *Rajiv Kalia,* Publisher: *Pearson Education India*
- **Emotional Intelligence,** Daniel Goleman , Publisher: Bantam Books
- **You Can Win,** *Shiv Khera,* Publisher: *Bloomsbury India*

Semester IV		
BOT-260-MJ - Basics of Tally		
Teaching Scheme: Practical Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (PR): 60 Marks Total :60 Marks

Course Objectives:

- To introduce fundamental accounting concepts and computerized accounting systems.
- To familiarize students with the features, interface, and architecture of Tally software.
- To enable students to record accounting transactions using vouchers in Tally.
- To develop the ability to generate and interpret financial statements and reports.
- To understand inventory management and statutory compliance using Tally.

Course Outcomes:

CO1: Explain basic accounting principles and the features of Tally. – Understand
CO2: Apply company creation, configuration, and ledger management in Tally. - Apply
CO3: Apply accounting and inventory vouchers to record business transactions. - Apply
CO4: Analyze financial statements and inventory reports generated in Tally. – Analyze
CO5: Apply statutory compliance features such as GST and data security in Tally. - Apply

Guidelines for Instructor's Manual

The instructor shall frame at least 15 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.

Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on the overall performance of students. For each lab assignment, the instructor will assign grades/marks based on parameters such as timely completion of the task, conceptual understanding, correctness of implementation, code quality, neatness and documentation, and adherence to laboratory instructions, with appropriate weightage assigned to each parameter.

Regularity in lab attendance, active participation, ability to troubleshoot errors independently, and improvement over time shall also be considered during evaluation. The final assessment will reflect both process-oriented learning and successful completion of assigned experiments.

Sr. No.	Assignment List
1	Introduction to Tally: Study features, versions, and interface of Tally
2	Company Creation: Create a new company and configure accounting features
3	Ledger Creation: Create ledgers and groups
4	Voucher Types: Study and practice different voucher types
5	Accounting Vouchers: Enter payment, receipt, journal, and contra vouchers
6	Sales & Purchase Vouchers: Record sales and purchase transactions
7	Trial Balance: Generate and interpret trial balance
8	Final Accounts: Generate Profit & Loss Account and Balance Sheet
9	Inventory Setup: Create stock groups, units, and stock items
10	Inventory Vouchers: Record inventory transactions
11	GST Configuration: Enable and configure GST in Tally
12	GST Transactions: Record GST-compliant sales and purchase entries
13	GST Reports: Generate GST returns and reports
14	Data Backup & Restore: Perform data backup and restore
15	Mini Project: Complete accounting cycle of a business

Reference Books:

1. Tally ERP 9 with GST, S. K. Agarwal, BPB Publications
2. Computerized Accounting with Tally, K. K. Nanda, Dreamtech Press
3. A Complete Guide to Tally with GST, Dinesh Maidasani, Wiley India
4. Financial Accounting, S. N. Maheshwari, S. K. Maheshwari, Vikas Publishing House
5. Tally Official Reference Manual Tally Solutions Pvt. Ltd.

Semester IV

AEX-261-MJ - Advanced Excel

Teaching Scheme: Practical Sessions: Total 30 Hours	Credit: 02	Examination Scheme: External (PR): 60 Marks Total :60 Marks

Course Objectives:

- To enhance proficiency in advanced spreadsheet features for data analysis.
- To apply complex formulas and functions for efficient data processing.
- To analyze and visualize data using charts, PivotTables, and dashboards.
- To automate tasks using Excel tools such as macros and VBA basics.
- To support decision-making through data modeling and analysis techniques.

Course Outcomes:

CO1: Explain advanced Excel features and data management concepts. – Understand
CO2: Apply advanced formulas and functions to solve data problems. - Apply
CO3: Analyze datasets using PivotTables, charts, and conditional formatting. - Analyze
CO4: Create dashboards and automated solutions using Excel tools. – Create
CO5: Evaluate data models and analytical results for decision-making. - Evaluate

Guidelines for Instructor's Manual

The instructor shall frame at least 15 assignments. Instructor's manual consisting of University syllabus, conduction & Assessment guidelines is to be developed.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up for each assignment. Write-up shall include Title, Problem Statement, software and Hardware requirements, Date of Completion.

Program codes with sample output of all performed assignments are to be submitted as softcopy. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be retained with program prints.

Guidelines for Assessment

Continuous assessment of laboratory work is to be carried out based on the overall performance of students. For each lab assignment, the instructor will assign grades/marks based on parameters such as timely completion of the task, conceptual understanding, correctness of implementation, code quality, neatness and documentation, and adherence to laboratory instructions, with appropriate weightage assigned to each parameter.

Regularity in lab attendance, active participation, ability to troubleshoot errors independently, and improvement over time shall also be considered during evaluation. The final assessment will reflect both process-oriented learning and successful completion of assigned experiments.

Sr. No.	Assignment List
1	Excel Environment & Data Types: Study Excel interface, data types, and workbook management
2	Advanced Formulas: Use IF, VLOOKUP/XLOOKUP, HLOOKUP, and nested functions
3	Logical & Text Functions: Implement logical, text, and date functions
4	Data Validation: Apply data validation and drop-down lists
5	Conditional Formatting: Highlight patterns using conditional formatting
6	Sorting & Filtering: Apply advanced sorting and filtering techniques
7	PivotTables: Create and analyze PivotTables
8	PivotCharts: Visualize data using PivotCharts
9	Dashboard Design: Design interactive dashboards
10	What-If Analysis: Use Goal Seek, Scenario Manager, and Data Tables
11	Data Analysis Tools: Apply Solver and Analysis ToolPak
12	Macros: Record and run macros
13	VBA Basics: Write simple VBA programs
14	Data Import: Import data from external sources
15	Mini Project: Develop an Excel-based analytical solution

Reference Books:

1. Advanced Excel Essentials, Jordan Goldmeier, Apress
2. Excel 2019 Power Programming with VBA, Michael Alexander, Richard Kusleika, Wiley India
3. Microsoft Excel 365 Step by Step, Joan Lambert, Microsoft Press
4. Excel Dashboards and Reports, Michael Alexander, John Walkenbach, Wiley India
5. Excel Data Analysis, Wayne L. Winston, Microsoft Press