DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

CURRICULUM

Scheme and Syllabus I to IV Semester

Outcome Based Education

Batch 2025-2027

Department of Master of Computer Applications

ABOUT THE INSTITUTE

Dayananda Sagar Academy of Technology and Management- DSATM was established in 2011 with 5 UG Programmes and 1 PG Program, the Programmes are approved by All India Council for Technical Education (AICTE) New Delhi, Affiliated to Visvesvaraya Technological University (VTU), Belagavi and DSATM is an autonomous institute from 2023-2024.

The Dayananda Sagar Institutions is one of pioneer institutions in India and abroad with six decades of excellence in Academic and Research. The newer campuses were necessary to accommodate the growing need of the technology and innovation.

DSATM nurtures the students in academic, research, sports, cultural and extracurricular activities.

- Creating an academic environment to nurture and develop competent entrepreneurs, leaders and professionals who are socially sensitive and environmentally conscious.
- Integration of Outcome Based Education and cognitive teaching and learning strategies to enhance learning effectiveness.
- Developing necessary infrastructure to cater to the changing needs of Business and Society.
- Optimum utilization of the infrastructure and resources to achieve excellence in all areas of relevance.
- Adopting learning beyond curriculum through outbound activities and creative assignments.
- Imparting contemporary and emerging techno-managerial skills to keep pace with the changing global trends.
- Facilitating greater Industry-Institute Interaction for skill development and employability enhancement.
- Establishing systems and processes to facilitate research, innovation and entrepreneurship for holistic development of students.
- Implementation of Quality Assurance System in all Institutional processes.

VISION OF THE INSTITUTE

To strive at creating the institution a centre of highest caliber of learning, so as to create an overall intellectual atmosphere with each deriving strength from the other to be the best of engineers, scientists with management & design skills.

MISSION OF THE INSTITUTE

- To serve its region, state, the nation and globally by preparing students to make meaningful contributions in an increasing complex global society challenges.
- To encourage, reflection on and evaluation of emerging needs and priorities with state-of-the-art infrastructure at institution.
- To support research and services establishing enhancements in technical, economic, human and cultural development.
- To establish interdisciplinary centre of excellence, supporting/ promoting student's implementation.
- To increase the number of Doctorate holders to promote research culture on campus.
- To establish IIPC, IPR, EDC, innovation cells with functional MOU's supporting student's quality growth.

QUALITY POLICY

Dayananda Sagar Academy of Technology and Management aims at achieving academic excellence through continuous improvement in all spheres of Technical and Management education. In pursuit of excellence cutting – edge and contemporary skills are imparted to the utmost satisfaction of the students and the concerned stakeholders.

ABOUT THE DEPARTMENT

The MCA program at Dayananda Sagar Academy of Technology was started in the year 2021 with an intake of 60. Subsequently in the year 2023, the intake was increased to 120.The duration of the MCA program is 2 years. The department believes that Innovative Teaching-Learning methods coupled with problem-solving using modern tools help students to enhance their skills & enable them to handle the challenges faced in their professional lives. The department provides quality education with high standards to achieve academic excellence thereby achieving the career goals of the students. Various workshops/Technical Talks/Guest Lectures are organized through the department club "Xcurrate". Our students have completed MOOC's from various online platforms that has benefitted them in taking industrial internships. Our students are doing extremely well both in academics and extracurricular activities. The department offers various electives in cutting-edge technologies so that students are industry-ready.

The department encourages faculty and students to participate in National/International conferences to exhibit their ideas in the form of presentations and 5 publications in peer-reviewed Journals. The department has dedicated & committed faculty members supported by technical & administrative staff. The teaching faculties of the department are highly committed and give their best to the students by incorporating an innovative teaching learning process. The faculties are actively involved in research. Faculties publish their research work in various reputed International peer-reviewed journals. The students of MCA are placed in reputed companies such as Virtusa, TCS, Capgemini, Cognizant, Tata Elxsi, Cognizant, Newton School and many more.

VISION OF THE DEPARTMENT

Nurture Continuous Learning through research and innovations in the field of Computer Science, Technology and Applications, to build competent professionals

MISSION OF THE DEPARTMENT

- Create a learning environment to motivate students to build strong technology skills.
- Promote value based ethical practices in all facets of learning.

- Instill Entrepreneurial collaborative thinking through structured interventions and industry participation.

PROGRAM EDUCATION OBJECTIVES (PEO'S):

PEO1: Analyze real life problems, design computing systems appropriate to its solutions that are technically sound, economically feasible and socially acceptable.

PEO2: Exhibit professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in lifelong learning.

PEO3: Demonstrate Leadership and Entrepreneurship Skills by incorporating organizational goals.

PROGRAM OUTCOMES (PO's)

MCA Graduates will be able to:

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

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

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO 1: The graduates of the Program will have skills to develop, deploy and maintain applications for desktop, web, mobile, cloud and cross platforms using modern tools and technologies.

PSO 2: The graduates of the program analyze the societal needs to provide novel solutions through technological based research.

PROPOSED PG CREDIT STRUCTURE IN ALIGNMENT WITH VTU

Sl.No	Semester	No. of Credits
1	1st Semester	20
2	2nd Semester	20
3	3rd Semester	22
4	4th Semester	18
	Total	**80**

Scheme of Teaching and Examinations – 2025
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2025-26)

1st SEMESTER: MCA

Sl.No	Course Code	Course Title	Course Category	BOS/ TD	Teaching Hours/Week					Credits	Examination			
					Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
					L	T	P	S						
1	MMC101	Mathematical Foundation for Computer Applications	BSC	MAT	2	2	0	0	4	03	3	50	50	100
2	MMC102	Operating Systems	PCC	MCA	3	0	0	0	3	03	3	50	50	100
3	MMC103	Data Structures and Algorithms	PCC	MCA	3	0	0	0	3	03	3	50	50	100
4	MMC104	Object Oriented Programming Using Java	IPCC	MCA	3	0	2	0	5	04	3	50	50	100
5	MMC105	Relational Database Management Systems	IPCC	MCA	3	0	2	0	5	04	3	50	50	100
6	MMCL106	Problem-Solving Using C	PCCL	MCA	0	0	2	2	4	02	3	50	50	100
7	MAEC107	Data Visualization Laboratory	AEC	MCA	0	0	2	0	2	01	3	50	50	100
8	MMAT108	Mathematics Bridge Course	NCMC	MCA	2	0	2	0	4	0	0	100	-	100
9	MRMI109	Research Methodology and IPR(Online)	NCMC	MCA	Online course to be completed									PP
				Total	**16**	**02**	**10**	**2**	**30**	**20**	**21**	**450**	**350**	**800**

Scheme of Teaching and Examinations – 2025
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2025-26)

2nd SEMESTER: MCA

Sl.No	Course Code	Course Title	Course Category	BOS/ TD	Teaching Hours/Week					Credits	Examination			
					Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
					L	T	P	S						
1	MMC201	Software Engineering	PCC	MCA	3	0	0	0	3	3	3	50	50	100
2	MMC202	Machine Learning and Data Analytics Using Python	PCC	MCA	3	0	0	0	3	3	3	50	50	100
3	MMC203	Advanced Java Programming	PCC	MCA	2	2	0	0	4	3	3	50	50	100
4	MMC204	Computer Networks	IPCC	MCA	3	0	2	0	5	4	3	50	50	100
5	MMC205	Web Technologies	IPCC	MCA	3	0	2	0	5	4	3	50	50	100
6	MMCL206	Data Science Laboratory	PCCL	MCA	0	0	2	2	4	2	3	50	50	100
7	MAEC207	Cloud Computing Laboratory Using AWS	AEC	MCA	0	0	2	0	2	1	3	50	50	100
8	MAEC208	Ability enhancement course with seminar	NCMC	MCA	0	0	0	2	2	-	-	100	-	100
				Total	**14**	**02**	**8**	**4**	**28**	**20**	**21**	**450**	**350**	**800**

Scheme of Teaching and Examinations – 2025
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2025-26)

3rd SEMESTER: Master of Computer Applications (MCA)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
						L	T	P	S						
1	MMC31*	Professional Elective Course-1	PEC	MCA	MCA	3	0	0	0	3	3	3	50	50	100
2	MMC32*	Professional Elective Course-2	PEC	MCA	MCA	3	0	0	0	3	3	3	50	50	100
3	MMC33*	Professional Elective Course-3	PEC	MCA	MCA	3	0	0	0	3	3	3	50	50	100
4	MMCP304	Project Work	PROJ	MCA	MCA	0	0	0	25	25	13	3	100	100	200
					Total	**9**	**0**	**0**	**25**	**34**	**22**	**12**	**250**	**250**	**500**

Professional Elective Course-1		Professional Elective Course-2		Professional Elective Course-3	
MMC311	Introduction to Generative AI	MMC321	Deep Learning	MMC331	Computer Vision
MMC312	Ethical Hacking	MMC322	Cyber Security	MMC332	Block chain Technology
MMC313	Enterprise Application Programming	MMC323	User Interface Design	MMC333	Web Development using Full stack open
MMC314	Social Media Analytics	MMC324	Big Data Analytics	MMC334	IOT Technology & Applications

MMC315	Network and Linux Administration	MMC325	Cloud Essentials	MMC335	Devops
MMC316	Software Design and Patterns	MMC326	Software Testing	MMC336	Software Project Management

Scheme of Teaching and Examinations – 2025
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2025-26)

4th SEMESTER: Master of Computer Applications (MCA)

Sl.No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
						L	T	P	S						
1	MMC401	Mobile Application Development using Flutter	IPCC	MCA	MCA	3	0	2	0	5	4	3	50	50	100
	MMC402	Online Course	PEC/MDC	MCA	MCA	online course					3	-	-	100	100
2	MMCS403	Technical Seminar	SEM	MCA	MCA	0	0	0	4	4	2	-	100	-	100
4	MMCI404	Research/Industry/Startup Internship	INT	MCA	MCA	0	0	0	25	25	9	3	100	100	200
Total						**3**	**0**	**2**	**29**	**34**	**18**	**6**	**250**	**250**	**500**

PROPOSED PG SCHEME: 1st Sem

Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total (Hrs/week)	
				L	T	P	S		
1	BSC	MAT	MAT	2	2	0	0	4	3
2	PCC	MCA	MCA	3	0	0	0	3	3
3	PCC	MCA	MCA	3	0	0	0	3	3
4	IPCC	MCA	MCA	3	0	2	0	5	4
5	IPCC	MCA	MCA	3	0	2	0	5	4
6	PCCL	MCA	MCA	0	0	2	2	4	2
7	AEC	MCA	MCA	0	0	2	0	2	1
8	NCMC	MAT	MCA	2	0	2	0	4	PP
9	NCMC	MCA	MCA	Online course					PP
								Total	**20**

PROPOSED PG SCHEME- 2nd Sem

Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total (Hrs/week)	
				L	T	P	S		
1	PCC	MCA	MCA	3	0	0	0	3	3
2	PCC	MCA	MCA	3	0	0	0	3	3
3	PCC	MCA	MCA	2	2	0	0	4	3
4	IPCC	MCA	MCA	3	0	2	0	5	4
5	IPCC	MCA	MCA	3	0	2	0	5	4
6	PCCL	MCA	MCA	0	0	2	2	4	2
7	AEC	MCA	MCA	0	0	2	0	2	1
8	NCMC	MCA	MCA	0	0	0	2	2	PP
								Total	**20**

PROPOSED PG SCHEME- 3rd Sem

Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total (Hrs/week)	
				L	T	P	S		
1	PEC-1	MCA	MCA	3	0	0	0	3	3
2	PEC-2	MCA	MCA	3	0	0	0	3	3
3	PEC-3	MCA	MCA	3	0	0	0	3	3
4	PROJ	MCA	MCA	25 hours per week					13
								Total	**22**

PROPOSED PG SCHEME- 4th Sem

Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total (Hrs/week)	
				L	T	P	S		
1	IPCC	MCA	MCA	3	0	2	0	5	4
2	Online Course	MCA	MCA	online Course					3
2	SEM	MCA	MCA	0	0	0	4	4	2
4	Research/Industry/Startup Internship	MCA	MCA	25 hours per week					9
								Total	**18**

Percentage of Mapping– Theory & Practical - Scheme & Syllabus- 1st semester

1st Sem Sl. No	Course Category	Theory	Practical
1	BSC	100%	--
2	PCC	100%	--
3	PCC	100%	--
4	IPCC	60%	40%
5	IPCC	60%	40%
6	PCCL	--	100%
7	AEC	--	100%
8	NCMC	--	----
9	NCMC	--	----
	Total Percentage	84%	70%

Percentage of Mapping– Theory & Practical - Scheme & Syllabus- 2nd semester

2nd Sem Sl. No	Course Category	Theory	Practical
1	PCC	100%	--
2	PCC	100%	--
3	PCC	100%	--
4	IPCC	60%	40%
5	IPCC	60%	40%
6	PCCL	--	100%
7	AEC	--	100%
8	NCMC	-	-
	Total Percentage	84%	70%

Percentage of Mapping– Theory & Practical - Scheme & Syllabus- 3rd semester

3rd Sem Sl. No	Course Category	Theory	Practical
1	PEC-1	100%	--
2	PEC-2	100%	--
3	PEC-3	100%	-
4	PROJ	--	100%
	Total Percentage	100%	100%

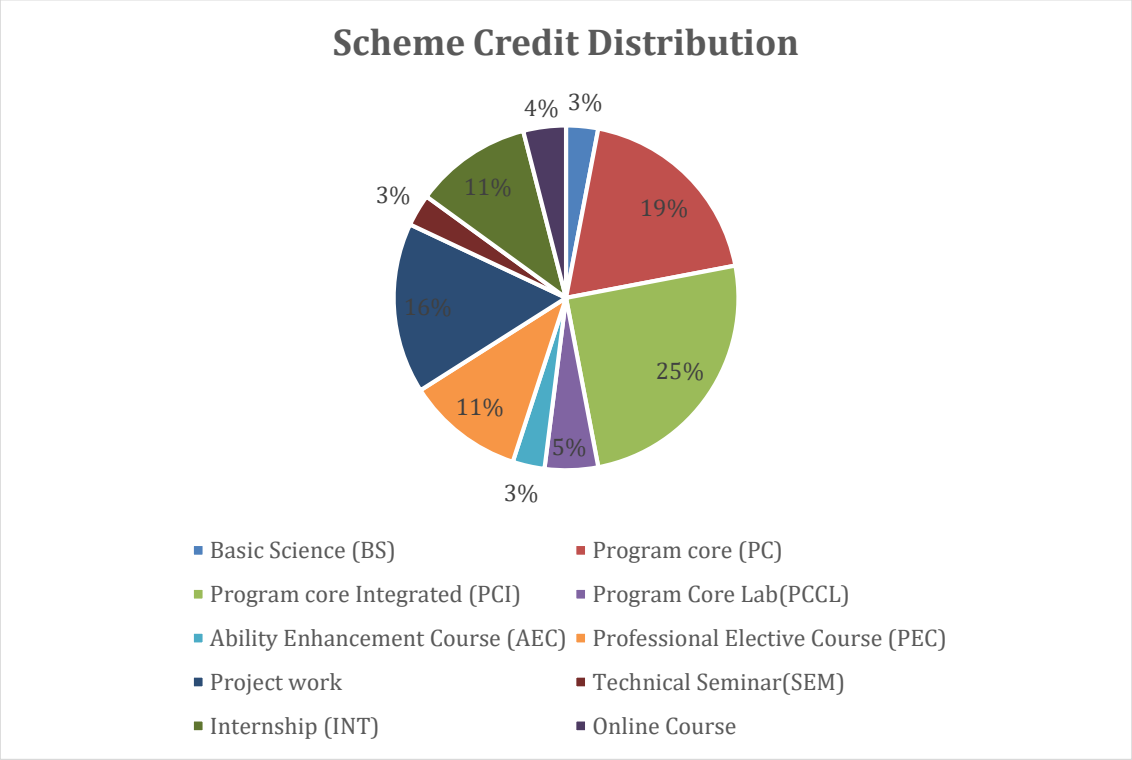
Percentage of Mapping– Theory & Practical - Scheme & Syllabus- 4th semester

Sl. No	Course Category	Theory	Practical
1	IPCC	60%	-40%
2	SEM	--	100%
3	INT	--	100%
	Total Percentage	60%	80%

Scheme Distribution

Department of Master of Computer Applications

Course Component	Credits	% of Credits
Basic Science (BS)	03	3%
Program core (PC)	15	19%
Program core Integrated (PCI)	20	25%
Program Core Lab(PCCL)	04	5%
Ability Enhancement Course (AEC)	02	3%
Professional Elective Course (PEC)	09	11%
Project work	13	16%
Technical Seminar	02	3%
Internship	09	11%
Online Course	03	4%
Total	**80**	**100%**



SEMESTER WISE CREDIT BREAKDOWN FOR MCA DEGREE CURRICULUM

BATCH 2025-2027

Course Category	Semester				Total Credits
	1st	2nd	3rd	4th	
Basic Sciences (BSC)	3	-	-	-	03
Professional Core Courses (PCC)	6	9	-	-	15
Integrated Professional Core Course (IPCC)	8	8	-	4	20
Professional Elective Course (PEC)	-	-	9	-	09
Ability Enhancement Course (AEC)	1	1	-	-	02
Program Core exclusive labs	2	2	-	-	04
Internship (INT)	-	-	-	9	09
Technical Seminar	-	-	-	2	02
Project Work (PW)	-	-	13	-	13
Non-credit Mandatory Courses (NCMC)	0	-	-	-	-
Online Course	-	-	-	3	03
Total Credits	20	20	22	18	80

IPCC: Integrated Professional Core Course,

PCC: Professional Core Course

PBL: Project Based Learning

AEC: Ability Enhancement Course,

NCMC: Non-Credit Mandatory Course

MCC: Mandatory Core Course

L: Lecture,

T: Tutorial,

P: Practical

S= SDA: Skill Development Activity,

CIE: Continuous Internal Evaluation,

SEE: Semester End Evaluation.

Integrated Professional Core Course (IPCC): Refers to Integrated Professional Core Course Theory Integrated with practical's of the same course. Credit for IPCC can be 04 and its Teaching Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

Non Credit Mandatory Course (NCMC): Students have to complete the **Research Methodology and IPR** course from http://online.vtu.ac.in and to qualify for this course is compulsory before completion of the minimum duration of the program(2 years). However, this course will not be considered for vertical progression.

Bridge Course: Non-Credit mandatory Course MMAT108-Mathematics for MCA students: Students who have not taken Mathematics at the 10+2 or degree level are required to study and pass this course in the 1st semester. However, this course will not be considered for vertical progression.

1st SEMESTER

BASIC SCIENCE COURSE (BSC)

BSC Course – Basic Science Course

Teaching Hours/Week (L: T:P: S)	2:2:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course Basic Science Course (BSC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 50% of the maximum marks (25 marks out of 50) and for the SEE minimum passing mark is 40% of the maximum marks (20 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered

- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th week of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Core Course (PCC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory				**50**	----	----	**25**	
	Theory	Internal Assessment Test (IAT) - I	Module – 1 to 2.5	50	(50+50) / 2	**25**	13	Average of Two Internal test each of 50 Marks scale down the marks to 25 Marks
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	17	Two CCA methods to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	**30**	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	50	

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**I**				
Course Title	**:**	**Mathematical Foundation for Computer Applications**				
Course Code	**:**	**MMC101**				
Course Type **(Theory/ Practical/ Integrated)**	**:**	**Theory**				
Category	**:**	**BSC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Credits (L:T:P:S)	**:**	**2:2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**
Credits		**3**				

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Acquire basic knowledge of Discrete Mathematical concepts used in computer science
2	Use concepts of matrices, mathematical logic, sets, relations, probability, statistics and graph theory in solving problems
3	Analyse problems using concepts of mathematical logic, statistics and graph theory
4	Analysis of various real time problems using the skills acquired

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various

course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.

6. Topics will be introduced in multiple representations.

7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**SETS AND RELATIONS:** Inclusion-exclusion principle, pigeonhole Principle, relations, representation of relations, Equivalence Relation, Functions-One-One and Onto, Composition of functions, Inverse functions.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
2	**MATRICES:** Matrices, solution of system of equations, consistency, Gauss elimination method, Gauss Seidel iterative method **MATHEMATICAL LOGIC:** Propositional Logic, Propositional Equivalence.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
3	**BUSINESS STATISTICS:** Correlation and correlation coefficient, regression lines, rank correlation. Introduction to time series, Components of a time series, Decomposition of time series, method of semi averages, method of moving averages and least square method (straight line, parabola and exponential curve).	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
4	**PROBABILITY THEORY:** Random variables, Discrete and Continuous probability distribution, binomial distribution, Poisson distribution, normal distribution.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	

5	**Graph Theory** Basics of Graph theory, Dijkstra's Algorithm, BFS & DFS Algorithms, sorting, weighted trees and prefix codes.	**8**
Pedagogy	**Chalk and board, group discussion, ppt, videos**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Kenneth H Rosen, "Discrete Mathematics and its Applications", McGraw Hill publications, 7th edition. (Chapters 2.1,2.2,2.5, 2.6,6.2,8.5,8.6,10.1 to 10.8)
2	Wolpole Myers Ye "Probability and Statistics for engineers and Scientist" Pearson Education, 8th edition.
3	Richard A Johnson and C.B Gupta "Probability and statistics for engineers" Pearson Education.
4	J.K Sharma "Discrete Mathematics", Mac Millan Publishers India, 3rd edition,2011
5	S.C.Gupta and V.K.Kapoor "Fundamentals of Mathematical Statistics", Chand Publishers,12th edition,2020.
6	David C Lay, Linear algebra and its applications, 4th Edition, Pearson Publications, 2018
7	Introduction to graph theory, Douglas B.West, Prentice Hall India Learning Private Limited, 2nd Edition, 2002.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	**Understand the basic concepts of discrete mathematics**	**Understand**	**L2**
CO2	**Apply the concepts of discrete mathematics used in computer science**	**Apply**	**L3**
CO3	**Analyse data using various concepts of discrete mathematics**	**Analyse**	**L4**
CO4	**Investigate problems arising in real life using the overall knowledge acquired**	**Evaluate**	**L5**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	**3**													
CO3		**2**												

CO4				2					1	1				
CO5														

Weblinks and Video Lectures (e-Resources)	
1	https://youtu.be/xlUFkMKSB3Y; https://youtu.be/dpj0dg8gvHQ; https://youtu.be/AtA3mmWyV0k
2	https://youtu.be/0uTE24o3q-o; https://youtu.be/FUIlqy5BlTc; https://youtu.be/RBgSoft-HGs; https://youtu.be/MJkXMrQVglU
3	https://youtu.be/r1sLCDA-kNY; https://youtu.be/9wCnvr7Xw4E
4	https://youtu.be/2BK12ntx0og;
5	https://youtu.be/HkNdNpKUByM; https://youtu.be/y4RAYQjKb5Y

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			Practical
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)	Test
	Test-1	Test-2		
	25 Marks	25 Marks	50 Marks	
Remember	-	-	10	-
Understand	5	5	10	-
Apply	15	15		-
Analyse	5	5	10	-
Evaluate	-	-	20	-
Create	-	-	-	-

CIE Course Assessment Plan

CO's		Marks Distribution					Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module-3	Module-3	Module-4	Module-5		
CO1	2	3			2	3	10	20%
CO2	5	5	5	5	5	5	30	60%

CO3	3	2			3	2	10	20%
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-
Total	10	10	5	5	10	10	50	-

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
Remember	-
Understand	10
Apply	30
Analyse	10
Evaluate	
Create	

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	5	-	-	-	5	10	20%
CO2	5	5	10	5	5	30	60%
CO3	-	5	-	5	-	10	20%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	10	10	10	10	10	-	100%

PROFESSIONAL CORE COURSE (PCC)

PCC Course - Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Core Course (PCC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.

- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Core Course (PCC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory				**50**	----	----	**25**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	13	Average of Two Internal test each of 50 Marks scale down the marks to 25 Marks
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	17	Two CCA methods to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	**30**	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	50	

Dayananda Sagar Academy of Technology & Management
(Autonomous Institute under VTU)

Semester	:	**I**				
Course Title	:	**OPERATING SYSTEMS**				
Course Code	:	**MMC102**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40**		**SEE Duration**	:	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Know the Basic Components of Operating System.
2	Comprehend how an operating System Virtualizes CPU and Memory.
3	Discuss Various Scheduling and Paging Techniques.
4	Understand the basics of shell programming.
5	Implementing the programming aspects using Unix operating System.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**OPERATING SYSTEMS OVERVIEW:** Introduction, operating system operations, Computer System architecture, Operating System structure, Operating System operations process management, memory management, storage management. **OPERATING SYSTEMS STRUCTURES:** Operating system services and systems calls, system programs, operating system structure, operating systems generation, system boot.	8
Pedagogy	**Case Study- Comparison of Architecture of Linux and Windows**	
2	**PROCESS MANAGEMENT:** Process concepts, Process Scheduling, Inter Process Communication, Scheduling Criteria, Scheduling Algorithms. **SYNCHRONIZATION:** Background: The critical section problem, Mutex Locks, Semaphores, classic problems of Synchronization: Readers-Writers Problem, Dining Philosophers Problem using Semaphores.	8
Pedagogy	**Problem Solving-Process scheduling**	
3	**DEADLOCKS:** System model, deadlock characterization, Methods for Handling Deadlocks, deadlock prevention, detection and avoidance, recovery from deadlock banker's algorithm.	8
Pedagogy	**Collaborative learning - Bankers algorithm**	
4	**MEMORY MANAGEMENT:** Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms.	8
Pedagogy	**Case Study-Fragmentation, Group activity -Analyse system Memory Utilization and Improvements**	
5	**FILE SYSTEM:** Concept, Access methods, Directory Structure, Implementing file system: Allocation Methods, free Space Management	8
Pedagogy	**Case study- file systems comparison on different operating systems**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating Systems Principles, 10th Edition, Wiley – India.
2	D M Dhamdhere: Operating Systems – A Concept Based Approach, 2nd Edition, Tata McGraw – Hill, 2019.
3	UNIX: The Complete Reference: Kenneth Roson et al, Osborne/McGraw Hill, 2018.
4	Sumitabha Das: UNIX Concepts and Applications, 4th Edition, Tata McGraw Hill, 2012.
5	P C P Bhatt: Operating Systems, 2nd edition, PHI, 2012.

Weblinks and Video Lectures (e-Resources)	
1	https://www.mbit.edu.in/wp- content/uploads/2020/05/Operating_System_Concepts_8th_EditionA4.pdf
2	https://www.coursera.org/courses?query=operating%20system
3	https://onlinecourses.nptel.ac.in/noc20_cs04/preview

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Describe the concepts of Operating Systems including process, memory and file system management.	**L2**	**Understand**
CO2	Apply the Scheduling algorithms, Process and CPU management to solve in real world problems	**L3**	**Apply**
CO3	Analyze the Principles of Process Synchronization, Deadlock Detection and Avoidance Techniques for efficient Resource Allocation	**L4**	**Analyze**
CO4	Design and evaluate Memory Management Technique such as Paging, Segmentation and virtual memory systems to Optimize Performance .	**L5**	**Evaluate**

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	**10**	**5**
Understand	10	20	**-**	**5**
Apply	20	20	**10**	**10**
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	10	20	20	20	10	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	5
Understand	5
Apply	20
Analyse	30
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	5	10	10	10	5	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	25	40	50	50	45	200	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**I**				
Course Title	:	**Data Structures and Algorithms**				
Course Code	:	**MMC103**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L: T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours4	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Understand the basic concepts of various Data Structures Techniques
2	Learn the concepts of Stack, Queue, Linked Lists, Searching and Sorting techniques.
3	Know the various data structures for solving computing problems.
4	Understand the efficiency of algorithms in terms of asymptotic notations for the given problem.
5	Know the various applications of the Data Structures and Algorithms.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

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Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Introduction: Basic Concepts:** Definition primitive and non-primitive, Linear and non-linear data structures, data structure operations and importance of data structures, Pointers, Dynamic memory allocation, The Abstract data type, Arrays in C, dynamically allocated arrays: One dimensional array and two-dimensional arrays, Structures and Unions: Internal representation of structures, self-referential structures, Strings in C, Pattern Matching.	8
Pedagogy	**Assignment**	
2	**Stacks and Queues:** Stacks, Stacks using dynamic arrays, Queues, Circular Queues using dynamic array: A Mazing Problem, Evaluation of expression: Expressions, Evaluating Postfix Expressions, Infix to Postfix, Multiple Stacks and Queues.	8
Pedagogy	**Mini Project**	
3	**Linked List and Trees:** Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operation: Operations for chains, Operations for Circularly Linked Lists, Doubly Linked List. **Trees:** Introduction: Terminology, representation of Trees, Binary Trees: The abstract data type, Properties of binary trees, Binary Tree representations, Binary Tree Traversals: In-order, Preorder, Post-order traversals, Heaps: Priority Queues, Definition of a Max Heap, Insertion into a Max Heap, Deletion from a Max Heap	8
Pedagogy	**Hands-on Session**	
4	**Introduction to Algorithms:** Fundamentals of the Analysis of Algorithm Efficiency Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms.	8
Pedagogy	**Lab Assessment**	
	Brute Force: Selection Sort and Bubble Sort, Sequential Search, Exhaustive	

5	search and String Matching. Divide-and-Conquer Merge sort, Quicksort, Binary Search, Binary tree Traversals and related properties. Decrease-and- Conquer Insertion Sort, Depth First and Breadth First Search, Topological sorting. Greedy Technique Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm.	**8**
Pedagogy	**Hands-on Session**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2019.
2	Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2017, Universities Press.
3	Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2016. Pearson.
4	Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2016.
5	Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2016.
6	Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2016. Pearson.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Discuss the fundamental concepts of data structures, algorithms and their applications in problem solving.	**Understand**	**L1,L2**
CO2	Apply linear and non-linear data structures such as arrays, linked list, stacks, queues, trees and graphs to solve computational problems	**Apply**	**L3**
CO3	Analyze the time and space complexity of algorithms to evaluate their efficiency.	**Analyze**	**L4**
CO4	Design and implement algorithms for searching, sorting, DFS, BFS and shortest path.	**Evaluate**	**L5**
CO5	Develop recursive algorithm and apply divide and conquer strategies to address the complex problems.	**Implement**	**L6**

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=BBpAmxUNQo
2	https://www.youtube.com/watch?v=8hly31xKliO
3	https://archive.nptel.ac.in/courses/106/106/106106127/
4	https://archive.nptel.ac.in/courses/106/106/106106131/

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	**10**	**5**
Understand	10	20	**-**	**5**
Apply	20	20	**10**	**10**
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	10	20	20	20	10	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100 Marks)
Remember	-
Understand	20
Apply	40
Analyze	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	5	4	5	6		20	20%
CO2	6	10	8	10	6	40	40%
CO3	8	6	10	6	10	40	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
¤ Total	-	-	-	-	-	-	100

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCC Course – Integrated Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:2:0
Total Hours of Pedagogy	40 hours Theory + 20 Hours of Practical Classes
Credits:	04
Theory - Each Module	8 Hrs
Practical's	8-10 Programs / Experiments
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

- The theory part of the IPCC shall be evaluated both by CIE and SEE.
- The practical part shall be evaluated by only CIE (no SEE).
- However, questions from the practical part of IPCC shall be included in the SEE question paper.

Integrated Professional Core Course (IPCC) - 4 Credit Course	
	Assessment Details (both CIE and SEE) ● The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. ● The minimum passing mark for the CIE is 60% of the maximum marks (30 marks out of 50) and for the SEE minimum passing mark is 40% of the maximum marks (20 out of 50 marks). ● A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. **Continuous Internal Evaluation (CIE) for the Theory component of the IPCC (Maximum marks 50)** **Internal Assessment Test (IAT):**

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 30 marks and that for the practical component is 20 marks.
- 30 marks for the theory component are split into 15 marks for two Internal Assessment Tests (Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 15 marks) and 15 marks for Two Continuous Comprehensive Assessment(CCA) methods.
- The first Internal test at the end of 40-50% coverage of the syllabus
- The second Internal test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Revised Blooms Taxonomy (RBT) Levels. Emphasis to be given for Higher order Thinking Skills(HOTS).

Continuous Internal Evaluation (CIE) for the practical component of the IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report, **05 Marks** are for conducting the experiment, **05 Marks for** preparation of the laboratory record and observation notebook , **5 Marks** for conducting Open Ended Experiments Each experiment. Marks of all experiments' write-ups are added to 15 marks.
- The Practical laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **5 Marks.**
- The open-ended experiment after completion of all the experiments shall be conducted for 20 marks with a split-up for 5 Marks for writeup, 10 Marks for Execution, and 5 Marks for Viva-Voce.
  Marks for writeup, Execution and Viva-Voce is added and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory 2component of IPCC for 20 marks.

- The student has to secure 50% of 20 marks to qualify in the CIE of the practical component of the IPCC.

Semester End Examination (SEE) for IPCC Theory

SEE will be conducted as per the scheduled timetable, with common question papers for the course (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.
- The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks.
- The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only.
- Questions mentioned in the SEE paper may include questions from the practical component.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be (CCA1+CCA2)/2 and scaled down to **15 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The Assessment will be through rubrics.
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **15 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **30 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

	• Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom, • The assessment of these techniques shall be in rubrics. • The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

4 Credits Courses – Integrated Professional Core Course (IPCC)

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**15**	
CIE	**Theory**	Internal Assessment Test (IAT) - I	Module – 1 to 2.5	50	(50+50) / 2	**15**	8	Average of Two Internal test each of 50 Marks scale down the marks to 15 Marks
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity based learning	Considering all the Modules	50	(50+50) / 2	**15**	12	Two CCA methods to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives/ Activity based learning		50				
	Total CIE Theory					**30**	20	Scale down Marks of IAT and CCA to 30

CIE	**Practical**	Conduction of Experiments	Performance- Continuous Evaluation of each experiment	05	10	Average of all Experiments	10	5	Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
			Record	03					
			Observation book	02					
		Practical Test	Write up	15	50	----	05	3	One Internal Practical Test after conduction of all Experiments for 50 Marks
			Execution	25					
			Viva-voce	10					
		Open Ended Experiment	Write up	05	20	----	05	2	One experiment for 20 marks. 20 marks reduced to 05 marks
			Execution	10					
			Viva-voce	05					
					Total CIE Practical		**20**	**10**	Scale down Marks of Experiments, Record,

								Observation, Practical Test and Open-Ended Experiment
SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	50	

- The Laboratory Component for the IPCC shall be for CIE only.
- However, in SEE, the Questions from the Laboratory Component shall be included in the respective Modules only.

Dayananda Sagar Academy of Technology & Management
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Semester	:	**I**				
Course Title	:	**Object Oriented Programming using Java**				
Course Code	:	**MMC104**				
Course Type (Theory/ Practical/ Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L: T:P:S)	:	**3:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**60 Hrs**		**SEE Duration**	:	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Understand the basic Object-Oriented Programming concepts and apply them in Problem-Solving.
2	Learn Object-Oriented Programming concepts to solve Real-World Problems.
3	Gain Familiarity with the concepts of Class and Objects and its access control to Real-World Entities.
4	Gain knowledge on behavior of Programs involving the basic Programming constructs like control Structures, Constructors, String Handling and Garbage Collection.
5	Learn the concepts of Method Overloading and Constructors to develop Application Programs.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**THE HISTORY AND EVOLUTION OF JAVA: T**he Byte Code, Features of Java, an Overview of Java: Object Oriented Programming, Structure of Java Program, Data Types and Variables, Type Conversion and Casting, Arrays. **CLASSES: F**undamentals, Declaring Objects, Assigning Object Reference Variables, Methods, Constructors, this keyword, Garbage Collection, Stack Applications **METHODS AND CLASSES: O**verloading Methods, using objects as Parameter, Argument passing, Returning Objects, Access Control, static, Final, Command Line Arguments	8
Pedagogy	**Chalk and board, Active Learning, Quiz**	
2	**INHERITANCE:** Basics – Member Access and Inheritance, practical example, Inheritance Types, Super, Constructors, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Final with inheritance. **STRING HANDLING:** String Constructor, String length, Special string Operations, Character Extraction, String comparison, Modifying a string, String Buffer **Generics**: About Generics, A simple Generic Example, General class with Two Type Parameters, General form of generic class	8
Pedagogy	**Chalk and board, Power Point Presentation, Algorithmic challenges**	
3	**INTERFACES:** Interfaces vs Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface; **Packages:** Java API Packages, the import Statement, Using System Packages, Naming Conventions, CLASSPATH Settings, Creating and using Packages, Importing from other Packages, Access protection in Packages, Example for package.	8
Pedagogy	**Chalk and board, Power Point Presentation, Hunt the code**	
4	**Exception handling:** Fundamentals, Exception types, uncaught exceptions, try and catch, multiple catch clauses, nested try statements, throw, throws, finally, java's built-in exceptions, User-defined exceptions. **Multithreaded Programming:** Java thread model, main thread, creating thread, creating multiple threads, isalive( ) and Join( ), thread priorities, synchronization **Input/Output:** Exploring java.io - The I/O Classes and Interfaces, The Byte Streams	8
Pedagogy	**Chalk and board, Power Point presentation , Coding and Debugging**	

5	Event Handling: Two Event Handling Mechanisms, The Delegation Event Model, EventsEvent Sources, Event Listeners, Event Classes- The MouseEventClass, Event Listener Interfaces-The MouseListener Interface, the MouseMotionListener Interface, Delegation Event Model Handling Mouse Events. AWT: Working with Windows, Graphics and Text, AWT Classes, Window Fundamentals, Working with Frame Windows	**8**
Pedagogy	**Chalk and board, Power Point Presentation , Mini Project**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	T.Budd, "Understanding Object- Oriented Programming with Java", Pearson Education, Updated Edition (New Java 2 Coverage), 2017.
2	Herbert Schildt, "Java the complete reference", McGraw Hill, Osborne, 11th Edition, 2011.
3	P.J.Dietel and H.M.Dietel , "Java How to program", Prentice Hall, 6th Edition, 2010.

Weblinks and Video Lectures (e-Resources)	
1	http://java.sun.com http://www.oracle.com/technetwork/java/index.html) http://java.sun.com/javase
2	http://www.oracle.com/technetwork/java/javase/overview/index.html
3	http://download.oracle.com/javase/7/docs/api/index.html
4	http://download.oracle.com/javase/7/docs/api/index.html

List of Experiments or Programs

Sl.No	**Experiments/Programs**	**COs**
1	Write a Java program to check whether the given number is Palindrome or not	CO4
2	Write a Java program To find the area and circumference of the circle by accepting the radius from the user. To accept a number and find whether the number is Prime or not	CO4
3	a)Write a Java program to demonstrate a division by zero exception b)Write a Java Program to demonstrate the Multithreading	CO4
4	Write a Java program to implement Inner class and demonstrate its Access protection.	CO4
5	Write a Java program to demonstrate Constructor Overloading and Method Overloading.	CO5

6	Write a JAVA program to demonstrate Inheritance. Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.	CO4
7	Write a JAVA program to create an enumeration Day of Week with seven values SUNDAY through SATURDAY. Add a method isWorkday() to the DayofWeek class that returns true if the value on which it is called is MONDAY through FRIDAY. For example, the call DayOfWeek. SUNDAY.isWorkDay () returns false.	CO4
8	Write a Java program that displays the number of characters, lines and words in a text file.	CO4
9	Create a package named shape and Create some classes in the package representing some common shapes like Square, Triangle, and Circle. Import and compile these classes in other program.	CO5
10	Write a Java applet program, which handles keyboard event.	CO5
	Open Ended Programs i) Write a Java applet program which handles Mouse events ii) Write a Java Program to create a simple calculator GUI using AWT components	CO5

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Describe the Programming Concepts of java Programming.	**L1,L2**	**U/R**
CO2	Apply the proficiency in writing and executing Java programs using an integrated development environment (IDE).	**L3**	**A**
CO3	Analyze and apply object-oriented programming principles such as classes, objects, inheritance, and polymorphism to create reusable and modular code.	**L4**	**AN**
CO4	Develop an understanding of basic Java I/O Stream Files	**L5**	**C**
CO5	Create the Programs using problem-solving skills by applying Java programming techniques to solve computational problems.	**L6**	**E**

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	10	5
Understand	10	20	-	5
Apply	20	20	10	10
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%

CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	10	20	20	20	10	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	15
Understand	-
Apply	45
Analyze	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-		
CO5	-	-	-	-	-	-		
Total	10	20	20	20	10	20	100	100%

Dayananda Sagar Academy of Technology & Management

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Semester	:	**I**				
Course Title	:	**Relational Database Management Systems**				
Course Code	:	**MMC105**				
Course Type (Theory/ Practical/ Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L: T:P:S)	:	**3:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**60 Hrs**		**SEE Duration**	:	**3 Hours**

Cour
se Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Provide a strong foundation in database concepts, technology, and practice.
2	Practice SQL programming through a variety of database problems.
3	Understand the use of concurrency and transactions in database.
4	Understand how to build database applications for real world problems.

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Introduction to Databases:** Introduction data and databases, Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.	10
Pedagogy	**Role Play**	
2	**Conceptual Data Modeling:** Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two. **Relational Model:** Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping	10
Pedagogy	**Demonstration**	
3	**SQL:** Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL, Views (Virtual Tables) in SQL, Schema Change Statements in SQL, Transaction Support in SQL (Commit, Rollback, Save point) **Introduction to PL/SQL:** Procedures, function , triggers in PL/SQL.	10
Pedagogy	**Demonstration**	
4	**Database Design and Transaction Concepts :** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Cod Normal Form, De-normalization, Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Two-Phase Locking Techniques for Concurrency Control	10
Pedagogy	**Problem Solving**	

5	**Introduction to NoSQL & MongoDB**: NoSQL, SQL versus NoSQL, Types of NoSQL Databases, CAP theorem, Getting Started with MongoDB – Documents, Collections, Databases, MongoDB Shell, Data Types, CRUD operations, Introduction to find Query.	**10**
Pedagogy	**Demonstration**	

List of Experiments or Programs

Sl.No	Experiments/Programs	COs
1	Create the following tables with properly specifying Primary keys, Foreign keys and solve the following queries. BRANCH (Branchid, Branchname, HOD) STUDENT (USN, Name, Address, Branchid, sem) BOOK (Bookid, Bookname, Authorid, Publisher, Branchid) AUTHOR (Authorid, Authorname, Country, age) BORROW (USN, Bookid, Borrowed_Date) Execute the following Queries: i.List the details of Students who are all studying in 2nd sem MCA. ii.List the students who are not borrowed any books. iii.Display the USN, Student name, Branch_name, Book_name, Author_name, Books_Borrowed_Date of 2nd sem MCA Students who borrowed books. iv.Display the number of books written by each Author. v.Display the student details who borrowed more than two books. vi.Display the student details who borrowed books of more than one Author. vii.Display the Book names in descending order of their names. viii.List the details of students who borrowed the books which are all published by the same publisher.	**CO3**
2	Consider the following schema: STUDENT (USN, name, date_of_birth, branch, mark1, mark2, mark3, total, GPA) Execute the following queries: i. Update the column total by adding the columns mark1, mark2, mark3. ii. Find the GPA score of all the students. iii. Find the students who born on a particular year of birth from the date_of_birth column. iv. List the students who are studying in a particular branch of study. v. Find the maximum GPA score of the student branch-wise. vi. Find the students whose name starts with the alphabet “S”. vii. Find the students whose name ends with the alphabets “AR”. viii. Delete the student details whose USN is given as 1001.	**CO4**
3	Design an ER-diagram for the following scenario, Convert the same into a relational model and then solve the following queries. Consider a Cricket Tournament “ABC CUP” organized by an organization. In the tournament there are many teams are contesting each having a Teamid,Team_Name, City, a coach. Each team is uniquely identified by using Teamid. A team can have many Players and a captain. Each player is uniquely identified by Playerid, having a Name, and multiple phone numbers,age. A player represents only one team. There are many Stadiums to conduct matches. Each stadium is identified using Stadiumid, having a stadium_name,Address (involves city,area_name,pincode). A team can play many matches. Each match played between the two teams in the scheduled date and time in the predefined Stadium. Each match is identified uniquely by using Matchid. Each match won by any of the one team that also wants	**CO3**

	to record in the database. For each match man_of_the match award given to a player. Execute the following Queries: i. Display the youngest player (in terms of age) Name, Team name, age in which he belongs of the tournament. ii. List the details of the stadium where the maximum number of matches were played. iii. List the details of the player who is not a captain but got the man_of _match award at least in two matches. iv. Display the Team details who won the maximum matches. v. Display the team name where all its won matches played in the same stadium. **Vi. Retrieve the matches played in a specific stadium.** **Vii. Retrieve all the teams participating in the "ABC CUP" tournament:**	
4	Design an ER-diagram for the following scenario, Convert the same into a relational model, normalize Relations into a suitable Normal form and then solve the following queries. A country can have many Tourist places . Each Tourist place is identified by using tourist_place_id, having a name, belongs to a state, Number of kilometers away from the capital city of that state,history. There are many Tourists visits tourist places every year. Each tourist is identified uniquely by using Tourist_id, having a Name, age, Country and multiple emailids. A tourist visits many Tourist places, it is also required to record the visted_date in the database. A tourist can visit a Tourist place many times at different dates. A Tourist place can be visited by many tourists either in the same date or at different dates. Queries: i. List the state name which is having maximum number of tourist places. ii. List details of Tourist place where maximum number of tourists visited. iii. List the details of tourists visited all tourist places of the state “KARNATAKA”. iv. Display the details of the tourists visited at least one tourist place of the state, but visited all states tourist places. v. Display the details of the tourist place visited by the tourists of all country.	**CO4**

5	A country wants to conduct an election for the parliament. A country having many constituencies. Each constituency is identified uniquely by Constituency_id, having the Name, belongs to a state,Number_of_voters. A constituency can have many voters. Each voter is uniquely identified by using Voter_id, having the Name, age, address (involves Houseno,city,state,pincode). Each voter belongs to only one constituency. There are many candidates contesting in the election. Each candidates are uniquely identified by using candidate_id, having Name, phone_no, age, state. A candidate belongs to only one party.Thereare many parties. Each party is uniquely identified by using Party_id, having Party_Name,Party_symbol. A candidate can contest from many constituencies under a same party. A party can have many candidates contesting from different constituencies. No constituency having the candidates from the same party. A constituency can have many contesting candidates belongs to different parties. Each voter votes only one candidate of his/her constituencty. Queries: i. List the details of the candidates who are contesting from more than one constituencies which are belongs to different states. ii. Display the state name having maximum number of constituencies. iii. Create a stored procedure to insert the tuple into the voter table by checking the voter age. If voter's age is at least 18 years old, then insert the tuple into the voter else display the "Not an eligible voter msg" . iv. Create a stored procedure to display the number_of_voters in the specified constituency. Where the constituency name is passed as an argument to the stored procedure. v. Create a TRIGGER to UPDATE the count of " Number_of_voters" of the respective constituency in "CONSTITUENCY" table , AFTER inserting a tuple into the "VOTERS" table.	**CO3**
6	**Execute the following schema using MongoDB.** Exercise–I: Student Database Agenda: Create database, create collection, insert data, find, find one, sort, limit, skip, distinct, projection. Create a student database with the fields: (SRN, Sname, Degree, Sem, CGPA) 1.Display all the documents 2.Display all the students in MCA 3.Display all the students in ascending order 4.Display first 6 students 5.Display students 5,6,7 6.list the degree of student "Ram" 7.Display student's details of 4,5,6,7 in descending order of percentage 8.Display the number of students in MCA 9.Display all the degrees without _id 10.Display all the distinct degrees	**CO3**

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2019, McGraw Hill.
2	Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
3	MongoDB: The Definitive, Guide Kristina Chodorow and Michael Dirolf, 1st Edition, 2015 O'Reilly Media, ISBN: 978-1-449-38156-1
4	Professional NOSQL, Shashank Tiwari, 2014, Inc.WROXPress, John Wiley & Sons, ISBN: 978-0-470-94224-6.
5	Abraham Silberschatz, Henry F. Korth and S. Sudarshan"s Database System Concepts 6th EditionTata Mcgraw Hill Education Private Limited

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Describe the database objects, enforce integrity constraints on a database using RDBMS	**Remember Understand**	L1/L2
CO2	Apply SQL for various database operations	**Apply**	L3
CO3	Analyze database design with normalization, Concurrency control and transaction management	**Analyze**	L4
CO4	Design database applications and relate the concept of transaction, concurrency control and recovery in database	**Evaluate**	L5
CO5	Develop a non- relational data model for a given problem	**Create**	L6

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	–	–	–	–	–	–	–	–	–	–
CO2	**2**	–	2	–	–	–	–	–	3	–
CO3	–	-	–	3	–	–	–	–	–	3
CO4	–	–	3	–	3	–	–	–	–	–
CO5	–	–	–	3	–	–	–	–	–	–

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=3EJlovevfcA
2	https://www.youtube.com/watch?v=9TwMRs3qTcU
3	https://www.youtube.com/watch?v=ZWl0Xow304I
4	https://www.youtube.com/watch?v=4YilEjkNPrQ
5	https://www.youtube.com/watch?v=CZTkgMoqVss
6	https://www.youtube.com/watch?v=Hl4NZB1XR9c

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			Practical
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)	Test
	Test-1	Test-2		
	50 Marks	50 Marks	20 Marks	50 Marks
Remember	20	10	-	-
Understand	20	-	-	-
Apply	-	10	-	10
Analyse	10	30	-	20
Evaluate	-	-	10	20
Create	-	-	10	-

CIE Course Assessment Plan

CO's	Marks Distribution					Total Marks	Weightage
	Test-1			Test-2			
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	40	40%
CO3	2	2	2	2	2	40	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	-	-	-	-	-	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10
Understand	10
Apply	20
Analyse	10
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	15	5	10	10	20	60	35%
CO2	10	10	-	-	-	20	12%
CO3	20	10	20	20	20	90	53%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	45	25	30	30	40	170	100%

Dayananda Sagar Academy of Technology & Management

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Semester	:	**I**				
Course Title	:	**Problem Solving Using C**				
Course Code	:	**MMCL106**				
Course Type (Theory/ Practical/ Integrated)	:	**Practical**				
Category	:	**PCCL**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**0:0:2:2**		**SEE**	:	**50 Marks**
Total Hours	:	**30 Hrs**		**SEE Duration**	:	**3 Hours**
Credits	:	**2**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Learn the basic concepts of Data Structures
2	Understand sorting and searching techniques for the given problem.
3	Understand the Data Structures concepts like Stacks, Queues, Linked list , Graphs and its operations
4	Learn about the various applications of Data structures and Algorithms

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve

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Scheme of Teaching and Examinations for MCA Programme -2025-26
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List of Experiments or Programs

Part A

Sl.No	Experiments/Programs	COs
1	Write a C program to implement the following searching techniques a. Linear Search b. Binary Search.	CO1
2	Write a C program to implement the following sorting algorithms using user defined functions: a. Bubble sort (Ascending order) b. Selection sort (Descending order).	CO1
3	Write a C Program implement STACK with the following operations a. Push an Element onto Stack b. Pop an Element from Stack	CO2
4	Implement a Program in C for converting an Infix Expression to Postfix Expression.	CO3
5	Implement a Program in C for evaluating a Postfix Expression.	CO3
6	Write a C program to simulate the working of a singly linked list providing the following operations: a. Display & Insert b. Delete from the beginning/end c. Delete a given element	CO3
7	Check whether a given graph is connected or not using the DFS method using C programming.	CO3
8	From a given vertex in a weighted connected graph, find shortest paths to other vertices Using Dijkstra's algorithm (C programming)	CO4
9	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm	CO4
10	Print all the nodes reachable from a given undirected graph starting node in a digraph using BFS method	CO4
Part B		
11	Students shall carry out a Mini Project using C or C++ A team of two students should develop the Mini project. However, during the examination, each student should demonstrate the project individually	CO5

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Outline the techniques for evaluating the given expression	Understand	L1, L2
CO2	Apply sorting/searching techniques and validate input/output for the given problem.	Apply	L3
CO3	Evaluate data structures like Stacks, Queues, Linked list , Trees and Graphs, its operations, and algorithms	Analyze	L4
CO4	Implement the algorithm to find whether the given graph is connected or not and conclude on the performance of the technique implemented	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	3	-
CO4	-	-	3		-	-	-	3	-	-

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=BBpAmxU NQo
2	https://www.youtube.com/watch?v=8hly31xKliO
3	https://archive.nptel.ac.in/courses/106/106/106106127/

Assessment Pattern (both CIE and SEE)

<table>
<tr><td colspan="8">2 Credit Course</td></tr>
<tr><td>Assessment Method</td><td>Component</td><td>Type of Assessment</td><td>Assessment Type used</td><td>Max. Marks</td><td>Evaluation Details</td><td>Reduced Marks</td><td>Min. Marks</td><td>Total</td></tr>
<tr><td rowspan="4">CIE</td><td rowspan="3">Practical</td><td>Continuous Evaluation</td><td>Observation, Record, Execution , Viva</td><td>50</td><td>Observation -10
Record – 10
Execution of Programs - 20
Viva – 10
Total – 50 marks , Scored marks are scaled down to 30 marks</td><td>30</td><td>20</td><td>30</td></tr>
<tr><td>Test-1</td><td>Practical</td><td>100</td><td rowspan="2">Average of two Internal Assessment Tests each of 100 Marks, Scored Marks are scaled down to 20 marks</td><td rowspan="2">20</td><td rowspan="2">10</td><td rowspan="2">20</td></tr>
<tr><td>Test-2</td><td>Practical</td><td>100</td></tr>
<tr><td colspan="6">Total CIE Practical</td><td>30</td><td>50</td></tr>
<tr><td>SEE</td><td colspan="3"></td><td>100</td><td>SEE Exam is conducted for 100 Marks, scored marks are scaled down to 50 marks</td><td>50</td><td>20</td><td>50</td></tr>
<tr><td colspan="7">CIE+SEE</td><td>50</td><td>100</td></tr>
</table>

ABILITY ENHANCEMENT COURSE (AEC)

AEC Course – Ability Enhancement Course

	Teaching Hours/Week (L: T:P: S)	0:0:2:0
	Total Hours of Pedagogy	24 hours Practical
	Credits:	01
	Programs / Experiments	12
	CIE Marks	50
	SEE Marks	50
	Total Marks	100
	Exam Hours	3
	Examination nature (SEE)	Practical (Internal Examiners only)

1 Credit Course – Practical

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 60% of the maximum Marks (30 Marks out of 50).

The minimum passing mark for the SEE is 40% of the maximum Marks (20 Marks out of 50).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 30% (20 Marks out of 50) in the Semester-End Examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are 50 Marks. The split-up of CIE marks for record/ journal and test are in the ratio 60:40.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.

- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course are 50 Marks.

- SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedules mentioned in the academic calendar of the University. All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered by the examiners or based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here,
    - Writeup-20%,
    - Conduction procedure and result in -60%,
    - Viva-voce 20% of maximum marks.

  SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.
- The minimum duration of SEE is 02 hours.

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Semester	**:**	**I**				
Course Title	**:**	**Data Visualization Laboratory**				
Course Code	**:**	**MAEC107**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Practical**				
Category	**:**	**AEC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**0:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**	**24**		**SEE Duration**	**:**	**3**
Credits	**:**	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the Principles and Importance of PowerBI and Tableau
2	Familiarize with the Power BI and Tableau interface and its components.
3	Learn how to clean, transform, and model data using Power BI and Tableau tools .
4	Learn how to import data from various sources into Power BI and Tableau.
5	Understand the principles of dashboard design.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.

- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

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Scheme of Teaching and Examinations for MCA Programme -2025-26

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COURSE CURRICULUM

Module No.	Topics	Hours
1	Introduction to Data Visualization, Advantages of Data Visualization, Best practices of Data Visualization, The Visualization Imperative, Visual Perception, Various types of charts, Message to charts	3
Pedagogy	**Hands on session**	
2	Introduction to PowerBI, Getting started with PowerBI, Data Sources, Query Editor, Clean and transform the data with Query Editor, Merging and Appending the data, Views in PowerBI Desktop	3
Pedagogy	**Hands On Session**	
3	Introduction to Data Modelling, Modelling data with PowerBI, Manage Data Relationship, Automate Relationship updates, Cross filter Direction ,Optimizing Data Models Introduction to Tableau – Tableau Products, Connecting to Data, Data types, Calculated Fields, Creating Visualization , Comparisons, Sorting , Dot chart, Counting Dimensions , Histogram.	3
Pedagogy	**Hands On Session**	
4	Proportions and Percentages – Various types of charts: Stacked bar, Piechart, Treemap, Waterfall chart using Gantt, Bullet Graph, and Reference lines	3
Pedagogy	**Hands On Session**	
5	Normal Distribution –Box plots, Visualizing Variation – Control charts, Anatomy of Control chart.	3
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Discuss** the principles of effective data visualization and the importance of visual storytelling in data analysis.	L1	U/R
CO2	Apply the concepts of Power BI's and Tableau to clean, transform, and model data	L2	A
CO3	**Analyze** between various data visualization techniques and choose the most appropriate one for a given dataset or business scenario.	L3	AN
CO4	**Evaluate** the performance and efficiency of Power BI and Tableau dashboards and reports, identifying areas for optimization.	L4	E
CO5	**Design** and build customized, interactive dashboards that meet specific business needs.	L5	C

Mapping of Course Outcomes to Program Outcomes:

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

Text Books	
Sl. No	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Devin Knight, Brian Knight, Mitchell Pearson, and Manuel Quintana, "Microsoft Power BI Complete Reference" ,2nd Edition, McGraw-Hill Education,2018.
2	Errin O'Connor," Microsoft Power BI Dashboards Step by Step" , 1st Edition (2018), Microsoft Press.

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/@MicrosoftPowerBI
2	https://www.youtube.com/watch?v=86SxlxSAK5w

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Continuous Assessment Tests (IAT)	
	IAT-1	IAT-2
	50 Marks	50 Marks
Apply	10	20
Analyse	10	10
Evaluate	10	10
Create	20	20

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
CO1	-	-	-	5	-	-	05	10%
CO2	10	-	10	-	--	-	20	20%
CO3	-	10	-	10	--	5	25	20%
CO4	-	-	10	-	10	-	20	30%
CO5	10	-	-	-	-	20	30	20%
Total	20	10	20	15	10	25	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
Remember	5
Understand	10
Apply	10
Analyse	20
Evaluate	30
Create	30

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
CO1	5	-	-	5	-	-	10	10%
CO2	10	-	10	-	-	-	20	20%
CO3	-	10	-	10	-	-	20	20%
CO4	10	-	10	-	10	-	30	30%
CO5	10	-	--	-	-	10	20	20%
Total	35	10	20	15	10	10	100	100

2nd SEMESTER

PROFESSIONAL CORE COURSE (PCC)

PCC Course - Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Core Course (PCC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Core Course (PCC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - I	Module – 1 to 2.5	50	(50+50) / 2	**25**	13	Average of Two Internal test each of 50 Marks scale down the marks to 25 Marks
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	17	Two CCA methods to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	30	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	50	

Dayananda Sagar Academy of Technology & Management

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Semester	:	**II**				
Course Title	:	**Software Engineering**				
Course Code	:	**MMC201**				
Course Type **(Theory/ Practical/ Integrated)**	:	**Theory**				
Category	:	**PCC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L: T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Understand the basic concepts of software Engineering
2	Explore the different process models and requirement engineering process
3	Understand the different architectural designs and patterns
4	Understand the project management process and software Quality Management

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.

6. Topics will be introduced in multiple representations.

7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**SOFTWARE PROCESS AND AGILE DEVELOPMENT**: Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models Introduction to Agility- Agile process- Extreme programming- XP Process -Case Study.	8
Pedagogy	**Case Studies**	
2	**Understanding Requirements**: Requirement engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirement Model. **Requirements modeling**: Requirement Analysis, Data Modeling Concepts, Class-Based Modeling, Requirement Modeling Strategies, creating a Behavioral Model	8
Pedagogy	**Role Play, Case Studies**	
3	**Architectural Design and Implementation:** The Design Process, Design Concepts, The Design Model, Design Patterns, Pattern-Based Software Design, Architectural Patterns, Component Level Design Patterns, User-Interface Design Patterns, WebApp Design Patterns.	8
Pedagogy	**UML Tool Demonstration**	
4	**Software Testing –** A strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing.	8
Pedagogy	**Case Studies, Problem solving**	

5	**Project Management -** Risk management, Managing people, Teamwork Software pricing, Plan-driven development, Project scheduling, Agile planning, Estimation techniques, Overall Architecture Building and Testing Deployment- Tools- Case Study.	**8**
Pedagogy	**Case Studies**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014.
2	Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012
3	Stephan R. Schach, "Object Oriented Software Engineering". Tata McGrawHill,2008
4	Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML, 2nd Edition, Pearson Education, 2005.
5	Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.
6	Craig Larman, Applying UML and Patterns, 3rd ed. Pearson Education, 2005.

Course Outcomes: At the end of the course, the student will be able to:

CO	**Course Outcomes**	**RBT Level**	**Level Indicator**
CO1	Describe the basic concepts of Software Engineering and architecture	**Remember** **Understand**	L1/L2
CO2	Apply the principles and practices of Software Engineering and architectural designs to build real world applications	**Apply**	L3
CO3	Analyze and manage software projects and ensure software quality and streamline testing process for delivering high quality software products	**Analyze**	L4
CO4	Develop effective software projects using software models and tools	**Evaluate**	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**
CO1	–	–	–	–	–	–	–	–	–	–
		–	3	–	–	–	–	–	3	–

CO2										
CO3	_	-	_	2	_	_	_	_	_	3
CO4	_	_	3	_	3	_	_	_	_	_

Weblinks and Video Lectures (e-Resources)	
1	**https://onlinecourses.nptel.ac.in/noc20_cs68/preview**
2	**https://www.geeksforgeeks.org/software-engineering/**
3	**https://www.tutorialspoint.com/software_engineering/index.htm**

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Theory**			
	Continuous Assessment Tests (IAT)		**Continuous Comprehensive Assessment (CCA)**	
	IAT-1	**IAT-2**	**CCA-1**	**CCA-2**
	50 Marks	**50 Marks**	**50 Marks**	**50 Marks**
Remember	-	-	**10**	**5**
Understand	10	20	**-**	**5**
Apply	20	20	**10**	**10**
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	**Marks Distribution**						**Total Marks**	**Weightage**
	Test-1			**Test-2**				
	Module-1	**Module-2**	**Module 2 to 2.5**	**Module-2.5 to 3**	**Module-4**	**Module-5**		
CO1	**-**	**5**	**5**	**5**	**-**	**-**	**15**	**15%**

CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	10	20	20	20	10	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	20	-	10	10	10	50	42%
CO2	-	10	-	-	-	10	8%
CO3	10	-	20	10	10	50	42%
CO4	-	10	-	-	-	10	8%
Total	30	20	30	20	20	120	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**II**				
Course Title	:	**Machine Learning and Data Analytics using Python**				
Course Code	:	**MMC202**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**MCA**		**CIE**	:	50 Marks
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	50 Marks
Total Hours	:	**40 Hrs**		**SEE Duration**	:	3 Hours
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the basic concepts of Data Analytics using Python
2	Learn the concepts of Python collections, Numpy, Pandas and Matplotlib
3	Learn the basic concepts of Machine Learning
4	Understand the various algorithms in Machine Learning
5	Learn the various applications of Machine Learning

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.

- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

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Scheme of Teaching and Examinations for MCA Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction to Python Programming**: Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Reading Input, Print Output, Type Conversions Control Flow Statements, Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, Keyword Arguments, **Python Collections**: Strings- Creating and Storing Strings, Basic String Operations String Slicing and Joining, String Methods, Formatting Strings, Lists-Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods. Sets, Tuples and Dictionaries.	8
Pedagogy	**Demonstration**	
2	**Introduction to Numpy and Pandas :** **Numpy:-** Understanding datatypes in python, basics of NumPy arrays, computation on NumPy arrays: universal functions **Pandas**:-Introducing to pandas data structures, essential functionality, summarizing and computing descriptive statistics, handling missing data, Combining and merging data sets	8
Pedagogy	**Hands on session**	
3	**Visualization with Matplotlib and Seaborn**: General Matplotlib tips, simple line plots, simple scatter plots, visualizing errors, density and contour plots, histograms, binning, and density, customizing plot legends and color bars, customizing matplotlib, visualization with seaborn	8
Pedagogy	**Hands on Session**	
4	**Introduction to Machine Learning**: Need for Machine Learning, Machine learning concerning other fields, types of Machine Learning, Challenges of Machine Learning, Machine Learning Processes, Applications of Machine Learning, Feature Engineering and Dimensionality Reduction Techniques, Modelling in Machine Learning **Regression**: Introduction to Regression, Steps in building a Regression model, Simple Linear Regression Model, Validation of Regression methods, Logistic Regression.	8
Pedagogy	**Hands-on session**	

5	**Classification**: Decision Trees Learning, Naive Bayes Classifier, K Nearest Neighbour, Support Vector Machine **Clustering:** Working of Clustering algorithms, K Means Clustering, Creating Product segments using clustering, Hierarchical clustering	8

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Jake Vander plas, "Python Data Science Handbook: Essential tools for working with data", O'Reilly Publishers, I Edition.
2	Tim Hall and J-P Stacey, "Python 3 for Absolute Beginners", Apress, 1st edition, 2019.
3	Manaranjan Pradhan , U.Dinesh Kumar, "Machine Learning using Python", Wiley India Pvt Ltd,2019
4	Tom M. Mitchell , "Machine Learning",Mc Graw Hill, 2013
5	Wes Mc Kinney, "Python for Data Analysis", O'Reilly Media, 2012Mark Lutz, "Programming Python", O'Reilly Media, 4th edition, 2010.
Reference Books	
1	S.Sridhar , M.Vijayalakshmi, " Machine Learning" Oxford University Press,2021
2	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition,Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
3	Mark Lutz, "Programming Python", O'Reilly Media, 4th edition, 2010.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the basic concepts of Data Analytics and Machine Learning using Python	L1/L2	U/R
CO2	Apply the concepts of Numpy, Pandas, and Data Structures in Data analytics	L3	A
CO3	Analyse the various algorithms of Machine Learning	L4	AN
CO4	Develop custom machine-learning models for specific applications	L5	C
CO5	Evaluate the effectiveness of different machine learning models using cross-validation and other validation techniques.	L6	E

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	www.geeksforgeeks.org/python programming
2	https://www.youtube.com/watch?v=eWRfhZUzrAc
3	https://www.youtube.com/watch?v=kWEbNBXc2-Y
4	https://archive.nptel.ac.in/courses/106/106/106106182/
5	https://www.youtube.com/watch?v=i_LwzRVP7bg

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember			10	5
Understand	10	20		5

Apply	20	20	**10**	**10**
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	**-**	**5**	**5**	**5**	**-**	**-**	**15**	**15%**
CO2	**10**	**5**	**5**	**10**	**5**	**10**	**45**	**45%**
CO3	**-**	**10**	**10**	**5**	**5**	**10**	**40**	**40%**
CO4	**-**	**-**	**-**	**-**	**-**	**-**		
CO5	**-**	**-**	**-**	**-**	**-**	**-**		
Total	**10**	**20**	**20**	**20**	**10**	**20**	**100**	**100%**

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	**15**
Understand	**-**
Apply	**45**
Analyse	**40**
Evaluate	**-**
Create	**-**

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-		
CO5	-	-	-	-	-	-		
Total	10	20	20	20	10	20	100	100%

Dayananda Sagar Academy of Technology & Management

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Semester	**:**	**II**				
Course Title	**:**	**Advanced Java Programming**				
Course Code	**:**	**MMC203**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PCC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**2:1:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand basic concepts of Advanced Java programming like Enumerations ,Collections and Autoboxing
2	Learn how to establish a connection to a relational database using JDBC.
3	Gain a solid foundation in the core concepts of the Spring framework
4	Understand the fundamental concepts of reactive programming and its microservices
5	Learn to apply various operators to transform and combine reactive streams.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve

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Scheme of Teaching and Examinations for MCA Programme -2025-26
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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Enumerations, Autoboxing and Annotations(metadata):** Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at run time by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations.	8
Pedagogy	**Quiz**	
2	**The collections and Framework:** Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections?, The legacy Classes and Interfaces, Parting Thoughts on Collections.	8
Pedagogy	**Coding and Debugging**	
3	**The Concept of JDBC**: JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.	8
Pedagogy	**Hunt the Code**	
4	**Introduction to Spring Boot-**Overview of Spring Framework**,** Advantages of Spring Boot**,** Spring Boot vs Spring Framework**,** Setting up the development environment (Maven/Gradle)**,** First Spring Boot application, Understanding Spring Boot starters**,** Spring Boot dependencies and auto-configuration**,** Spring Boot annotations**,** Understanding application properties **,**Working with profiles and external configuration **Spring Boot Project Structure-**Project structure and packaging**,** Directory layout and best practices**,** Creating and running a Spring Boot project.	8

Pedagogy	**Hands on Session**	
5	**Introduction to Reactive Programming-**Overview of Reactive Programming, The Reactive Manifesto**,**Key concepts: Asynchronous, Non-blocking, Event-driven**,** Advantages of Reactive Programming**,** Imperative vs Reactive Programming, Reactive Programming in modern software development **Reactive Programming Fundamentals-**Understanding Observables, Observers, and Subscriptions**,** Streams and the importance of backpressure**,** Reactive Streams Specification, Operators in Reactive Programming (map, filter, reduce, etc) , Introduction to Reactive Micro services with Springboot .	**8**
Pedagogy	**Hands-on Session**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Herbert Schildt: JAVA the Complete Reference, 12th Edition, Tata McGraw Hill, 2021.
2	Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2021.
3	Y. Daniel Liang: Introduction to JAVA Programming, 12thEdition, Pearson Education, 2021.
4	“Spring Boot in Action" by Craig Walls ,Mannings publications,sixth edition 3.3 ,2015
5	Reactive Programming with RxJava" by Tomasz Nurkiewicz and Ben Christensen,O’reilly learning publications.

Weblinks and Video Lectures (e-Resources)	
1	**httpps://www.geeksforgeeks.org/what-is-advanced-java/**
2	**https://www.tutorialspoint.com/what-is-advanced-java**
3	**https://www.codecademy.com/learn/learn-advanced-java**

Course Outcomes: At the end of the course, the student will be able to:

CO	**Course Outcomes**	**RBT Level**	**Level Indicator**

CO1	Describe basic concepts of Advanced Java programming like Enumerations, ,Collections and Autoboxing	**L1/L2**	**U/R**
CO2	Apply the concepts of JDBC to establish the connection with Databases	**L3**	**A**
CO3	Analyze the framework of Java Springboot focusing on its core components, auto-configuration capabilities, and the streamlined development process	**L4**	**AN**
CO4	Design the Web application using the concepts of Java Springboot	**L5**	**C**
CO5	Create the Dynamic web pages using Reactive Programming	**L6**	**E**

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory				Practical
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)		Practical Test
	IAT-1	IAT-2	CCA-1	CCA-2	
	50 Marks	50 Marks	50 Marks	50 Marks	
Remember	10	-	**10**		-
Understand	-	10	**-**	**10**	-
Apply	20	20	**-**	**-**	-
Analyse	20	20	-	-	10

Evaluate	-	-	20	20	20
Create	-	-	20	20	20

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	10	-	5	5	5	30	25%
CO2	10	5	5	-	10	10	50	50%
CO3	5	10	5	5	5	5	35	25%
CO4	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	20%
Understand	20%
Apply	30%
Analyse	30%
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	10	-	5	5	5	30	25%

CO2	**10**	**5**	**5**	**-**	**10**	**10**	**50**	**50%**
CO3	**5**	**10**	**5**	**5**	**5**	**5**	**35**	**25%**
CO4	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total	**20**	**20**	**10**	**10**	**20**	**20**	**100**	**100%**

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCC Course – Integrated Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:2:0
Total Hours of Pedagogy	40 hours Theory + 20 Hours of Practical Classes
Credits:	04
Theory - Each Module	8 Hrs
Practical's	8-10 Programs / Experiments
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

- The theory part of the IPCC shall be evaluated both by CIE and SEE.
- The practical part shall be evaluated by only CIE (no SEE).
- However, questions from the practical part of IPCC shall be included in the SEE question paper.

Integrated Professional Core Course (IPCC) - 4 Credit Course	
	Assessment Details (both CIE and SEE) ● The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. ● The minimum passing mark for the CIE is 60% of the maximum marks (30 marks out of 50) and for the SEE minimum passing mark is 40% of the maximum marks (20 out of 50 marks). ● A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. **Continuous Internal Evaluation (CIE) for the Theory component of the IPCC (Maximum marks 50)** **Internal Assessment Test (IAT):** ● IPCC means practical portion integrated with the theory of the course. ● CIE marks for the theory component are 30 marks and that for the practical component is 20 marks. ● 30 marks for the theory component are split into 15 marks for two Internal Assessment Tests

(Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 15 marks) and 15 marks for Two Continuous Comprehensive Assessment(CCA) methods.

- The first Internal test at the end of 40-50% coverage of the syllabus
- The second Internal test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Revised Blooms Taxonomy (RBT) Levels. Emphasis to be given for Higher order Thinking Skills(HOTS).

Continuous Internal Evaluation (CIE) for the practical component of the IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report, **05 Marks** are for conducting the experiment, **05 Marks for** preparation of the laboratory record and observation notebook , **5 Marks** for conducting Open Ended Experiments Each experiment. Marks of all experiments' write-ups are added to 15 marks.
- The Practical laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **5 Marks.**
- The open-ended experiment after completion of all the experiments shall be conducted for 20 marks with a split-up for 5 Marks for writeup, 10 Marks for Execution, and 5 Marks for Viva-Voce.
  Marks for writeup, Execution and Viva-Voce is added and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory 2component of IPCC for 20 marks.
- The student has to secure 50% of 20 marks to qualify in the CIE of the practical component of the IPCC.

Semester End Examination (SEE) for IPCC Theory

SEE will be conducted as per the scheduled timetable, with common question papers for the course (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.
- The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks.
- The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only.
- Questions mentioned in the SEE paper may include questions from the practical component.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be (CCA1+CCA2)/2 and scaled down to **15 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The Assessment will be through rubrics.
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **15 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **30 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,

	● The assessment of these techniques shall be in rubrics. ● The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

4 Credits Courses – Integrated Professional Core Course (IPCC)

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**15**	
CIE	**Theory**	Internal Assessment Test (IAT) - I	Module – 1 to 2.5	50	(50+50) / 2	**15**	8	Average of Two Internal test each of 50 Marks scale down the marks to 15 Marks
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity based learning	Considering all the Modules	50	(50+50) / 2	**15**	12	Two CCA methods to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives/ Activity based learning		50				
	Total CIE Theory					**30**	20	Scale down Marks of IAT and CCA to 30

CIE	**Practical**	Conduction of Experiments	Performance- Continuous Evaluation of each experiment	05	10	Average of all Experiments	10	5	Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
			Record	03					
			Observation book	02					
		Practical Test	Write up	15	50	----	05	3	One Internal Practical Test after conduction of all Experiments for 50 Marks
			Execution	25					
			Viva-voce	10					
		Open Ended Experiment	Write up	05	20	----	05	2	One experiment for 20 marks. 20 marks reduced to 05 marks
			Execution	10					
			Viva-voce	05					
					Total CIE Practical		**20**	**10**	Scale down Marks of Experiments, Record,

								Observation, Practical Test and Open-Ended Experiment
SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	50	

- The Laboratory Component for the IPCC shall be for CIE only.
- However, in SEE, the Questions from the Laboratory Component shall be included in the respective Modules only.

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Semester	**:**	**II**				
Course Title	**:**	**Computer Networks**				
Course Code	**:**	**MMC204**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Credits (L: T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**60 Hrs**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Understand the fundamental concepts of Networks.
2	Describe how the packets are delivered on the internet and learn a simple LAN with hubs, bridges and switches.
3	Understand the advanced networking concepts.
4	Enumerate the functions and layers of the OSI and TCP/IP models
5	Explore design networks and protocols for distributed systems for web, email, video, and internet-of-everything.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Introduction**: Data Communications, Networks types, Internet, Standards & administration, Network model Protocols Layering, TCP/IP Protocol suite, Addressing, OSI model.	08
Pedagogy	**OSI Layer-Role play**	
2	**Physical Layer-1:** Data & signals: Analog & Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital to digital conversion analog to digital conversion Transmission Modes, Digital-to-analog conversion, Simulation experiments.	12
Pedagogy	**Encoding-Problem solving**	
3	**Physical Layer-2 and Switching:** Multiplexing, Spread Spectrum, Guided media, Unguided media: wireless, Introduction to switching, Circuit Switched Networks, Packet switched ,Datagram Networks, Virtual Circuit Networks—Structure of a switch	10
Pedagogy	**Circuit switching -Hands on session Using Cisco packet tracer**	
4	**Data Link layer**: Link layer addressing, Error detection & correction, Block coding, Cyclic codes, Checksum, Forward error correction, Data link layer protocol, HDLC, Point to point protocol, Random access, control access, Channelization, Ethernet protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Telephone networks, Cable networks, SONET, ATM,IEEE 802.11 project, Bluetooth, Connecting devices, SDN	10
Pedagogy	**CRC -Simulation Using Cisco packet tracer**	
5	Network layer services, The Internet protocol: Introduction, ICMPV4, Mobile IP, Routing protocols, Client server programming, Interactive programming, Electronic mail, Telnet, Secure shell. Domain name systems, Multimedia, Multimedia internet, QOS support Integrated services, Differentiated services, MPLS, IPv6, Datagram format, Address structure, Extension headers, world wide web & HTTP, FTP, Electronic mail, Network Management: SNMP, ASN.1, Network layer Security, Firewalls, Application layer security.	10
Pedagogy	**Chalk and Board, PowerPoint Presentation, Assignment**	

List of Experiments or Programs

Sl. No.	Experiments/Programs	COs
1	Simulate the network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the center. Node n0 is a TCP source, which transmits packets to node n3 (a TCP sink) through the node n4. Node n1 is another traffic source, and sends UDP packets to node n2 through n4. The duration of the simulation time is 10 seconds	CO4
2	Simulate a variety of IP based Networks using Ns2	CO5
3	Develop a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP	CO5
4	Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism	CO5
5	Evaluates the existing network protocol performance using Ns2	CO4
6	Simulate the network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the center. Node n0 is a TCP source, which transmits packets to node n3 (a TCP sink) through the node n4. Node n1 is another traffic source and sends UDP packets to node n2 through n4. The duration of the simulation time is 10 seconds.	CO5
7	Simulate to study the transmission of packets over Ethernet LAN and determine the number of packets drop destination.	CO5
8	Simulate the different types of internet traffic such as FTP and TELNET over a wired network and analyze the packet drop and packet delivery ratio in the network.	CO4
9	Implement the connectivity of Network cables and Practically implement the cross-wired cable and straight-through cable using a clamping tool.	CO5
10	Configuring a Cisco Router as a DHCP Server	CO4
11	Applications using TCP sockets like: Echo client and echo server Chat File Transfer	CO5
12	Simulation of Distance Vector/ Link State Routing algorithm	CO4
	Open ended Programs	
1	Implement the commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine	CO4
2	Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.	CO4
3	Performance evaluation of Routing protocols using Simulation tool	CO4
4	Implement the code to simulate the ARP /RARP protocols	CO5

Text Books	
Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 5th Edition, Elsevier,, 2021
2	Behrouz A. Forouzan: Data Communication and Networking, 6th Edition Tata McGraw-Hill, 2017

Reference Books	
1	William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, edition 11, 2022
2	Nader F Mir: Computer and Communication Networks, Pearson Education, edition 4, 2020
3	Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures cGraw-Hill., edition 2, 2008

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Outline the basic concepts of network protocol, OSI and TCP/IP model, and networks devices and data transmission.	Understand	L1,L2
CO2	Apply the techniques of encoding, channel allocation, framing, error and flow control in the data link layer.	Apply	L3
CO3	Analyse the various functions of Network Layer	Analyze	L4
CO4	Design and implement a network protocol using TCP/IP and UDP	Evaluate	L5
CO5	Evaluate the different types of networks and services for various scenarios.	Implement	L6

Weblinks and Video Lectures (e-Resources)	
1	https://www.binghamton.edu/watson/continuing-education/data-science/intro-to-computer-networks.html
2	https://elearn.daffodilvarsity.edu.bd/course/view.php?id=5457
3	https://onlinecourses.nptel.ac.in/noc21_cs18/preview
4	https://jntuh.ac.in/uploads/academics/R22B.Tech.CSE(IOT)IandIIYearSyllabus.pdf

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	–	–	–	–	–	–	–	–	–	–
CO2	3	–	–	–	–	–	–	–	–	–
CO3	–	3	–	–	–	–	–	–	–	-
CO4	–	–	2	–	2	–	–	–	3	–

CO5	_	_	_	3	_	_	_	3	_	3

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Theory**			**Practical**
	Continuous Assessment Tests		**Alternative Assessment Tool (AAT)**	**Test**
	Test-1	**Test-2**		
	50 Marks	**50 Marks**	**20 Marks**	**50 Marks**
Remember	**20**	**10**	**-**	**-**
Understand	**20**	**-**	**-**	**-**
Apply	**-**	**10**	**-**	**10**
Analyse	**10**	**30**	**-**	**20**
Evaluate	**-**	**-**	**10**	**20**
Create	**-**	**-**	**10**	**-**

CIE Course Assessment Plan

CO's	**Marks Distribution**					**Total Marks**	**Weightage**
	Test-1			**Test-2**			
	Module-1	**Module-2**	**Module-3**	**Module-4**	**Module-5**		
CO1	**1**	**1**	**1**	**1**	**1**	**10**	**20%**
CO2	**2**	**2**	**2**	**2**	**2**	**40**	**40%**
CO3	**2**	**2**	**2**	**2**	**2**	**40**	**40%**
CO4	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total	**-**	**-**	**-**	**-**	**-**	**50**	**100%**

SEE- Semester End Examination (50 Marks)

Bloom's Category	**SEE Marks (100 Marks)**
Remember	**-**

Understand	**20**
Apply	**40**
Analyse	**40**
Evaluate	**-**
Create	**-**

SEE Course Plan

CO's	**Marks Distribution**					**Total Marks**	**Weightage**
	Module-1	**Module-2**	**Module-3**	**Module-4**	**Module-5**		
CO1	**5**	**4**	**5**	**6**	**-**	**20**	**20%**
CO2	**6**	**10**	**8**	**10**	**6**	**40**	**40%**
CO3	**8**	**6**	**10**	**6**	**10**	**40**	**40%**
CO4	**-**	**-**	**-**	**-**	**-**	**-**	
CO5	**-**	**-**	**-**	**-**	**-**	**-**	
Total	**19**	**20**	**23**	**22**	**16**	**100**	**100**

Semester	**:**	**II**				
Course Title	**:**	**Web Technologies**				
Course Code	**:**	**MMC205**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**IPCC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Credits (L: T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**60 Hrs**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Understand the basics of internet and web technologies
2	Understand scripting language concepts for developing client -side applications
3	Know the usefulness of web services
4	Gain Familiarities with database applications
5	Learn interactive web applications using client & server-side scripting

Teaching-Learning Process Pedagogy (General Instructions):
These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Introduction to HTML**-fundamentals of HTML elements, Document body, text, hyperlink, Web browsers, web servers, MIME, URL, HTTP Introduction to XHTML5 tags, Basic syntax and structure, text markups, images, lists, tables, progress, Media tags-audio and video, forms, frames, **XML -** Basics XML, document type definition, xml schemas, Document Object Model, presenting XML	**8**
Pedagogy	**Collaborative Learning**	
2	**Introduction to CSS -** Levels of CSS, Selectors, Font, color and Text Properties, BOX Model, Span and Div tags. **Introduction to JavaScript:** JavaScript basics, variables, string manipulation, mathematical functions, statements, operators, arrays, and functions., controls statements, pattern matching, Element Access, Event Handling.	**8**
Pedagogy	**Blended Learning**	
3	**Introduction to Bootstrap**- First example, containers, Bootstrap elements: colors, tables, images, buttons, button groups, progress bars, Forms, utilities, Classes, alerts, custom forms, Grid System	**8**
Pedagogy	**Hands on Session**	
4	**INTRODUCTION TO PHP and J query-** Basics of PHP, downloading, installing, configuring PHP, programming in a web environment and the anatomy of a PHP page, Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS.	**8**
Pedagogy	**Mini Project**	
5	**Introduction to ReactJS** – Environment setup – React HTML render – JSX – React Components: functional components, class components Component Life Cycle - React State – React Props – React Forms – React Events– React Conditionals– React Lists – React Router – React CSS – Hooks - Custom hook - Create a sample React app..	**8**
Pedagogy	**Hands on Session**	

List of Experiments or Programs

Sl.No	Experiments/Programs	COs
1	Create your Resume using Html & CSS	CO3
2	Write a Java script to design a simple calculator to perform the following operations: sum, product, difference, and quotient.	CO4
3	Write a Bootstrap program to demonstrate Cards with Data Insertion	CO3
4	Create a registration form using HTML and CSS with Database connectivity	CO4
5	Write a PHP program to connect to a MySQL database which retrieves the data from the tables and displays them to the user.	CO3
6	Create a student management system using ReactJS with routing and local storage	CO3
7	Write a JS code to validate the user login page	CO3
8	Create a Weather Information App using ReactJS Hooks and Custom Hook Integration	CO3
9	a. Write a PHP program to hit counter using cookies b. Write a PHP program to calculate Date and Time function.	CO4
10	Create a web page for software company website	CO4

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Fundamentals of Web Development by Randy Connolly (Unit-I, Unit-II), Pearson Edition 2015, ISBN 10: 1292057092, ISBN 13: 978-1-29-205709-5
2	Learn Java for Web Development, Authors: Vishal layka, Apress edition-2014, ISBN-13 (pbk): 978-1-4302-5983-1, ISBN-13 (electronic): 978-1-4302-5984-8 (Unit-III)
3	Practical web technologies, Authors: P.K.Yuen and V. Lau (Unit-IV), Pearson Edition-2003, ISBN 0 201 75076 7
4	Ajax on Java, Steven Douglas Olson, OReilly-2007, ISBN-10: 0-596-10187-2 (Unit-IV)
5	Introducing Maven Apress: By Balaji Waranasi ,Apress release-2014, ISBN-13 (pbk): 978-1-4842-0842-7 (Unit-V)

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Describe the fundamental concepts of HTML, CSS, JavaScript, and server-side scripting using PHP.	Remember Understand	L1/L2
CO2	Apply the web based concepts to create responsive and interactive web pages using HTML5, CSS3, JavaScript, Bootstrap, and jQuery.	Apply	L3
CO3	Analyse and interpret data structures using XML, including DTDs and Schemas, and articulate their role in data exchange and representation within web applications.	Analyze	L4
CO4	Design and develop a complete dynamic web application integrating frontend and backend technologies	Evaluate	L5
CO5	Evaluate and debug web applications for usability, responsiveness, and cross-browser compatibility using developer tools.	Create	L6

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=3EJlovevfcA
2	https://www.youtube.com/watch?v=9TwMRs3qTcU
3	https://www.youtube.com/watch?v=ZWl0Xow304I
4	https://www.youtube.com/watch?v=4YilEjkNPrQ
5	https://www.youtube.com/watch?v=CZTkgMoqVss
6	https://www.youtube.com/watch?v=Hl4NZB1XR9c

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			Practical
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)	Test
	Test-1	Test-2		
	50 Marks	50 Marks	20 Marks	50 Marks
Remember	20	10	-	-
Understand	20	-	-	-
Apply	-	10	-	10
Analyse	10	30	-	20
Evaluate	-	-	10	20
Create	-	-	10	-

CIE Course Assessment Plan

	Marks Distribution		

CO's	Test-1			Test-2		Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	3	2	5	5	5	20	20%
CO2	10	10	5	5	10	40	40%
CO3	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	33	22	15	15	25	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10
Understand	10
Apply	20
Analyse	10
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	15	5	10	10	20	60	35%
CO2	10	10	-	-	-	20	12%
CO3	20	10	20	20	20	90	53%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	45	25	30	30	40	170	100%

Dayananda Sagar Academy of Technology & Management

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Semester	:	**II**				
Course Title	:	**Data Science Laboratory**				
Course Code	:	**MMCL206**				
Course Type (Theory/ Practical/ Integrated)	:	**Practical**				
Category	:	**PCCL**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**0:0:2:2**		**SEE**	:	**50 Marks**
Total Hours	:	**30 Hrs**		**SEE Duration**	:	**3 Hours**
Credits	:	**2**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Learn the basic concepts of Python Data Structures
2	Understand the concepts of Object Oriented Programming
3	Understand the concepts like Numpy, Pandas and Matplotlib
4	Learn about the various applications of Data Analytics and Machine Learning using Python

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve

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List of Experiments or Programs

Sl.No	Experiments/Programs	COs
	PART-A	
1	Write a python program using object-oriented programming to demonstrate encapsulation, overloading and inheritance	**CO2**
2	Implement a python program to demonstrate the following using NumPy a) Array manipulation, Searching, Sorting and splitting. b) broadcasting and Plotting NumPy arrays	**CO2**
3	Implement a python program to demonstrate Data visualization with various Types of Graphs using Numpy and Seaborn	**CO2**
4	Develop a Python Program for basic plots using Matplotlib	**CO2**
5	Write a Python Program to demonstrate the concepts of Pandas	**CO2**
6	Write a program to demonstrate linear regression using an appropriate dataset.	**CO3**
7	Write a program to demonstrate logistic regression using an appropriate dataset.	**CO3**
8	Write a program to demonstrate the working of the decision tree. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample	**CO3**
9	Write a program to implement Naive Bayes algorithm to classify the iris data set. Print both correct and wrong predictions.	**CO3**
10	Write a program to implement clustering using the k-Means algorithm using an appropriate dataset.	**CO3**
	PART-B	
11	Students shall carry out a Mini Project using Python to demonstrate the data analysis and Machine Learning concepts	
12	A team of two students should develop the Mini project. However, during the examination, each student should demonstrate the project individually	
13	The team should submit a brief project report (20-25 pages) that must include the following a. Introduction b. Data collection c. Data Preprocessing d. Exploratory Data Analysis e.Feature Engineering f. Machine Learning Algorithms f. Conclusion and Future Directions	
14	Rubrics may be used to evaluate the Mini project	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Manaranjan Pradhan , U.Dinesh Kumar, "Machine Learning using Python", Wiley India Pvt Ltd,2019
2	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition,Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
3	Mark Lutz, "Programming Python", O'Reilly Media, 4th edition, 2010.
4	Jake Vander plas, "Python Data Science Handbook: Essential tools for working with data", O'Reilly Publishers, I Edition.
5	Wes Mc Kinney, "Python for Data Analysis", O'Reilly Media, 2012Mark Lutz, "Programming Python", O'Reilly Media, 4th edition, 2010.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Discuss the basic concepts of Python Programming.	**Understand**	**L1,L2**
CO2	Apply the concepts of Python collections and Object Oriented Programming for solving the given problem	**Apply**	**L3**
CO3	Analyse the essential operations using Numpy, Pandas and Data Visualization	**Analyze**	**L4**
CO4	Design the applications using Python Machine Learning algorithms	**Design**	**L5**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	3	-
CO4	-	-	3	-	-	-	-	-	-	3

Weblinks and Video Lectures (e-Resources)	
1	www.geeksforgeeks.org/python programming
2	https://www.youtube.com/watch?v=eWRfhZUzrAc
3	https://www.youtube.com/watch?v=kWEbNBXc2-Y
4	https://archive.nptel.ac.in/courses/106/106/106106182/

Assessment Pattern (both CIE and SEE)

2 Credit Course								
Assessment Method	**Component**	**Type of Assessment**	**Assessment Type used**	**Max. Marks**	**Evaluation Details**	**Reduced Marks**	**Min. Marks**	**Total**
CIE	Practical	Continuous Evaluation	Observation, Record, Execution , Viva	50	Observation -10 Record – 10 Execution of Programs - 20 Viva – 10 Total – 50 marks , Scored marks are scaled down to 30 marks	30	20	30
		Test-1	Practical	100	Average of two Internal Assessment Tests each of 100 Marks, Scored Marks are scaled down to 20 marks	20	10	20
		Test-2	Practical	100				
	Total CIE Practical						**30**	**50**
SEE				**100**	SEE Exam is conducted for 100 Marks, scored marks are scaled down to 50 marks	**50**	**20**	**50**
CIE+SEE							**50**	**100**

ABILITY ENHANCEMENT COURSE (AEC)

AEC Course – Ability Enhancement Course

Teaching Hours/Week (L: T:P: S)	0:0:2:0
Total Hours of Pedagogy	24 hours Practical
Credits:	01
Programs / Experiments	12
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Practical (Internal Examiners only)

1 Credit Course – Practical

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 60% of the maximum Marks (30 Marks out of 50).

The minimum passing mark for the SEE is 40% of the maximum Marks (20 Marks out of 50).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 30% (20 Marks out of 50) in the Semester-End Examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are 50 Marks. The split-up of CIE marks for record/ journal and test are in the ratio 60:40.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.

	● The suitable rubrics can be designed to evaluate each student's performance and learning ability. ● The marks scored shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student. **Semester End Evaluation (SEE):** SEE marks for the practical course are 50 Marks. ● SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the Head of the Institute. ● The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedules mentioned in the academic calendar of the University. All laboratory experiments are to be included for practical examination. ● (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered by the examiners or based on the course requirement evaluation rubrics shall be decided jointly by examiners. ● Students can pick one question (experiment) from the questions lot prepared by the examiners jointly. ● Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. ● General rubrics suggested for SEE are mentioned here, ● Writeup-20%, ● Conduction procedure and result in -60%, ● Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners) ● Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero. ● The minimum duration of SEE is 02 hours.

Dayananda Sagar Academy of Technology & Management

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Semester	:	**II**				
Course Title	:	**Cloud Computing Lab using AWS**				
Course Code	:	**MAEC207**				
Course Type **(Theory/ Practical/ Integrated)**	:	**Practical**				
Category	:	**AEC**				
Stream	:	**MCA**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**0:0:2:0**		**SEE**	:	**50**
Total Hours	:	**24**		**SEE Duration**	:	**3**
Credits	:	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To provide with practical experience in working with popular cloud platforms such as Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP), etc.
2	To understand and work with different types of cloud services, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).
3	To Formulate the security aspects of cloud computing, including authentication, encryption, and data protection techniques.
4	To expose the cloud automation tools and practices such as Infrastructure as Code (IaC), using tools like Terraform or AWS CloudFormation.
5	The opportunity to work on real-world projects that require the integration of various cloud services, preparing them for industry scenarios.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Set up an AWS EC2 Instance with Linux and Windows operating systems and establish and link an EBS Volume to a Linux installation.	3
Pedagogy	**Hands on session-AWS Account activation**	
2	Generate a snapshot of an existing EBS instance and Conduct an experiment to configure the Route 53 implement.	3
Pedagogy	**Hands On Session-Link to EBS and mount**	
3	Conduct an experiment to establish an environment with automatic scaling and Create a Virtual Private Cloud (VPC) using AWS	3
Pedagogy	**Hands On Session-AWS Services**	
4	Conduct an experiment to deploy a Database Instance (RDS/Oracle) on AWS and access it from a local environment.Host a basic website using an EC2 Instance.	3

Pedagogy	Hands On Session-AWS Databases	
5	Host a static website on AWS S3.Demonstrate data replication across regions using S3 Services in an experiment.	3
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Cloud Computing: A Hands-On Approach" by Arshdeep Bahga, Vijay Madisetti
2	Cloud Computing: Theory and Practice" by Dan C. Marinescu
Reference Books	
1	Cloud Computing: Principles and Paradigms" by Rajkumar Buyya, James Broberg, Andrzej Goscinski
2	Mastering Cloud Computing: Foundations and Applications Programming

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Describe the basic concepts and terminology related to cloud computing architecture and services.	L1	U/R
CO2	Apply cloud computing concepts to configure and deploy services on a cloud platform.	L2	A
CO3	Analyze cloud service usage and performance to optimize deployments.	L3	AN

CO4	Evaluate different cloud solutions to choose the most appropriate one for a given problem.	**L4**	**E**
CO5	Design and implement a complete cloud-based solution integrating multiple services.	**L5**	**C**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	_	_	_	_	_	_	_	_	_	_	_
CO2	**3**	_	_	_	_	_	_	_	_	_	_
CO3	_	**3**	_	_	_	_	_	_	_	**3**	_
CO4	_	_	**2**	_	_	_	_	_	_	_	**3**
CO5	_	_	_	_	**2**	_	_	**2**	_	**3**	_

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=OwdIhnpl4BQ
2	https://www.youtube.com/watch?v=VWeGxsQA6uw

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Continuous Assessment Tests (IAT)**	
	IAT-1	**IAT-2**
	50 Marks	**50 Marks**
Apply	10	20
Analyse	10	10

Evaluate	10	10
Create	20	20

CIE Course Assessment Plan

CO's	**Marks Distribution**						**Total Marks**	**Weightage**
	Test-1			**Test-2**				
CO1	**-**	**-**	**-**	**5**	**-**	**-**	**05**	**10%**
CO2	**10**	**-**	**10**	**-**	**--**	**-**	**20**	**20%**
CO3	**-**	**10**	**-**	**10**	**--**	**5**	**25**	**20%**
CO4	**-**	**-**	**10**	**-**	**10**	**-**	**20**	**30%**
CO5	**10**	**-**	**-**	**-**	**-**	**20**	**30**	**20%**
Total	**20**	**10**	**20**	**15**	**10**	**25**	**100**	**100**

SEE- Semester End Examination (50 Marks)

Bloom's Category	**SEE Marks**
Remember	**5**
Understand	**10**
Apply	**10**
Analyse	**20**
Evaluate	**30**
Create	**30**

SEE Course Plan

CO's	**Marks Distribution**	**Total Marks**	**Weightage**

CO1	5	-	-	5	-	-	10	10%
CO2	10	-	10	-	-	-	20	20%
CO3	-	10	-	10	-	-	20	20%
CO4	10	-	10	-	10	-	30	30%
CO5	10	-	--	-	-	10	20	20%
Total	35	10	20	15	10	10	100	100

3rd SEMESTER

Dayananda Sagar Academy of Technology & Management
(Autonomous Institute under VTU)

Semester	**:**	**II**				
Course Title	**:**	**Ability enhancement course with seminar**				
Course Code	**:**	**MAEC208**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Practical**				
Category	**:**	**AEC**				
Stream	**:**	**MCA**		**CIE**	**:**	**100 Marks**
Credits (L:T:P:S)	**:**	**0:0:0:2**		**SEE**	**:**	**-**
Total Hours	**:**	**-**		**SEE Duration**	**:**	**-**
Credits		**-**				

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	To enable students to identify real-world problems and develop suitable solutions using modern technologies.
2	To provide knowledge of application design, development methodologies, validation, and implementation techniques.
3	To enhance students' analytical, technical presentation, documentation, and communication skills through technical seminars and project reviews.
4	To encourage teamwork, problem-solving ability, innovation, and independent learning in the development of applications.

Teaching-Learning Process
Pedagogy (General Instructions):
These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.

7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Demonstrate effective technical presentation, documentation, and communication skills during project reviews and seminars.	**Understand**	**L2**
CO2	Apply the concepts of technologies for developing the various applications	**Apply**	**L3**
CO3	Analyze real-world problems and define appropriate objectives and requirements for application development.	**Analyse**	**L4**
CO4	Design and develop functional applications using suitable tools, technologies, and methodologies.	**Evaluate**	**L5**

CIE EVALUATION

In this course, students are required to develop application based on a selected problem statement relevant to current industry or societal needs. The total CIE marks is 100 Marks. The course evaluation is divided into two reviews, each carrying 50 marks. In Review 1, students will be assessed based on the identification and presentation of the problem statement (10 marks), formulation of objectives (10 marks), proposed methodology (10 marks), presentation skills (15 marks), and performance in the question-and-answer session (5 marks). In Review 2 , students will be assessed based on system design (15 marks), validation and testing (5 marks), presentation (10 marks), and implementation of the application (10 marks). The course aims to enhance students' technical, analytical, presentation, and problem-solving skills through practical application development and technical discussions.

PROFESSIONAL ELECTIVE COURSE (PEC)

PEC Course - Professional Elective Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Elective Course (PEC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 50% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered

- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,

- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Elective Course (PEC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory				**50**	----	----	**25**	
	Theory	Internal Assessment Test (IAT) - I	Module – 1 to 2.5	50	(50+50) / 2	**25**	13	Average of Two Internal test each of 50 Marks scale down the marks to
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	17	Two CCA methods to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	30	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
CIE + SEE				100	----	----	50	

DAYANANDA SAGAR ACADEMY OF TECHNOLOGY AND MANAGEMENT
(Autonomous Institute under VTU)

Semester	**:**	**III**				
Course Title	**:**	**Introduction to Generative AI**				
Course Code	**:**	**MMC311**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PEC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the Fundamentals of Generative AI
2	Know the concepts of Core Generative AI Models: GANs, VAEs, and Diffusion Models
3	Know the Practical Skills in Generative AI Using Popular Frameworks
4	Learn the various Deep Generative Models
5	Learn how to Apply Generative AI to Real-World Applications

Teaching-Learning Process - Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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Scheme of Teaching and Examinations for MCA Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction to AI and Machine Learning**-Types of Generative Models (e.g., LLM, SLM,GANs, VAEs, Autoregressive Models)- Neural Networks: Basic Architecture, Backpropagation, Activation Functions-Deep Learning Basics and its Applications-Unsupervised vs. Supervised Learning	8
Pedagogy	**Group Discussion**	
2	**Introduction to Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs)-** Understanding the Generator-Discriminator Architecture in GANs-Latent Space Representation and Loss Functions-Training Strategies, Optimization, and Hyperparameter Tuning-Introduction to Text Generation- GPT Architecture - Evolution of GPT Models – Impact of GPT Models	8
Pedagogy	**Case study**	
3	**Introduction to TensorFlow and PyTorch for Generative AI** :Building GANs and VAEs from Scratch Hands-on Projects: Generating Images, Music, and Text - Model Evaluation Techniques (FID Score, Inception Score, BLEU Score) - Fine-tuning Pretrained Models for Specialized Applications	8
Pedagogy	**Case study**	
4	**Deep Generative Models** : Boltzmann machines , Deep Belief Networks, Convolutional Boltzmann Machines, Boltzmann machines for Sequential outputs, Back-propogation through Random operations, Directed Generative Nets, Generative stochastic networks, Evaluating Generative Models	8
Pedagogy	**Case study**	
5	**AI in Digital Art and Content Creation** - Music Generation Using Neural Networks - Healthcare Applications: Drug Discovery and Medical Imaging - Natural Language Generation (NLG) and Chatbots - Case Studies: Generative AI in Gaming, Fashion, and Virtual Reality, Introduction to Prompt Engineering	8
Pedagogy	**Hands-on Session**	

Text Books

Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Gohil, P. (2019). *Machine learning with Tensor Flow*. BPB Publications.

2	Simon Haykin, Neural networks and Learning Machines, Third Edition, Pearson, 2016
3	Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.
Reference Books	
4	Numa Dahamani ,Maggie Engler ,"Introduction to Generative AI" ,Manning Publications ,2024
5	Deep Learning (Chapter 20: Generative Models),Goodfellow, I., Bengio, Y., & Courville, A. **MIT Press book** (2016).
6	"Hands-On Generative Adversarial Networks with PyTorch 1.x: Implement next-generation neural networks to build powerful GAN models using Python" by Stefano Van Der Walt, Benjamin Kallus, and Alex Lavin
7	GANs in Action: Deep learning with Generative Adversarial Networks" by Jakub Langr and Vladimir Book

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Describe the basic concepts, techniques, and applications of Generative AI.	Understand	L1,L2
CO2	Use foundational Generative AI techniques to build and test basic generative models for practical tasks.	Apply	L3
CO3	Analyze the effectiveness and limitations of simple generative models developed using core Generative AI methods.	Analyze	L4
CO4	Assess the performance, usability, and constraints of generative models created with foundational Generative AI methods.	Evaluate	L5
CO5	Develop and deploy generative AI solutions that demonstrate creativity and practical value across various application areas.	Implement	L6

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=rwF-X5STYks
2	https://www.youtube.com/watch?v=6aZiboOfYRA
3	https://www.youtube.com/shorts/W5nwke7iw8c
4	https://www.youtube.com/watch?v=t64TZ5S-IeY

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)
	Test-1	Test-2	
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-
Apply	20	20	-
Analyse	20	20	-
Evaluate	-	-	20
Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-	-	-	-	-	-
CO5	-	-		-	-	-	-	-	-
Total	-	-		-	-	-	-	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100 Marks)
Remember	-

Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	5	10	5	10	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	-	-	-	-	-	200	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**III**				
Course Title	**:**	**Ethical Hacking**				
Course Code	**:**	**MMC312**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PEC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Credits (L: T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	The principles and scope of ethical hacking within the framework of cybersecurity and legal considerations.
2	To acquire hands-on proficiency in executing penetration tests, vulnerability assessments, and Ethical hacking techniques across various system components, networks, and applications.
3	The methodologies and phases of penetration testing in ethical hacking practices.
4	To use commonly used hacking tools and software for vulnerability assessment and security analysis.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Introduction to Ethical Hacking** Introduction to ethical hacking and its importance, Legal and ethical considerations in ethical hacking, differentiating between black hat, white hat, and grey hat hacking, Basic cyber security concepts and terminology, Overview of penetration testing methodologies	8
Pedagogy	**Assignment**	
2	**Foot printing and Information Gathering** Passive and active information gathering techniques, Who is lookup, DNS enumeration, and social engineering, Tools and methodologies for foot printing, Google hacking and OSINT (Open Source Intelligence) techniques	8
Pedagogy	**Case study**	
3	**Scanning and Enumeration:** Port scanning techniques: SYN, TCP, UDP scans; Service enumeration and version detection; NetBIOS, SNMP, and SMTP enumeration; Vulnerability scanning and assessment	8
Pedagogy	**Hands on session**	
4	**System Hacking and Exploitation** Password cracking techniques and tools; Privilege escalation and maintaining access; Malware types and counter measures; Active and Passive sniffing - ARP Poisoning - IP Poisoning and MAC Flooding.	8
Pedagogy	**Case study**	
5	**Web Application Attacks:** Web Application Assessment Methodology – Enumeration - Inspecting URLs - Inspecting Page Content - Viewing Response Headers - Inspecting Sitemaps - Locating Administration Consoles. **Exploiting Web-Based Vulnerabilities.** Exploiting Admin Consoles - Cross-Site Scripting (XSS) - SQL Injection	8
Pedagogy	**Hands-on Session**	

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1	**Harper Allen**, *Gray Hat Hacking: The Ethical Hacker's Handbook*, 6th Edition, McGraw-Hill, **2022**
2	**Joseph Migga Kizza,** *Computer Network Security*, 5th Edition, Springer, **2020**
3	**Rafay Baloch**, *Ethical Hacking and Penetration Testing Guide*, CRC Press, **2015**, ISBN: 978-1-4822-3161-8
4	Joseph Migga Kizza, "Computer Network Security", 5th edition Springer, 2020.

References

1	William Stallings, Network Security Essentials: Applications and Standards, Pearson Education Limited2017,ISBN13:978-1-292-15485-5
2	Patrick Engebretson,The Basics of Hacking and Penetration Testing,Syngress Publishing,2013, ISBN978-0-12-411644-3

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Outline the fundamental concepts of ethical hacking and describe various types of cyber-attacks	Understand	L1,L2
CO2	Apply footprinting, scanning, and enumeration techniques to perform ethical hacking tasks	Apply	L3
CO3	Analyze system and network vulnerabilities to identify potential security risks and exploit points	Analyse	L4
CO4	Evaluate the effectiveness of various penetration testing tools and techniques in assessing system security.	Evaluate	L5
CO5	Design and implement secure system configurations and mitigation strategies to protect against cyber threats.	Create	L6

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)
	Test-1	Test-2	
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-
Apply	20	20	-
Analyse	20	20	-
Evaluate	-	-	20

Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100 Marks)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	5	10	5	10	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	-	-	-	-	-	200	100%

Dayananda Sagar Academy of Technology & Management
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Semester	:	**III**				
Course Title	:	**Enterprise Application Programming**				
Course Code	:	**MMC313**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hours**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To understand the layered architecture of enterprise applications
2	To gain practical skills in using frameworks such as Spring Boot or Jakarta EE
3	To learn to work with both relational and NoSQL databases in enterprise environments
4	To explore microservices, containerization, and CI practices
5	To apply security, performance optimization and CD techniques

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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Scheme of Teaching and Examinations for MCA Programme -2025-26
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COURSE CURRICULUM

Module No.	Topics	Hours
1	**Enterprise Application Fundamentals and Architecture:** Definition, Characteristics, Types (ERP, CRM, SCM etc.), Enterprise Application Architecture and layers, MVC, Dependency Injection, REST vs SOAP APIs, Enterprise Application Use Cases	8
Pedagogy	Hands-on Session	
2	**Backend Development with Enterprise Frameworks:** Overview of Jakarta EE, Spring Boot introduction, building controllers, services, repositories, REST API and JSON serialization, Exception Handling and Logging, Creating REST Controllers with Spring Boot	8
Pedagogy	Hands-on Session	
3	**Data Management and Integration:** SQL and NOSQL Data Models, JPA, ORM with Hibernate, Transactions and Data Validation, External API and Message Queue Integration	8
Pedagogy	Hands-on Session	
4	**Microservices and Containerization:** Microservices vs Monoliths architecture, Docker, Docker Compose, Service Discovery, API Gateway Basics, CI/CD Fundamentals	8
Pedagogy	Hands-on Session	
5	**Security, Performance, and Deployment:** Spring Security fundamentals, Authentication, authorization, custom login forms, Securing REST APIs, JWT and OAuth2 Authentication, Caching, Monitoring, and Profiling, CD (AWS Basics/ Heroku), Deploying on Tomcat, Docker basics	8
Pedagogy	Hands-on Session	

Text Books

Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Spring in Action, Craig Walls, Manning Publications, 6th Edition, 2022
2	Building Microservices, Sam Newman, O'Reilly, 2nd Edition, 2021
3	Designing Data-Intensive Applications, Martin Kleppmann, O'Reilly, 2017

4	Enterprise Integration Patterns, Gregor Hohpe & Bobby Woolf, Pearson Addison-Wesley Professional, 1st Edition, 2003
5	Foundations of Software Testing by Aditya P. Mathur – Pearson Education custom edition 2000

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Define the structure, core components, and typical design patterns found in enterprise software systems.	Understand	L1,L2
CO2	Use Spring Boot and related enterprise frameworks to implement scalable back-end services for real-world applications	Apply	L3
CO3	Analyze how relational and NoSQL databases interact with backend services and assess their influence on overall application performance.	Analyze	L3
CO4	Assess the effectiveness of microservices-based and containerized backend architectures in meeting scalability and deployment goals.	Evaluate	L4
CO5	Create and deploy a full-stack enterprise application with secure architecture, ensuring end-to-end functionality and data protection.	Implement	L4

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	3	-	-	-	-	3	-
CO3	2	3	2	3	-	-	-	-	3	2
CO4	3	-	3	3	-	2	1	2	3	1
CO5	3	2	3	3	2	3	3	3	3	2

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)
	Test-1	Test-2	
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-
Apply	20	20	-

Analyse	20	20	-
Evaluate	-	-	20
Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	15
Understand	-
Apply	45
Analyze	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-		
CO5	-	-	-	-	-	-		
Total	10	20	20	20	10	20	100	100%

Dayananda Sagar Academy of Technology & Management
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Semester	**:**	**III**				
Course Title	**:**	**Social Media Analytics**				
Course Code	**:**	**MMC314**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PEC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Credits (L: T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	To learn the fundamentals and evolution of social media platforms.
2	To know key concepts and techniques in social media data collection and analysis.
3	To adopt analytics tools to extract insights from social media data.
4	Explore skills in sentiment analysis, trend prediction, and influence measurement.
5	To know data-driven strategies for business and marketing using social media insights.

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Introduction to Social Media Analytics Foundations of Social Media Data Analysis Introduction to Social Media Analytics:** Definition, Applications, and Importance, Overview of Popular Social Media Platforms: Facebook, Twitter, Instagram, LinkedIn, YouTube Social Media Data Types: Structured vs. Unstructured Data, Social Media **Metrics and KPIs:** Engagement, Reach, Impressions, Sentiment Score, Data Collection Techniques: Web Scraping, APIs (Twitter, Fa cebook, YouTube), Streaming Data	8
Pedagogy	**Demonstration on Machine Learning with Big Data**	
2	**Sentiment Analysis and Text Mining Natural Language Processing for Social Media Data Fundamentals of Sentiment Analysis:** Positive, Negative, Neutral Sentiments, Text Preprocessing: Tokenization, Stopword Removal, Stemming, Lemmatization Machine Learning Approaches for Sentiment Classification: Naïve Bayes, SVM, LSTM, Word Embeddings	8
Pedagogy	**Hands-on with Hadoop**	
3	**Social Network Analysis and Trend Detection Graph-based Social Media Analytics Basics of Social Network Analysis (SNA) Key Metrics:** Centrality, Clustering Coefficients, Community Detection, Influencer Identification and User Engagement Analytic Hashtag Analysis and Topic Modelling using LDA, Trend Detection on Social Media: Time Series Analysis, Virality Prediction.	8
Pedagogy	**Hands-on with Spark**	
4	**Visualizing and Interpreting Social Media Insights Data Visualization and Interpretation for Social Media Analytics** Importance of Data Visualization in Social Media Analytic. Visualization Techniques. **Web analytics tools and techniques:** Click stream analysis, A/B testing, online surveys, Use of Google Analytics; Web crawling and Indexing; Natural Language Processing Techniques for Micro-text Analysis	8
Pedagogy	**Data Processing and SQL**	
5	**Applications of Social Media Analytics in Business and Research Business and Industry Applications of Social Media Analytics Social Media** Analytics in Digital Marketing: Ad Performance and Customer Engagement, Social Media in Business Intelligence: Brand Monitoring and Crisis Management, Ethical Considerations in Social Media Analytics: Privacy, Bias, and Data Protection.	8

	Future Trends in Social Media Analytics: AI-Driven Social Insights, Capstone Project: Analyzing Real-World Social Media Data for Business Insights.	
Pedagogy	**Demonstration**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Matthew A. Russell, Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Instagram, GitHub, and More, O'Reilly Media. 2019
2	Wasim Ahmed, Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media, Wiley 2017
3	Piyushimita Thakuriah, Nebiyou Tilahun, Moira Zellner, Seeing Cities Through Big Data: Research, Methods and Applications in Urban Informatics, Springer.2017
4	Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, Social Media Mining: An Introduction, Cambridge University Press. 2014

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Summarize key concepts related to social media analytics, such as data types, metrics, and techniques for collecting social media data	**Remember Understand**	L1/L2
CO2	Apply sentiment analysis and text mining methods to extract insights from social media data using Natural Language Processing (NLP) and machine learning techniques	**Apply**	L3
CO3	Examine and interpret social network dynamics by applying graph-based analytics, hashtag trend analysis, and virality detection methods	**Analyze**	L4
CO4	Assess and interpret social media analytics using Tableau and Power BI to inform strategic decisions	**Evaluate**	L5
CO5	Create data-driven social media analytics applications for business decision-making, digital marketing strategies, and brand monitoring, integrating ethical best practices	**Create**	L6

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	NPTEL Course on Social Media Analytics – nptel.ac.in
2	IBM Social Media Analytics Tutorials – ibm.com
3	YouTube Channel: Analytics Vidhya – youtube.com/analyticsvidhya

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember			10	5
Understand	10	20		5
Apply	20	20	10	10
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	Marks Distribution					Total Marks	Weightage
	Test-1			Test-2			
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	40	40%
CO3	2	2	2	2	2	40	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	-	-	-	-	-	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10
Understand	10
Apply	20
Analyse	10

Evaluate	**-**
Create	**-**

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	15	5	10	10	20	60	35%
CO2	10	10	-	-	-	20	12%
CO3	20	10	20	20	20	90	53%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	45	25	30	30	40	170	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**III**				
Course Title	:	**Network and Linux Administration**				
Course Code	:	**MMC315**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L: T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	To Set up and manage network interfaces, IP addresses, and network services
2	To Configuration firewalls using ip tables, NAT, and secure Linux networks
3	To Manage Network Services, Work with DNS, DHCP, remote login, and web server configurations..
4	To Diagnose network issues and optimize performance using Linux tools.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	Introduction to Networking :History and evolution of computer networking Basic network components and models TCP/IP Networks :Layers of the TCP/IP model Understanding IP addresses, subnetting, and classes The Internet Control Message Protocol (ICMP) Linux Networking Basics :Maintaining your Linux system for networking networking interfaces and configuration in Linux Overview of the /proc file system.	8
Pedagogy	**Hands on session on networks interface design tools**	
2	Configuring Serial Hardware :Communications software for modem links Accessing and managing serial devices Configuration utilities for serial communication TCP/IP Configuration : Understanding /proc for network-related data Configuring Linux-based TCP/IP networking Name Services and DNS :Resolver library overview How DNS works and alternatives to BIND.	8
Pedagogy	**Hands on session on networks defense tools**	
3	Point-to-Point Protocol in Linux Running pppd and using options files, Automating dialing with chat ,IP configuration and link control options Security considerations and authentication in PPP Advanced PPP Configurations : Debugging PPP setups, PPPoE options in Linux, Networking Security & Firewalls : Understanding network security threats, Firewall concepts and IP filtering basics.	8
Pedagogy	**Hands-on Experience:practice using Linux commands, configuring systems, and troubleshooting issues.**	
4	TCP/IP Firewalls :Methods of attack and security considerations, Netfilter and iptables basics, Setting up and managing Linux firewalls, IP Masquerade & Network Address Configuring IP accounting Collecting and analyzing network data.Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control. IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange (IKE)	8
Pedagogy	**Hands-on Experience:practice using Linux commands, configuring**	
5	Network Services and Remote Access : Understanding inetd, tcpd, and xinetd, Remote Procedure Call (RPC) configuration,Remote login and execution services IPv6 & Web Server Configuration History and standards of wireless networking, Security concerns in 802.11b networks.Mobile Device Security, IEEE 802.11i, Wireless LAN Security.Firewalls and Intrusion Detection Systems: Intrusion Detection Password Management, Firewall Characteristics Types of Firewalls, Firewall Basing, Firewall Location and Configurations.	8
Pedagogy	**Hands-on Experience: configuring systems, and troubleshooting issues.**	

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1	Cryptography and Network Security: Principles and Practice, 6th Edition, William Stallings, 2014, Pearson, ISBN13:9780133354690
2	Linux Network Administrator's Guide – Tony Bautts, Terry Dawson, Gregor N. Purdy 3rd edition,2005.
Reference Books	
1	Computer Networking: A Top-Down Approach– James F. Kurose & Keith W. Ross ,A great introduction to networking concepts, covering application-layer protocols, TCP/IP, and security.8th Edition 2020.
2	Linux Firewalls: Enhancing Security with nftables and Beyond – Steve Suehring.A comprehensive guide on firewall security, iptables, and nftables in Linux.4th edition,2015.
3	Mastering Linux Network Administration – Jay LaCroix Covers advanced Linux networking topics, including system administration and server configuration. 2015.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Summarize the essential features and common challenges of network commands used in networking environments.	**Understand**	**L1,L2**
CO2	Use networking tools and techniques to interconnect components and implement industrial network designs.	**Apply**	**L3**
CO3	Analyze the operational behavior and configuration methods of dynamic routing protocols to determine optimal implementation practices.	**Analyze**	**L4**
CO4	Analyze and judge the performance of administrative tools in real-world scenarios to support effective business solutions.	**Evaluate**	**L5**
CO5	Construct and apply predictive analytics models through administrative platforms to support trend-based recommendations and planning.	**Implement**	**L6**

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)
	Test-1	Test-2	
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-

Apply	20	20	-
Analyse	20	20	-
Evaluate	-	-	20
Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-2	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100 Marks)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	5	10	5	10	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	-	-	-	-	-	200	100%

Dayananda Sagar Academy of Technology & Management

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Semester	**:**	**III**			
Course Title	**:**	**Software Design and Patterns**			
Course Code	**:**	**MMC316**			
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**			
Category	**:**	**PEC**			
Stream	**:**	**MCA**	**CIE**	**:**	**50 Marks**
Credits (L: T:P:S)	**:**	**3:0:0:0**	**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**	**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Understand the importance and role of design patterns in software development.
2	Learn how to implement various creational, structural, and behavioral design patterns.
3	Analyze software design problems and apply appropriate design patterns to solve them.
4	Develop reusable and maintainable object-oriented software.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	Fundamentals and Design Principles: Introduction to Design Patterns, Definition, purpose, and history, Benefits and limitations of design patterns, Classification: Creational, Structural, Behavioral. Principles of Object-Oriented Design, SOLID principles, Coupling and Cohesion, UML for patterns.	8
Pedagogy	Case study	
2	Creational Design Patterns: Singleton and Factory Method, Singleton: ensuring a single instance, Factory Method: object creation interface, Abstract Factory: related object families, Builder: step-by step complex object creation.	8
Pedagogy	Collaborative Learning	
3	Structural Design Patterns: Adapter and Decorator, Adapter: interface compatibility, Decorator: dynamic behavior extension, Composite and Proxy, Composite: tree-like structure, Proxy: controlling object access.	8
Pedagogy	Group Discussion	
4	Behavioral Design Patterns: Observer and Strategy, Observer: publish-subscribe systems, Strategy: interchangeable algorithms, Command and Template Method, Command: encapsulate requests, Template Method: algorithm skeleton	8
Pedagogy	Demo	
5	Interactive systems and the MVC architecture: Introduction , The MVC architectural pattern, analyzing a simple drawing program , designing the system, designing of the subsystems, getting into implementation, implementing undo operation , drawing incomplete items, adding a new feature , pattern based solutions.	8
Pedagogy	Demo	

Reference Books

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1	Design Patterns: Elements of Reusable Object-Oriented Software ,Authors: Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides,Publisher: Addison-Wesley Professional.
3	First Design Patterns Authors: Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra Publisher: O'Reilly Media, 2004 / 2020 (2nd Ed. covers modern Java and updated patterns)

4	Hands-On Design Patterns with Delphi: Build applications using idiomatic, extensible, and concurrent design patterns in Delphi, Packt Publishing Limited 27 February 2019 ISBN-13978-1789343243
5	Patterns of Enterprise Application Architecture (Addison-Wesley Signature Series (Fowler)) Edition1 ISBN-1,3978-0321127426,Addison-Wesley,Publication date,15 November 2002

Weblinks and Video Lectures (e-Resources)	
1	https://youtu.be/T9zbvi8eUW0?si=qCucZA4uFYSd-6Q8
2	https://youtu.be/T9zbvi8eUW0?si=qCucZA4uFYSd-6Q8
3	https://www.youtube.com/watch?v=rl4kdGLaUiQ&list=PL6n9fhu94yhUbctIoxoVTrkIN3LMwTCmd&index=1

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Describe fundamental concepts and classifications of design patterns.	L2	Describe
CO2	Apply creational patterns to construct flexible and reusable objects.	L3	Apply
CO3	Demonstrate the use of structural patterns for building scalable architectures.	L4	Analyse
CO4	Implement behavioral patterns for effective communication among objects.	L5	Evaluate
CO5	Integrate multiple design patterns into a real-world software solution.	L5	Create

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Alternative Assessment Tool (AAT)		
	Test-1	Test-2	
	50 Marks	50 Marks	40
Remember	10	10	-
Understand	10	-	-
Apply	20	20	-
Analyse	10	20	-
Evaluate	-	-	20
Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution					Total Marks	Weightage
	Test-1			Test-2			
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	40	40%
CO3	2	2	2	2	2	40	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	-	-	-	-	-	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	5
Understand	5
Apply	20
Analyse	30
Evaluate	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	5	10	10	10	5	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	25	40	50	50	45	200	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**III**				
Course Title	**:**	**Deep Learning**				
Course Code	**:**	**MMC321**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PEC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the fundamentals of Deep Learning
2	Understanding the working of Convolutional Neural Networks and RNN in decision making.
3	Know the strength and weaknesses of different Deep Learning approaches.
4	Learn major deep learning algorithms, the problem settings, and their applications to solve real world problems

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction**: What is a Neural Network? The Human Brain, Models of a Neuron, Neural Networks Viewed As Directed Graphs, Feedback, Network Architectures **Applications** : Natural Language Processing , Bigdata, Brain Computer Interface , Vision ,IOT **Rosenblatt's Perceptron:** Introduction, Perceptron, The Perceptron Convergence Theorem, Relation Between the Perceptron and Bayes Classifier for a Gaussian Environment. **Textbook 1: Introduction 1, (1- 6), Ch 1, (1.1 - 1.4)**	8
Pedagogy	Group Discussion	
2	**Multilayer Perceptrons:** Introduction, Some Preliminaries, Batch Learning and On-Line Learning, The Back- Propagation Algorithm, XOR Problem, Heuristics for Making the Back-Propagation Algorithm Perform Better, Computer Experiment: Pattern Classification, Back Propagation and Differentiation. **Textbook 1: Ch 4, (4.1- 4.8)**	8
Pedagogy	Case study	
3	**Regularization for Deep Learning**: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under Constrained Problem, Dataset Augmentation, Semi-Supervised Learning. **Optimization for Training Deep Models:** How Learning Differs from pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rate. **Textbook 2: Ch 7, (7.1 – 7.6), Ch 8, (8.1 – 8.5)**	8
Pedagogy	Case study	
4	**Convolution Networks:** The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Func tion, Structured Outputs, Data Types, Efficient	8

	Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basic for Convolutional Network, Convolutional Networks and the History of Deep Learning . **Textbook 2: Ch 9, (9.1 – 9.11)**	
Pedagogy	**Case study**	
5	**Sequence Modeling:** Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to- Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Long Short-Term Memory and Other Gated RNNs. **Textbook 2: Ch 10, (10.1-10.6), 10.10**	**8**
Pedagogy	**Hands-on Session**	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Simon Haykin, Neural networks and Learning Machines, Third Edition, Pearson, 2016
2	Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.
Reference Books	
3	N.D. Lewis, "Deep Learning Made Easy with R: A Gentle Introduction for Data Science", January 2016
4	Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly publications,2022
5	Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning, 2009

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Outline the core principles and components of deep learning models and algorithms.	**Understand**	**L1,L2**

CO2	Apply foundational algorithms within deep learning frameworks to develop and train predictive models.	Apply	L3
CO3	Analyze the components and learning mechanisms of different neural network models, such as CNNs, RNNs, and GANs.	Analyze	L4
CO4	Assess and compare the effectiveness of different neural network models using appropriate performance metrics and evaluation	Evaluate	L5
CO5	Build and optimize CNN architectures to develop innovative solutions for real-world data-driven problems.	Implement	L6

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.deeplearningbook.org/lecture_slides.html
2	https://www.youtube.com/watch?v=VyWAvY2CF9c
3	https://www.youtube.com/watch?v=7sB052Pz0sQ
4	https://www.youtube.com/watch?v=M ubj_fqiAv8
5	https://www.coursera.org/learn/neural-networks-deep-learning
6	https://onlinecourses.nptel.ac.in/noc20_cs62/preview

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)
	Test-1	Test-2	
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-
Apply	20	20	-
Analyse	20	20	-
Evaluate	-	-	20

Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	15
Understand	-
Apply	45
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-		
CO5	-	-	-	-	-	-		
Total	10	20	20	20	10	20	100	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**III**				
Course Title	:	**Cyber Security**				
Course Code	:	**MMC322**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L: T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	To learn cybercrime and cyber law.
2	To understand the cyber-attacks and tools for mitigating them.
3	To understand information gathering.
4	To learn how to detect a cyber-attack.
5	To learn how to prevent a cyber-attack.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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Scheme of Teaching and Examinations for MCA Programme -2025-26
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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**INTRODUCTION** Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.	8
Pedagogy	**Assignment**	
2	**ATTACKS AND COUNTER MEASURES OSWAP;** Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Counter measures.	8
Pedagogy	**Case study**	
3	**RECONNAISSANCE** Harvester – Who is – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches.	8
Pedagogy	**Case study**	
4	**INTRUSION DETECTION** Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort. **INTRUSION PREVENTION** Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations –Intrusion Prevention Systems – Example Unified Threat Management Products.	8
Pedagogy	**Case study**	
5	**Cyber Forensics and Emerging Trends:** Cyber Forensics: Basics, Chain of Custody, Data Acquisition, Forensic Tools Incident Response and Handling Introduction to Blockchain Security and Smart Contracts AI and ML in Cyber Security Current Trends: Zero Trust Architecture, Threat Intelligence, Cloud Security	8
Pedagogy	**Case Study**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	William Stallings, Lawrie Brown, —Computer Security Principles and Practicell, Fifth Edition, Pearson Education, 2024.
2	Anand Shinde, —Introduction to Cyber Security Guide to the World of Cyber Securityll, Notion Press, 2021. (Unit-1 &2)
3	Patrick Engebretson, —The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easyll, Elsevier, 2011. (Unit-3)
Other References	
1	NPTEL Courses: **"Introduction to Cyber Security"** by IIT Kharagpur / **"Privacy and Security in Online Social Media"** by IIT Madras

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Describe the fundamental concepts of cybersecurity, cybercrime, and cyber laws.	**Understand**	**L1,L2**
CO2	Apply cryptographic techniques to ensure the security of data and communication systems	**Apply**	**L3**
CO3	Analyze network and system vulnerabilities to assess and interpret potential security risks	**Analyse**	**L4**
CO4	Evaluate and justify the use of access control mechanisms and secure coding practices to enhance system security.	**Evaluate**	**L5**
CO5	Design strategies for secure application development, effective incident response, and adherence to legal and regulatory compliance.	**Create**	**L6**

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		
	Test-1	Test-2	Alternative Assessment Tool (AAT)
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-
Apply	20	20	-
Analyse	20	20	-
Evaluate	-	-	40

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100 Marks)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	5	10	5	10	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	-	-	-	-	-	200	100%

Dayananda Sagar Academy of Technology & Management

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Semester	**:**	**III**				
Course Title	**:**	**User Interface Design**				
Course Code	**:**	**MMC323**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PEC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Credits (L: T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Know the key terms related to user interfaces and user interface design and implementation.
2	Identify various types of computer users and design contexts.
3	Gain knowledge about interface design process
4	Learn about Direct Manipulation and Virtual Environment.
5	Understand command, natural languages and issues in design for maintaining QoS.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Introduction**: Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivation, Universal Usability, Goals for our profession. Guideline, principles, and theories: Introduction, Guidelines, principles, Theories.	8
Pedagogy	**Hands on session**	
2	**Development Processes: Managing Design Processes:** Introduction, Organizational Design to support Usability, The Four Pillars of Design, Development methodologies: Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues	8
Pedagogy	**Hands on session**	
3	**Evaluating Interface**: Design Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments	8
Pedagogy	**Hands on session**	
4	**Direct Manipulation and Virtual Environments**: Introduction, Examples of Direct Manipulation, Discussion of direct manipulation, 3D Interfaces, Tele-operation, Virtual and Augmented Reality Menu Selection, Form Filling and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combination of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry With Menus, Form Filling, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays	8
Pedagogy	**Hands on session**	
5	**UI/ UX Design Tools** User Study- Interviews, writing personas: user and device personas, User Context, Building Low Fidelity Wireframe and High-Fidelity Polished Wireframe Using wire framing Tools, Creating the working Prototype using Prototyping tools, Sharing and Exporting Design.	8
Pedagogy	**Tools Explore**	

Text Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	BenShneiderman, Plaisant, Cohen, Jacobs: Designing the User Interface, 5th Edition, Pearson ,Education, 2010.
Reference Books	
1	A Project Guide to UX Design: For user experience designers in the field or in the making (2nd. ed.). Russ Unger and Carolyn Chandler. New Riders Publishing, USA, 2012.
2	The UX Book Process and Guidelines for Ensuring a Quality User Experience, Rex Hartson and Pardha S. Pyla, Elsevier, 2012
3	Eberts: User Interface Design, Prentice Hall, 1994 3 Wilber O Galitz: The Essential Guide to User Interface Design- An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt Ltd, 2011.
4	The Elements of User Experience: User-Centered Design for the Web and Beyond, Second Edition Jesse James Garrett, Pearson Education. 2011.
5	Alan Dix, Janet Finalay, Gregory D AbiwdmRusselBealel: Human-Computer Interaction, III Edition, Pearson , Education, 2008.
6	The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Third Edition Wilbert O. Galitz , Wiley Publishing, 2007.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Describe the new technologies that provide interactive devices and interfaces Direct Manipulation and Virtual Environment	**L1**	**Remember**
CO2	Apply the guidelines to develop the UID and evaluate for the given problem.	**L2**	**Apply**
CO3	Analyse methodologies with an analysis of the social impact and legal issues.	**L3**	**Analyse**
CO4	Implements the command, natural languages and issues in design for maintaining QoS.	**L4**	**Demonstrate**
CO5	Demonstrate techniques for information search and visualization for the given problem.	**L5**	**Evaluate**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	3	-

CO4	-	-	-	3		-	-	-	-	3
CO5	-	-	-	-	3	-	-	3	3	3

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember			10	5
Understand	10	20		5
Apply	20	20	10	10
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	Marks Distribution					Total Marks	Weightage
	Test-1			Test-2			
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	40	40%
CO3	2	2	2	2	2	40	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	-	-	-	-	-	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10

Understand	**10**
Apply	**20**
Analyse	**10**
Evaluate	**-**
Create	**-**

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	15	5	10	10	20	60	35%
CO2	10	10	-	-	-	20	12%
CO3	20	10	20	20	20	90	53%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	45	25	30	30	40	170	100%

Dayananda Sagar Academy of Technology & Management

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Semester	**:**	**III**				
Course Title	**:**	**Big Data Analytics**				
Course Code	**:**	**MMC324**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PEC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Credits (L: T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	To learn the Big Data Platform and its Use cases
2	To know HDFS Concepts and Interfacing with HDFS
3	Explore Big Data Technologies – Learn about various Big Data tools and frameworks such as Hadoop, Spark, and NoSQL databases.
4	To adopt skills to Perform Data Processing & Analysis – Develop skills in processing, storing, and analysing large-scale data using distributed computing techniques.

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Big Data Fundamentals and Ecosystem Overview Introduction to Big Data:** Concepts and Ecosystem: Definition and Evolution of Big Data. Characteristics of Big Data (Volume, Velocity, Variety, Veracity, Value). Traditional vs Big Data Systems **Introduction to Hadoop Ecosystem:** HDFS, YARN, MapReduce. Architecture and components of Hadoop. Limitations of Hadoop and the shift to Spark	8
Pedagogy	**Demonstration on Machine Learning with Big Data**	
2	**Hadoop Architecture and MapReduce Programming Distributed Data Processing using Hadoop:** **Hadoop Distributed File System (HDFS):** Design and operations,Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures. **Hadoop MapReduce**: Programming model, job execution flow. Writing MapReduce programs (Word Count, Sorting, Joins),Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.	8
Pedagogy	**Hands-on with Hadoop**	
3	**Apache Spark for Big Data Analytics In-Memory Big Data Processing with Spark:** Spark architecture and components: RDDs, DAG, Executors. Transformations and Actions on RDDs. Introduction to Data Frames and Spark SQL. **Introduction to Spark MLlib for machine learning. PySpark:** Setting up and running Spark jobs using Python.	8
Pedagogy	**Hands-on with Spark**	
4	**NoSQL and Big Data Storage Systems Scalable Data Storage with NoSQL Databases:** No SQL databases: Mongo DB: Introduction – Features – Data types – Mongo DB Query language – Architecture and CRUD operations – Arrays – Functions: Count – Sort – Limit – Skip – Aggregate – Map Reduce. Cursors – Indexes – Mongo Import – Mongo Export. Cassandra: Introduction – Features – Data types – CQLSH – Key spaces – CRUD operations – Collections – Counter – TTL – Alter commands – Import and Export – Querying System tables, Data modelling for scalability and performance, Introduction to CouchDB	8
Pedagogy	**Data Processing and SQL**	

5	**Big Data Tools and Industry Applications Real-World Big Data Applications and Tools : Overview of Big Data Tools:** HIVE : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases. Sqoop, Flume, Oozie. Data ingestion with Flume and Sqoop.Realtime analytics introduction using Kafka and Spark Streaming. Ethics and challenges in Big Data (privacy, bias, governance).	**8**
Pedagogy	**Demonstration**	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Jure Leskovec, Anand Rajaraman, Jeff Ullman – Mining of Massive Datasets, Cambridge University Press,3rd Edition, published in 2023
2	Venkat Ankam – Big Data Analytics with Spark, Packt Publishing,2016
3	Tom White – Hadoop: The Definitive Guide, O'Reilly Media,2015
4	Vignesh Prajapati – Big Data Analytics with R and Hadoop, Packt Publishing,2013
5	Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
6	Kyle Banker, "Mongo DB in Action", Manning Publications Company, 2012.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Discuss the core concepts, historical development, and architecture of Big Data, with a focus on the Hadoop ecosystem and its tools	**Remember Understand**	L1/L2
CO2	Execute data processing operations across distributed systems using HDFS and MapReduce programming models	**Apply**	L3
CO3	Analyze the efficiency of in-memory data processing with Apache Spark and develop machine learning models using Spark MLlib.	**Analyze**	L4
CO4	Design suitable NoSQL data models and evaluate their performance through practical implementation on HBase, MongoDB, and Cassandra	**Evaluate**	L5
CO5	Create integrated Big Data solutions employing tools like Hive, Pig, Sqoop, Flume, and Kafka, and evaluate ethical implications in data analytics practices	**Create**	L6

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	_	_	_	_	_	_	_	_	_	_
CO2	3	_	2	_	_	_	3	_	2	_
CO3	_	-	_	3	_	_	_	_	_	2

CO4	–	–	3	–	3	2	–	–	3	–
CO5	–	–	–	3	–	–	–	–	–	3

Weblinks and Video Lectures (e-Resources)	
1	NPTEL Big Data Analytics Course – https://nptel.ac.in/courses/106/104/106104189/
2	Simplilearn Big Data Tutorial (YouTube) – https://www.youtube.com/watch?v=-FrXAKGthF8
3	Detailed explanation of Big Data concepts and tools
4	Big Data Analytics Using Python (YouTube - Great Learning) – https://www.youtube.com/watch?v=ZkZclIFmgVY

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Theory**			
	Continuous Assessment Tests (IAT)		**Continuous Comprehensive Assessment (CCA)**	
	IAT-1	**IAT-2**	**CCA-1**	**CCA-2**
	50 Marks	**50 Marks**	**50 Marks**	**50 Marks**
Remember			10	5
Understand	10	20		5
Apply	20	20	10	10
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	**Marks Distribution**					**Total Marks**	**Weightage**
	Test-1			**Test-2**			
	Module-1	**Module-2**	**Module-3**	**Module-4**	**Module-5**		
CO1	**1**	**1**	**1**	**1**	**1**	**10**	**20%**
CO2	**2**	**2**	**2**	**2**	**2**	**40**	**40%**
CO3	**2**	**2**	**2**	**2**	**2**	**40**	**40%**
CO4	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total	**-**	**-**	**-**	**-**	**-**	**50**	**100%**

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10
Understand	10
Apply	20
Analyse	10
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	15	5	10	10	20	60	35%
CO2	10	10	-	-	-	20	12%
CO3	20	10	20	20	20	90	53%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	45	25	30	30	40	170	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**III**				
Course Title	:	**Cloud Essentials**				
Course Code	:	**MMC325**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L: T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Learn the basic concepts and techniques of entire application life cycle.
2	Know the various technology Aws tooling for reliability
3	Understand the various deploying code and provisioning infrastructure

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Introduction to Cloud:** Defining a cloud, Characteristics of Cloud Computing, Cloud computing reference model, Architectures for parallel and distributed computing, Elements of parallel computing and Elements of distributed computing. Cloud Service Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Function as a Service (FaaS), Blockchain-as-a-Service (BaaS) and use cases, Cloud Deployment Models: Public Cloud, Private Cloud, Hybrid and Multi-Cloud, Community Cloud.	8
Pedagogy	**Hands on session on AWS Creation**	
2	**Core Components of Cloud Architecture:** Compute Services, Storage Services, Networking Services, Virtualization, Types of Virtualization, Containers vs. Virtual Machines (VMs), Load Balancing in Cloud, Au to-Scaling & Fault Tolerance, Content Delivery Networks(CDN), Bare Metal Cloud ,Cloud Orchestration and Automation.	8
Pedagogy	**Hands on session on AWS Creation,VMS**	
3	**Cloud Automation, DevOps, and Future Innovations:** Cloud Automation and Infrastructure as Code (IaC), DevOps and Continuous Integration/Continuous Deployment (CI/CD), Multi-Cloud and Hybrid Cloud Strategies, Sustainability and Green Cloud Computing, Cloud Innovations- AI-powered cloud automation-5G and its impact on cloud computing.	8
Pedagogy	**Case study**	
4	**Cloud Security & Risk Management**: Cloud Adoption, Advantages and Challenges of Cloud Adoption, Security Risks in Cloud- Data Breaches, Identity Theft, Network Security in Cloud. Security Solutions in Cloud: Identity and Access Management (IAM), Data Encryption Techniques, Firewalls & Intrusion Detection Systems: Compliance & Regulatory Frameworks, Disaster Recovery and Business Continuity Planning in Cloud. Development environments for service development. AWS, Azure, Google App.	8
Pedagogy	**Case study:Data Encryption Techniques**	
5	**Emerging Trends and case study:** AI, Edge Computing, Quantum Cloud, Event-driven architecture in cloud, Cloud-based AI services -AWS Sage Maker, Google Vertex AI, Azure ML.	8
Pedagogy	**Case Study: Netflix's Cloud Migration, Zoom's Cloud Scalability.**	

TextBooks (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1	Rajkumar Buyya, Christian Vecchiola, and Thamrai Selvi Mastering Cloud Computing McGraw ,Hill Education.1st edition,2018
2	Handbook of Cloud Computing, Borko Furht- Armando Escalante,1st edition,2014.
3	Cloud Essentials: CompTIA Authorized Courseware for Exam CLO-001.1st edition 2013.

	Cloud Computing: Principles and Paradigms" by Rajkumar Buyya, James Broberg, and Andrzej Goscinski.wiley,2013.
ReferenceBooks (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Cloud Computing: Theory and Practice (3rd Ed.) – Dan C. Marinescu (2022)
2	Toby Velte, Anthony Velte, Cloud Computing: A Practical Approach, McGraw-Hill Osborne Media
3	Mastering Cloud Computing: Foundations and Applications Programming – Rajkumar Buyya, James Broberg, Andrzej Goscinski (2013)
4	Cloud Computing: Concepts, Technology & Architecture – Thomas Erl, Zaigham Mahmood, Ricardo Puttini (2013)
5	Distributed and Cloud Computing: From Parallel Processing to the Internet of Things – Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra (2012)
6	Hands-On AWS, Compute, Storage, Networking & Virtualization
7	Cloud Security and Privacy: An Enterprise Perspective – Tim Mather, Subra Kumaraswamy, et al. (2009)

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Outline the fundamental concepts of cloud computing architecture along with its associated benefits and challenges.	Understand	L1,L2
CO2	Apply various types of cloud resources to implement real-time cloud-based services and solutions.	Apply	L3
CO3	Analyze real-world case studies to determine the suitability of cloud computing for specific business or technical requirements	Analyze	L4
CO4	Evaluate the effective administrative tools in solving cloud-based application development	Evaluate	L5
CO5	Develop solutions for managing and deploying cloud services effectively	Implement	L6

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2

	50 Marks	50 Marks	50 Marks	50 Marks
Remember			10	5
Understand	10	20		5
Apply	20	20	10	10
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100 Marks)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	5	10	5	10	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	-	-	-	-	-	200	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**III**				
Course Title	:	**Software Testing**				
Course Code	:	**MMC326**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L: T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Discuss the various Test Metrics
2	Learn the knowledge on Testing Tools and methods
3	To know the perspective on Testing
4	Understand the concepts of Path Testing, Data flow testing, Levels of Testing, Integration Testing
5	To study an appropriate tool for the chosen problem.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**FOUNDATIONS OF SOFTWARE TESTING:**Why do we test Software?Software Testing Life Cycle: V-model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing	**8**
Pedagogy	Collaborative Learning	
2	**MANUAL & AUTOMATED TESTING:** **Manual Testing** :Black Box Testing,White Box Testing,Grey Box esting,FunctionalTesting,UsabilityTesting,AcceptanceTesting,Regression Testing **Automated Testing :** Automate Testing of Web Applications Introduction to Selenium Testing,Significance of Automation Testing, Benefits of Selenium Automation Testing.	**8**
Pedagogy	Tools exploration8	
3	**API TESTING & JENKINS : APITESTING :-** What is API?,Difference between API and Web services,How Web Services Works,Manually Test different API methods using(POSTMAN Tool,GET Method,PUT Method,POST Method,DELETE).**Jenkins:** Introduction To Jenkins :CI/CD,Jobs ,Builds,Agents & Distributing Builds,Extending Jenkins,Notifications,Security,Artifacts,Pipelines	**8**
Pedagogy	Hands on Session	
4	**MOBILE TESTING & ADVANCED TESTING CONCEPTS :** Introduction**,** Appium? Automation, Testing, Tools. Performance **Testing:** Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, **Usability Testing:**Testing the Documentation, **Security testing:** Testing in the Agile Environment, Testing Web and Mobile Applications.	8
Pedagogy	Hands on Session	
5	**SELENIUM & MAVEN: Introducing** Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports. **Maven:** Introduction to Maven, Maven usage, Configuring Maven with Eclipse, Taking Automatic Updates,Running tests in Maven,Creating a POM.xml File,Maven Integration Tool	8
Pedagogy	Hands on Session	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Adithya P.Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011
2	Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012 Paul C Jorgensen, "Software Testing A Craftsman's Approach", Auerbach publications, 3rd edition, 2011.
3	Software Test Automation by Mark Fewster (1999-09-04) ISBN-13, Addison Wesley,June 28, 1999
4	Hands-On Selenium webdriver with Java: A Deep Dive into the Development of End-to-End testsedition 1,ISBN-13,978-1098110000, O'Reilly Publisher,Publication date,May 10, 2022.
5	Software Testing: A Craftsman's Approach 4th ed. Edition by Paul C Jorgensen

Weblinks and Video Lectures (e-Resources)	
1	https://youtu.be/OGImfxO2TEU
2	https://youtu.be/T3q6QcCQZQg

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Outline the fundamental principles of software testing and their role in ensuring software quality	L2	Describe
CO2	Use appropriate manual testing techniques to identify defects in software applications.	L3	Apply
CO3	Analyze the structure and components of Jenkins, such as jobs, builds, agents, and pipelines, in a CI/CD environment.	L4	Analyse
CO4	Assess various performance testing techniques, including load, stress, volume, and fail-over testing, for evaluating system robustness.	L5	Evaluate
CO5	Develop a complete test automation workflow by integrating Selenium with Maven for continuous testing and automatic updates.	L5	Create

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	-	-	2	-	-	-	-	-	-	-	-	-
CO2	-	-	-	3	-	-	3	-	-	-	-	-	3	-

CO3	3	-	2	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	3	-	3	-	-	-	-	-	-	-	3	-
CO5	-	2	-	3	-	-	-	-	-	3	-	-	-	-

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember			10	5
Understand	10	20		5
Apply	20	20	10	10
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-		
CO5	-	-	-	-	-	-		
Total	10	20	20	20	10	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	5
Understand	5

Apply	**20**
Analyse	**30**
Evaluate	**-**

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	5	10	10	10	5	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	25	40	50	50	45	200	100%

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Semester	**:**	**III**				
Course Title	**:**	**Computer Vision**				
Course Code	**:**	**MMC331**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PEC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the Fundamentals of Computer Vision
2	Implement Feature Extraction and Object Recognition
3	Analyze Motion and Video Processing Techniques and Apply Deep Learning in Computer Vision

Teaching-Learning Process
Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction to Computer Vision and Image Representation**: Basics of Computer Vision and its applications, Digital images: Pixels, resolution, and color models, Image formation and perception Visualizing pixel intensity distributions, Working with pixel-based operations, Introduction to video processing	8
Pedagogy	Group Discussion	
2	**Feature Detection and Image Processing Techniques:** Edge detection techniques (Sobel, Canny) Line and corner detection, Gaussian kernels and filters, Delaunay mesh segmentation, Feature Descriptors and Matching, Object Detection and Recognition	8
Pedagogy	Problem-Based Learning	
3	**Shape and Object Recognition**: Contour detection and shape analysis, Feature extraction methods Maximal nucleus clusters and Lowe keypoints, Image segmentation techniques, Introduction to object tracking in videos	8
Pedagogy	Case Walkthrough	
4	**Computational Geometry and Machine Vision**: Concepts of computational topology in vision Linear filtering and transformations, Spatial relationships and image transformations, Use of graphs and meshes in object representation, Real-time and offline video analysis	8
Pedagogy	Brainstorming	
5	**Advanced Topics and Applications:** Deep learning for computer vision (basics) , Convolutional Neural Networks (CNNs) overview, Applications in biometrics, medical imaging, and robotics . Future trends in computer vision , Case studies and project discussions	8
Pedagogy	Group Activity	

Text Books

Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Szeliski, R. (2022). Computer vision: Algorithms and applications (2nd ed.). Springer.
2	Peters, J. F. (2017). Foundations of computer vision: Computational geometry, visual image structures, and object shape detection. Springer International Publishing
3	Forsyth, D. A., & Ponce, J. (2011). Computer vision: A modern approach (2nd ed.).

	Pearson

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Discuss the basic principles and operations involved in digital image processing.	Understand	L1, L2
CO2	Apply standard techniques for extracting image features and recognizing objects in diverse application contexts.	Apply	L3
CO3	Examine and compare various techniques used in motion analysis and video processing for effectiveness in different scenarios	Analyze	L4
CO4	Assess the performance and limitations of CNN-based models in handling image classification and segmentation problems.	Evaluate	L5
CO5	Create effective computer vision models by selecting and combining suitable techniques for solving practical problems	Implement	L6

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/channel/UCf0WB91t8Ky6AuYcQV0CcLw
2	https://www.youtube.com/watch?v=2w8XIskzdFw
3	https://16385.courses.cs.cmu.edu/spring2021/lectures

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember			10	5
Understand	10	20		5
Apply	20	20	10	10
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-		
CO5	-	-	-	-	-	-		
Total	10	20	20	20	10	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	15
Understand	-
Apply	45
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-		
CO5	-	-	-	-	-	-		
Total	10	20	20	20	10	20	100	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**III**				
Course Title	**:**	**Blockchain Technologies**				
Course Code	**:**	**MMC332**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PEC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Credits (L: T:P:PJ)	**:**	**3:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	The fundamental concepts of blockchain, including decentralization, consensus mechanisms, and distributed ledger technology.
2	The architecture and working of popular blockchain platforms like Bitcoin and Ethereum.
3	The process of developing smart contracts and decentralized applications (DApps).
4	About blockchain security, privacy, and its role in ensuring data integrity and trust.
5	The applications of blockchain technology across various domains such as finance, supply chain, healthcare, and governance.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Cryptocurrency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain	8
Pedagogy	**Assignment**	
2	Block chain: Architecture, versions, variants, use cases, Life use cases of block chain, Block chain vs shared Database, Introduction to crypto currencies, Types, Applications. Ciphers, RC4.	8
Pedagogy	**Case study**	
3	Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy, payment verification, Resolving Conflicts, Creation of Blocks	8
Pedagogy	**Case study**	
4	Introduction to Bitcoin, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency.	8
Pedagogy	**Case study**	
5	Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs Bitcoin, Etherum Ecosystem: keys, addresses, Transaction, Messages Introduction to Smart contracts, usage, application, working principle, Law and Regulations. Case Study.	8
Pedagogy	**Case study**	

TextBooks (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	**Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions** by Arshdeep Bikramaditya Signal, Gautam Dhameja (Priyansu Sekhar Panda., A Press.), **2018**
2	**Blockchain Applications: A Hands-On Approach** by Bahga, Vijay Madisetti, **2017**
3	**Blockchain** by Melanie Swan, O'Reilly, **2015**
RefrenceBooks (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Bitcoin and Cryptocurrency Technologies by Aravind Narayan. Joseph Bonneau, princton
2	Bitcoin and Blockchain Basics: A non-technical introduction for beginners by Arthu.T Books.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Discuss the basic concepts of blockchain technology and demonstrate their use with modern tools and platforms.	Understand	L1,L2
CO2	Apply smart contract logic using tools like Solidity and deploy contracts on blockchain test networks	Apply	L3
CO3	Analyze the role and impact of blockchain applications across various domains, including cybersecurity	Analyse	L4
CO4	Evaluate the security features, limitations, and performance aspects of blockchain-based applications to determine their effectiveness.	Evaluate	L5
CO5	Design and develop decentralized applications (DApps) to address real-world problems using blockchain technology.	Create	L6

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)
	Test-1	Test-2	
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-
Apply	20	20	-
Analyse	20	20	-
Evaluate	-	-	20

Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100 Marks)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	5	10	5	10	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	-	-	-	-	-	200	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**III**				
Course Title	:	**Web Development using Full Stack Open**				
Course Code	:	**MMC333**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hours**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To understand the fundamentals, structure and styling of web pages
2	To design and develop interactive web applications using React and Node.js
3	To integrate frontend and backend systems for seamless data exchange
4	To implement persistent storage using MongoDB and SQL
5	To develop and deploy full-stack applications using CI/CD pipelines

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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Scheme of Teaching and Examinations for MCA Programme -2025-26
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COURSE CURRICULUM

Module No.	Topics	Hours
1	**Advanced JavaScript Foundations:** JavaScript Fundamentals – Variables, functions and DOM manipulation; Execution context, scope, closures, Hoisting, this, arrow functions, Promises and async/await, Modules: import, export, Array methods: map(), filter(), reduce(), Error Handling	8
Pedagogy	**Creation of web pages with HTML, CSS and JavaScript**	
2	**Front-End Development with React:** Introduction to React – How React differs from traditional HTML and JS, Why use React?, JSX, Components of React (Functional vs Class), Creating dynamic user interfaces with conditional rendering, Handling user events and form submission, React Hooks – useState, useEffect, useContext, and custom hooks; Introduction to React Router, Introduction to testing React apps with Jest and React Testing Library	8
Pedagogy	**Hands-on Session**	
3	**Backend with Node.js and Express:** Introduction to Node.js – Features and Architecture, Working with npm and package management, Express Framework and Routing, Building a basic server using Express, Middleware Architecture, functions: logging, authentication and error handling; Creating REST APIs (GET, POST, PUT, DELETE), Input validation, error handling	8
Pedagogy	**Hands-on Session**	
4	**Data Persistence and Full-Stack Integration:** Introduction to MongoDB and Mongoose, Defining and connecting models, CRUD operations with MongoDB – Creating, reading, updating and deleting data, Querying and filtering data using Mongoose, Handling database errors, Data Exchange using JSON: Serialization and Parsing; Connecting React frontend to Node.js backend, Introduction to Authentication and Authorization concepts – Implementing JSON Web Tokens (JWT) for authentication, Managing user sessions and tokens	8
Pedagogy	**Hands-on Session**	
5	**Testing, Deployment, and CI/CD:** Backend testing with Jest and Supertest, End to End testing with Cypress, Environment variables and configuration management, Deployment to cloud platforms (Render / Vercel / Netlify), Setting up Continuous Integration and Continuous Deployment (CI/CD) pipelines, Automating test and builds using Jenkins, GitHub Actions, Deploying backend services using AWS/ Docker	8
Pedagogy	**Hands-on Session**	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Node.js Design Patterns, Mario Casciaro and Luciano Mammino, Packt Publishing, 3rd Edition, 2020
2	Learning React, Alex Banks and Eve Porcello, O'Reilly Media, 2nd Edition, 2020
3	MongoDB: The Definitive Guide, Shannon Bradshaw, Eoin Brazil and Kristina Chodorow, Shroff/O'Reilly, 3rd Edition, 2020
4	Eloquent JavaScript, Marijn Haverbeke, No Starch Press; 3rd edition, 2011
Reference Books	
5	Full Stack Open 2024 by University of Helsinki (Online Course Material) https://fullstackopen.com/en/

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Describe the core principles and technologies involved in modern web development.	**Understand**	**L1,L2**
CO2	Apply Node.js and Express frameworks to create scalable and efficient RESTful APIs for web applications.	**Apply**	**L2**
CO3	Examine the architecture and component interactions in full stack applications built with React and modern JavaScript.	**Analyze**	**L4**
CO4	Assess the performance and scalability of data models and CRUD operations implemented with MongoDB and Mongoose.	**Evaluate**	**L3**
CO5	Create and manage deployment pipelines for full stack applications using modern DevOps tools to ensure automation and scalability.	**Implement**	**L4**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	3	-	-	-	-	3	-

CO3	2	3	2	3	-	-	-	-	3	2
CO4	3	-	3	3	-	-	-	-	3	-
CO5	2	-	2	3	2	3	-	3	3	2

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		
	Test-1	Test-2	Alternative Assessment Tool (AAT)
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-
Apply	20	20	-
Analyse	20	20	-
Evaluate	-	-	20
Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	15
Understand	-
Apply	45
Analyze	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-		
CO5	-	-	-	-	-	-		
Total	10	20	20	20	10	20	100	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**III**				
Course Title	:	**IOT Technology and Applications**				
Course Code	:	**MMC334**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L: T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	To provide a sound foundation to the students on the concepts, percepts and practices in a field that is of immense concern to the industry and business.
2	Understand N/W protocols like RIP, OSPF & EIGRP according to industry requirement
3	The course implicitly and explicitly affects the abilities of students to have a good understanding of the upcoming other related distributions.
4	Understanding a subject related at a bit higher in its hierarchy.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	IoT & Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications,Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Smart Metering/Advanced Metering Infrastruc ture Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking, Over-The-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications.	8
Pedagogy	**Hands on session:Home automation**	
2	Fundamental IoT Mechanism and Key Technologies-Identification of IoT Objec t and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards -Overview and Approaches, IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol, Representational State Transfer, ETSI M2M, Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF IPv6 Over Low power WPAN, Zigbee IP(ZIP), IPSO.	8
Pedagogy	**Case study:CENELEC, IETF IPv6 Over Low power WPAN, Zigbee IP(ZIP), IPSO.**	
3	Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M, Layer 3 Connectivity: IPv6 Technologies for the IoT: Overview and Motivations. Address Capabilities, IPv6 Protocol Overview, IPv6 Tunneling, IPsec in IPv6, Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6.	8
Pedagogy	**Case study: Quality of Service in IPv6, Migration Strategies to IPv6.**	
4	Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, environment, Agriculture, Productivity Applications.	8
Pedagogy	**Hands on session:IoT Design**	
5	Data Analytics for IoT: Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis,Structural Health Monitoring Case Study.	8
Pedagogy	**Hands-on Session:Apache SparK**	

TextBooks (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	ArshdeepBahga, Vijay Madisetti: Internet of Things: A Hands-on Approach, Universities Press, 2015
2	Daniel Minoli: Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Wiley, 2013

RefrenceBooks (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Michael Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", Pearson Education 2015.
2	Claire Rowland, Elizabeth Goodman et.al: Designing Connected Products, O'Reilly, First Edition, 2015.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Describe how devices, gateways, and data handling processes contribute to the functioning of IoT systems.	Understand	L1,L2
CO2	Apply IoT frameworks in real-time scenarios from various domains such as healthcare, agriculture, and smart cities.	Apply	L3
CO3	Analyze and compare IoT application performance in domains such as healthcare, agriculture, smart cities, and industrial automation.	Analyze	L4
CO4	Assess and validate basic IoT solutions developed on embedded platforms based on performance and application requirements.	Evaluate	L5
CO5	Develop end-to-end predictive models using IoT-generated data to support intelligent decision-making in real-world scenarios.	Create	L6

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)
	Test-1	Test-2	
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-
Apply	20	20	-
Analyse	20	20	-

Evaluate	-	-	20
Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100 Marks)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	5	10	5	10	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	-	-	-	-	-	200	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**III**				
Course Title	**:**	**Devops**				
Course Code	**:**	**MMC335**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**IPCC**				
Stream	**:**	**MCA**		**CIE**	**:**	**50 Marks**
Credits (L: T:P:PJ)	**:**	**3:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 Hrs**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	To provide in-depth knowledge on various DevOps tools including Git, Jenkins,Docker, Ansible
2	To acquire knowledge on best practices in Continuous Development, Configuration Management and Continuous Integration.
3	To explore Continuous Monitoring of software throughout its development life cycle.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	DevOps : DevOps and Software - Development Life Cycle - Waterfall Model - Agile Model - Continuous Integration & Deployment – Jenkins Containers and Virtual Development Docker Vagrant - Configuration Management Tools – Ansible – Puppet – Chef. Jenkins - Continuous Integration with Jenkins - Configure Jenkins - Jenkins Management- Scheduling build Jobs - POLL SCM - Maven Build Scripts - Support for the GIT version control System - Types of Jenkins Jobs -Jenkins Build Pipe Line - Parent and Child Builds - Sequential Builds - Jenkins Master & Slave Node Configuration - Jenkins Workspace Management - Securing Jenkins – Authentication –Authorization –Confidentiality -Creating Users - Jenkins Plugins - Installing Jenkins Plugins - SCM plugin - Build and test.	8
Pedagogy	**Assignment: Sensors and actuators**	
2	Version Control-GIT : GIT Features - 3-Tree Architecture - GIT – Clone /Commit / Push - GIT Hub Projects - GIT Hub Management - GIT Rebase & Merge - GIT Stash, Reset, Checkout - GIT Clone, Fetch, Pull.	8
Pedagogy	**Hands on session on sensors**	
3	Build tool- Maven: Maven Installation - Maven Build requirements -Maven POM Builds (pom.xml) -Maven Build Life Cycle- Maven Local Repository (.m2) - Maven Global Repository - Group ID, Artifact ID, Snapshot -Maven Dependencies - Maven Plugins.	8
Pedagogy	**Hands on session Data Analytics**	
4	ANSIBLE : Introduction to Ansible - Ansible Server Configuration - Infrastructure Management - SSH Connection in Ansible Master - YAML Scripts -Host Inventory -Hosts and Groups - Host Variables - Group Variables - Host and Group Specific Data - Ad-hoc Commands – Playbooks Variables – Conditionals – Loops – Blocks – Handlers – Templates – Modules - Core Modules - Extra Modules - Ansible Roles.	8
Pedagogy	**Case study:Blockchain for IoT Security.**	
5	Docker : How to get Docker Image - What is Docker Image - Docker Installation - Working with Docker Containers -What is Container - Docker Engine - Crating Containers with an Image - Working with Images - Docker Command Line Interphase - Docker Compose - Docker Hub - Docker Trusted Registry - Docker swarm - Docker attach - Docker File & Commands.Kubernets architecture,pods,deployments services.	8
Pedagogy	**Hands-on Session:Smart Projects**	

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	"The DevOps Handbook" by Gene Kim, Jez Humble, Patrick Debois, and John Willis,2021

2	Jennifer Davis and Katherine Daniels, "Effective DevOps", 1st Edition, Shroff / O'Reilly Publications, 2021. (ISBN-13: 978-9352133765)
3	"Learning DevOps: Continuously Deliver Better Software" by Mikael Krief (Packt),2020
4	"Ansible for DevOps" by Jeff Geerling,2020
5	"Jenkins 2: Up and Running" by O'Reilly (by Brent Laster),2020
6	"Docker Deep Dive" by Nigel Poulton,2020
7	"Git Pocket Guide" by Richard E. Silverman (O'Reilly),2020
8	"Apache Maven Cookbook" by Srirangan (Packt),2020.
References	
1	The Phoenix Project,Gene Kim, Kevin Behr, George Spafford.,2020.
2	Accelerate: The Science of Lean Software and DevOps,2020.
3	Learning DevOps: Continuously Deliver Better Software Author: Mikael Krief,2020.
4	Cloud Native DevOps with Kubernetes,John Arundel, Justin Domingus.2020

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Describe the fundamental concepts of DevOps, Software Development Life Cycle models (Waterfall, Agile), and CI/CD principles.	**Understand**	**L1,L2**
CO2	Apply version control operations using Git and GitHub, including branching, merging, and stashing.	**Apply**	**L3**
CO3	Analyse end-to-end CI/CD pipelines incorporating secure practices using Jenkins and container orchestration with Docker Swarm.	**Analyze**	**L4**
CO4	Construct build automation pipelines using Maven and integrate them with Jenkins.	**Evaluate**	**L5**
CO5	Develop infrastructure automation scripts using Ansible for configuration management.	**Implement**	**L6**

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)
	Test-1	Test-2	
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-
Apply	20	20	-
Analyse	20	20	-
Evaluate	-	-	20
Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100 Marks)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	5	10	5	10	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
Total	-	-	-	-	-	200	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**III**				
Course Title	:	**SOFTWARE PROJECT MANAGEMENT**				
Course Code	:	**MMC336**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Know the fundamental concepts, need and significance of software project management.
2	Learn various methods for evaluating and estimating software projects.
3	Understand activity planning techniques such as scheduling, sequencing and risk analysis.
4	Learn how software projects are monitored and controlled using cost analysis, configuration control, and earned value methods.
5	Understand the behavioural and organizational aspects of managing people and teams within software project environments.

Teaching-Learning Process
Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

Scheme of Teaching and Examinations for MCA Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction To Software Project Management** Introduction, why is Software Project Management important? What is a Project? Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Someways of categorizing software projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, what is Management? Management Control, Traditional versus Modern Project Management Practices.	8
Pedagogy	Group Discussion	
2	**Project Evaluation** Evaluation of Individual Projects, Cost Benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing allocation of Resources within Programmes. **Effort Estimation** Basics for software Estimating, Effort Estimation Techniques, Expert judgement, Albrecht Function point Analysis, Function Points Mark II, COSMIC full function points, COCOMO II, Cost Estimation.	8
Pedagogy	Problem-Based Learning	
3	**Activity Planning** Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass, Identifying the critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks. **Risk Management** Risk Management, Nature of Risk, Categories of Risk, A framework for dealing with Risk, Risk Identification, Risk Assessment, Planning, Management, Applying PERT Technique.	10
Pedagogy	Case Walkthrough	
4	**Monitoring and Control** Creating the Framework, Collecting the Data, Review, Project Termination Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting Project Back to Target, Change Control, Software Configuration Management.	6
Pedagogy	Brainstorming	
5	**Managing People and Working in Teams** Introduction, Understanding Behavior, Organizational Behavior: A Background, Selecting the Right Person for the Job, Instruction in the Best	8

	Methods, Motivation, The Oldham– Hackman Job Characteristics Model, Stress– Health and Safety Working in Teams, Becoming a Team, Decision Making, Leadership.	
Pedagogy	**Group Activity**	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Software Project Management, BobHughes, Mike Cotterell, Rajib Mall, TataMcGrawHill,, Fifth Edition, 2017
Reference Books	
1.	Information Technology- Project Management, JackMarchewka, Wiley Student Version, Fourth Edition, 2013.
2.	Project Planning, Scheduling & Control, JamesPLewis, McGrawHill, Fifth Edition, 2011.
3.	Software Project Management in Practise , Pankaj Jalote, Pearson Education, 2002.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the significance of software project management and its role in successful software delivery.	Understand	L1, L2
CO2	Apply cost-benefit evaluation techniques to assess the viability of individual software projects	Apply	L3
CO3	Analyze strategies for shortening project duration and apply risk assessment frameworks to identify and evaluate project risks.	Analyze	L4
CO4	Evaluate cost monitoring techniques and assess the impact of change control procedures and software configuration management on project scope and quality	Evaluate	L5
CO5	Formulate effective team-building processes and collaborative decision-making practices for high-performing project teams.	Implement	L6

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	3	-	3	-	-	3	-
CO3	-	3	-	3	-	3	-	-	-	2

CO4	-	-	3	-	-	3	3	-	3	2
CO5	-	-	-	-	3	3	-	3	-	3

Weblinks and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc19_cs70/preview
2	https://www.youtube.com/watch?v=IBL9MqvpPlM
3	https://www.youtube.com/watch?v=cof4E2mCAMo

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember			10	5
Understand	10	20		5
Apply	20	20	10	10
Analyse	20	10	10	10
Evaluate	-	-	10	10
Create	-	-	10	10

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-		
CO5	-	-	-	-	-	-		
Total	10	20	20	20	10	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	15
Understand	-
Apply	45
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	-	5	5	5	-	-	15	15%
CO2	10	5	5	10	5	10	45	45%
CO3	-	10	10	5	5	10	40	40%
CO4	-	-	-	-	-	-		
CO5	-	-	-	-	-	-		
Total	10	20	20	20	10	20	100	100%

Dayananda Sagar Academy of Technology & Management

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Semester	:	**III**				
Course Title	:	**Project Work**				
Course Code	:	**MMCP304**				
Course Type (Theory/ Practical/ Integrated)	:	**Practical**				
Category	:	**PROJ**				
Stream	:	**MCA**		**CIE**	:	100 Marks
Teaching hours/ week (L:T:P:S)	:	**0:0:0:25**		**SEE**	:	100 Marks
Total Hours	:	**-**		**SEE Duration**	:	3 Hours
Credits	:	**13**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To Support independent learning.
2	To guide to select and utilize adequate information from varied resources maintaining ethics..
3	To inspire independent and team working.
4	To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
5	To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

Project Work

Each student shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.

- Follow the Software Development life cycle
- Data Collection ,Planning
- Design the Test cases
- Validation and verification of attained results
- Significance of parameters w.r.t scientific quantified data.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand comprehension of project requirements and underlying principles.	L1/L2	U/R
CO2	Apply knowledge and skills in practical, real-world project scenarios.	L3	A
CO3	Analyze the various project elements to understand their relationships and organizational structure..	L4	AN
CO4	Assess project outcomes and processes based on criteria and standards.	L5	C
CO5	Design and develop an innovative solution to a real-world problem	L6	E

Project work is a significant component aimed at fostering research, practical application of knowledge, and innovation. The evaluation process generally follows these steps:

1. **Selection and Approval of Project Work:**
   - Topic Selection: Students propose project topics, often in consultation with their faculty advisor.
   - Approval Process: The proposed topic is submitted for approval by a project committee or department, ensuring alignment with academic standards and relevance.
2. **Project Execution:**
   - Research and Development: Students carry out research, experiments, or development work as per the project plan.
   - Periodic Reviews: Regular progress reviews are conducted by faculty to monitor the project's progress and provide feedback.
   - Documentation: Students maintain a detailed record of their methodology, data, results, and analysis.
3. **Submission of the Project Report:**
   - Format and Guidelines: The report must follow the prescribed format by the university or department.
   - Plagiarism Check: The report is often checked for plagiarism to ensure originality.

4. **Evaluation Process:**

   - Internal Evaluation: Faculty members from the department review the project report and presentation for content quality, innovation, and depth of research.
   - External Evaluation: An external examiner, often an industry expert or academician from another institution, reviews the project.
   - Viva Voce Examination: The student defends their project work before a panel comprising internal and external examiners. This assesses their understanding, analytical ability, and application of the project work.
5. **Grading Criteria (Guidelines only)**
   - Report Quality: Depth of research, organization, and clarity of the document.
   - Presentation Skills: Effectiveness in communicating key aspects of the project.
   - Technical Merit: Innovation, accuracy, and the applicability of the research.
   - Viva Performance: Understanding of the subject, responses to questions, and ability to discuss the work effectively.

6. **Final Outcome:**

   - Marks Allocation: Typically, evaluation is a blend of internal (guided by the department) and external (examiner's input) assessments, distributed over the report, presentation, and viva.
   - Pass Requirement: Students must meet a minimum threshold to pass, as per university policies.

   This structured evaluation ensures a comprehensive assessment of the student's practical and research capabilities, preparing them for further research or professional practice.

Continuous Internal Evaluation:

Project Report: 10 marks. The basis for awarding the marks shall be the involvement of the student in the project and in the preparation of project report. To be awarded by the internal guide in consultation with external guide if any.

Project Presentation: 20 marks.

The Project Presentation marks of the Project Work shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty members from the department with HOD acting as the Chairperson.

Paper Publication - 10 marks

Students are required to publish their research paper in a reputed journal related to their area of study or project work. Papers should be published in scopus indexed Journal. Marks will be awarded based on the quality of the research work, relevance of the topic, originality, journal reputation, successful publication/acceptance status, and presentation of the paper

Project Execution: 50 Marks

The Project Execution marks of the Project Work shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the HOD acting as the Chairperson.

Question and Answer: 10 marks.

The student shall be evaluated based on the ability in the Question and Answer session for 10 marks.

Semester End Examination

SEE marks for the project report evaluation (60 marks), Viva-voce (40 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the external examiners

4th SEMESTER

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCC Course – Integrated Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:2:0
Total Hours of Pedagogy	40 hours Theory + 20 Hours of Practical Classes
Credits:	04
Theory - Each Module	8 Hrs
Practical's	8-10 Programs / Experiments
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

- The theory part of the IPCC shall be evaluated both by CIE and SEE.
- The practical part shall be evaluated by only CIE (no SEE).
- However, questions from the practical part of IPCC shall be included in the SEE question paper.

Integrated Professional Core Course (IPCC) - 4 Credit Course

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 60% of the maximum marks (30 marks out of 50) and for the SEE minimum passing mark is 40% of the maximum marks (20 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE) for the Theory component of the IPCC (Maximum marks 50)

Internal Assessment Test (IAT):

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 30 marks and that for the practical component is 20 marks.
- 30 marks for the theory component are split into 15 marks for two Internal Assessment Tests (Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 15 marks) and 15 marks for Two Continuous Comprehensive Assessment(CCA) methods.

- The first Internal test at the end of 40-50% coverage of the syllabus
- The second Internal test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Revised Blooms Taxonomy (RBT) Levels. Emphasis to be given for Higher order Thinking Skills(HOTS).

Continuous Internal Evaluation (CIE) for the practical component of the IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report, **05 Marks** are for conducting the experiment, **05 Marks for** preparation of the laboratory record and observation notebook , **5 Marks** for conducting Open Ended Experiments Each experiment. Marks of all experiments' write-ups are added to 15 marks.
- The Practical laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **5 Marks.**
- The open-ended experiment after completion of all the experiments shall be conducted for 20 marks with a split-up for 5 Marks for writeup, 10 Marks for Execution, and 5 Marks for Viva-Voce.
  Marks for writeup, Execution and Viva-Voce is added and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory 2component of IPCC for 20 marks.
- The student has to secure 50% of 20 marks to qualify in the CIE of the practical component of the IPCC.

Semester End Examination (SEE) for IPCC Theory

SEE will be conducted as per the scheduled timetable, with common question papers for the course (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.

- The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks.
- The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only.
- Questions mentioned in the SEE paper may include questions from the practical component.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be (CCA1+CCA2)/2 and scaled down to **15 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The Assessment will be through rubrics.
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **15 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **30 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

4 Credits Courses – Integrated Professional Core Course (IPCC)								
Assessment Method	**Component**	**Type of Assessments**	**Syllabus Coverage**	**Maximum Marks**	**Average**	**Reduced Marks**	**Minimum Passing Marks**	**Evaluation Details**
Total CIE Theory + Practical				**50**	----	----	**15**	
CIE	**Theory**	Internal Assessment Test (IAT) - I	Module – 1 to 2.5	50	(50+50) / 2	**15**	8	Average of Two Internal test each of 50 Marks scale down the marks to 15
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity based learning	Considering all the Modules	50	(50+50) / 2	**15**	12	Two CCA methods to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives/ Activity based learning		50				
	Total CIE Theory					**30**	20	Scale down Marks of IAT and CCA to 30

CIE	**Practical**	Conduction of Experiments	Performance- Continuous Evaluation of each experiment	05	10	Average of all Experiments	10	5	Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
			Record	03					
			Observation book	02					
		Practical Test	Write up	15	50	----	05	3	One Internal Practical Test after conduction of all
			Execution	25					
			Viva-voce	10					
		Open Ended Experiment	Write up	05	20	----	05	2	One experiment for 20 marks. 20 marks reduced
			Execution	10					
			Viva-voce	05					
	Total CIE Practical						**20**	**10**	Scale down Marks of Experiments, Record, Observation, Practical Test and

								Open-Ended Experiment
SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	50	

- The Laboratory Component for the IPCC shall be for CIE only.
- However, in SEE, the Questions from the Laboratory Component shall be included in the respective Modules only.

Dayananda Sagar Academy of Technology & Management

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Semester	:	**IV**				
Course Title	:	**Mobile Application Development using Flutter**				
Course Code	:	**MMC401**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**IPCC**				
Stream	:	**MCA**		**CIE**	:	**50 Marks**
Credits (L: T:P:PJ)	:	**3:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Learn to setup Android application development environment
2	Identify options to save persistent application data
3	Interpret tasks used in handling multiple activities

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for MCA Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	Get started, Build your first app, Activities, Testing, debugging and using support libraries,User Interaction, Delightful user experience, Testing your UI.	8
Pedagogy	**Mini Project**	
2	Background Tasks, Triggering, scheduling and optimizing background tasks.Permissions, Performance and Security, Firebase and AdMob, Publish.All about data, Preferences and Settings, Storing data using SQLite, Sharing data with content providers, Loading data using Loaders	**8**
Pedagogy	**Mini Project**	
3	Features of Flutter- Advantages of Flutter- Disadvantages of Flutter. Flutter Installation- Installation in Windows- Installation in Mac OS- Creating Simple Application in Android Studio - Architecture of Flutter Applications.Widgets- Gestures- Concept of State- Layers- Introduction to Dart Programming-Variables and Data types.State management with bloc Cubit vs bloc- when to use Form validation using bloc Multiple blocs in an app,Bloclistener and BlocConsumer,Implementing global state management (theme switching, authentication state)	**8**
Pedagogy	**Mini Project**	
4	Decision Making and Loops. Functions- Object Oriented Programming.Introduction to Widgets- Widget Build Visualization.Type of Layout Widgets- Single Child Widgets- Multiple Child Widgets,stateless,stateful widget - Advanced Layout Application-Introduction to Gestures- Statement Management in Flutter. Ephemeral State Management-Application State - scoped model- Navigation and Routing.	**8**
Pedagogy	**Mini Project**	
5	Introduction to Animation Based Classes-Work flow of the Flutter Animation- Working Application- Android Specific Code on Flutter- Introduction to Package- Types of Packages- Using a Dart Package- Develop a Flutter Plugin Package- Accessing Rest API- Basic Concepts- Accessing Product service API.widget Sets- Flutter Development with Visual Studio Code- Dart DevTools- Flutter SDK	**8**
Pedagogy	Mini Project	

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017.https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals-course-concepts/details (Download pdf file from the above link)
2	Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014.

3	J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition,Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580
4	Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition,O'Reilly SPD Publishers, 2015.
5	Anubhav Pradhan, Anil V Deshpande, " Composing Mobile Apps" using Android,Wiley 2014, ISBN: 978-81-265-4660-2015.
6	Beginning Flutter: A Hands-On Guide to App Development,Marco L. Napoli,Wiley-2015.
7	Programming Flutter: Native, Cross-Platform Apps the Easy Way,Carmine Zaccagnino, Pragmatic Bookshelf
8	Flutter Cookbook,Simone Alessandria, Brian Kayfitz,Packt Publishing
9	Dart Apprentice (for Dart basics),Razeware LLC (RayWenderlich.com)

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Describe how to configure the Android development environment and understand the basic techniques for testing and debugging Android applications.	**Understand**	**L1,L2**
CO2	Apply front-end development techniques to build user interfaces that adapt seamlessly to different devices and resolutions	**Apply**	**L3**
CO3	Examine performance bottlenecks in Android apps and assess the implications of permission models and security features.	**Analyze**	**L4**
CO4	Assess the effectiveness of various data storage, sharing, and retrieval techniques in Android applications.	**Evaluate**	**L5**
CO5	Create cross-device user interfaces using adaptive and responsive design principles to ensure optimal user experience.	**Implement**	**L6**

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory		
	Continuous Assessment Tests		Alternative Assessment Tool (AAT)
	Test-1	Test-2	
	50 Marks	50 Marks	40 Marks
Remember ¤	-	-	-
Understand	10	10	-
Apply	20	20	-
Analyse	20	20	-
Evaluate	-	-	20
Create	-	-	20

CIE Course Assessment Plan

CO's	Marks Distribution							Total Marks	Weightage
	Test-1				Test-2				
	Module-1	Module-2		Module-3	Module-3	Module-4	Module-5		
CO1	1	1	1	1	1	1	1	10	20%
CO2	2	2	2	2	2	2	2	20	40%
CO3	2	2	2	2	2	2	2	20	40%
CO4	-	-		-				-	-
CO5	-	-		-				-	-
Total	-	-		-				50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (100 Marks)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	10	5	10	5	10	40	20%
CO2	20	20	20	20	20	80	40%
CO3	20	20	20	20	20	80	40%
CO4	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-
Total	-	-	-	-	-	200	100%

TECHNICAL SEMINAR

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**IV**				
Course Title	**:**	**Technical Seminar**				
Course Code	**:**	**MMCS403**				
Course Type (Theory/ Practical/ Integrated)	**:**	**SEM**				
Category	**:**	**SEM**				
Stream	**:**	**MCA**		**CIE**	**:**	100 Marks
Teaching hours/ week (L:T:P:S)	**:**	**0:0:0:4**		**SEE**	**:**	-
Total Hours	**:**	**-**		**SEE Duration**	**:**	-
Credits	**:**	**2**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To enhance practical skills such as problem-solving, analysis, critical thinking, and application of technical knowledge.
2	To encourage professional growth and awareness of current trends
3	To prepare participants for future career opportunities by exposing them to industry-relevant topics and skills.
4	To understand specific technical concepts, theories, or methodologies relevant to the seminar topic.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.

- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

Scheme of Teaching and Examinations for MCA Programme -2025-26

DSATM

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

Technical Seminar

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** the activities Covered by Software Project Management	**Apply**	**L3**
CO2	**Apply** the practices and methods for successful software project management	**Analyse**	**L4**
CO3	**Analyze** the techniques for requirements, policies and decision-making for effective resource	**Design**	**L5**
CO4	**Evaluate** a framework for software project management plan for activities, risk, monitoring and control	**Evaluate**	**L6**

Each candidate should undertake a **Technical Seminar** as per the scheme of teaching and examination.

The student should select a topic from the relevant domain and prepare a **technical paper** based on the chosen topic. The work shall be carried out in three phases with presentations in each phase.

The Head of the Department shall make necessary arrangements for conducting the presentations through the concerned faculty members of the Department. A committee constituted by the Head of the Department shall evaluate the work and award the Continuous Internal Evaluation (CIE) marks. The committee shall consist of **three faculty members of the Department and the Head of the Department as Chairperson**.

The student shall complete the technical paper in the following **three phases**:

Phase 1: Synopsis Presentation

- Selection of research topic
- Identification of problem statement
- Objectives, scope, and relevance of the study
- Preliminary literature survey
- Proposed methodology

Phase 2: Design & Draft Paper Presentation

- Detailed study and analysis of the selected topic
- Preparation of paper structure (Abstract, Introduction, Methodology, Proposed Work, Results)
- Design of framework/model/architecture related to the work
- Submission of first draft of the technical paper

Phase 3: Final Paper Presentation

- Final technical paper with corrections and enhancements
- Implementation/results/case study analysis, wherever applicable
- Conclusion and future scope

All postgraduate students of the program shall mandatorily complete the Technical Paper Presentation and publication. Students are encouraged to choose topics based on emerging technologies, current research trends, and industry-relevant innovations. The technical paper should be published in a Scopus-indexed journal.

Continuous Internal Evaluation (CIE) Marks Distribution:

- **Phase 1: Synopsis Presentation** – 25 Marks
- **Phase 2: Design & Draft Paper Presentation** – 25 Marks
- **Phase 3: Final Paper Presentation** – 25 Marks
- **Research Paper preparation/publication**– 25 Marks
  Total Marks : 100

The Technical seminar shall be considered as a head of passing and shall be considered for the award of the degree. Students who fail to complete any phase or fail to submit the final technical paper shall be declared failed in the course and shall complete the same during the subsequent semester.

INTERNSHIP

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**III**				
Course Title	:	**Research/Industry/Startup Internship**				
Course Code	:	**MMCI404**				
Course Type (Theory/ Practical/ Integrated)	:	**Practical**				
Category	:	**INT**				
Stream	:	**MCA**		**CIE**	:	100 Marks
Teaching hours/ week (L:T:P:S)	:	**0:0:0:25**		**SEE**	:	100 Marks
Total Hours	:	**25 hours (per week)**		**SEE Duration**	:	3 Hrs
Credits	:	**9**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To gain in-depth knowledge and understanding of industry-specific practices, tools, and technologies.
2	Acquire familiarity with industry-standard software, methodologies, and best practices relevant to their field
3	Understand potential career paths and gain insights into the professional opportunities available in their field of study

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.

- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

INTERNSHIP

The Internship shall be carried out in any industry/ R & D Organization / Business Organization / Research Institute / Institute of national and international repute Business Organization / recognized national and International Professional Bodies , Societies or Organizations

- The department shall nominate a faculty member to facilitate , guide , and supervise students under internship
- The students shall report the progress of the internship to the Internal guide at regular intervals and seek his/her advice
- The internship shall be completed during the period specified in the Scheme of Teaching and Examination
- After completion of the internship, students shall submit a report to the Head of the Department with the approval of both internal and external Guides
- There shall be 100 marks for CIE and Shall be evaluated by the Internal Panel
- The students are permitted to carry out the Internship anywhere in India or Abroad. The University/College will not provide any kind of Financial Assistance to any student for an internship
- **Industry Internship:** The main objective of the industry internship is to ensure that the intern is exposed to a real-world environment and gain practical experience. Often, it may be a practical exposure to the theory that has been learned during the academic period. The industry internship helps students understand of analytical concepts and tools, hone their skills in real-life situations, and build confidence in applying the skills learned.
- **Research Internship**: A research internship is an opportunity for students or early career professionals to gain hands-on experience in conducting research under the guidance of a mentor or within a research team. These internships can take place in academic institutions, research organizations, government agencies, or private companies

- **Research /Industry Internship:** In the third-semester Students have to be in touch with a guide/mentor/coordinator and regularly submit the report referred to the progress internship. Based on the progress report the Guide/Mentor/coordinator has to enter the CIE marks. he/she has to attend the SEE at the parent Institute.

Continuous Internal Evaluation

CIE marks for the Internship report and Presentation shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the HOD acting as the Chairperson.

Semester End Examination

SEE marks for the internship (100 Marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the external examiners

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Demonstrate and understanding of the workplace environment, culture, and professional practices.	L1/L2	U/R
CO2	Apply theoretical knowledge and skills to practical tasks in a professional setting.	L3	A
CO3	Analyze problems and challenges encountered during the internship and propose solutions.	L4	AN
CO4	Evaluate their performance and the effectiveness of their contributions in the workplace.	L5	C
CO5	Develop a project plan for a new initiative that addresses a specific need identified during their internship.	L6	E

RUBRICS FOR INDUSTRY INTERNSHIP (CIE)

Review 1

TO BE EVALUATED BY THE INTERNAL COMMITTEE for 25 Marks

A committee shall be constituted comprising the Head of the concerned Department (or the HoD's nominee) and three faculty members, including one from the parent department, the project guide, and one faculty member from another department

Performance Indicator	Maximum Marks	HIGH	MODERATE	LOW
Industry Internship daily report (PO 9)	10	The diary is exceptionally detailed, well-organized, and comprehensive. Entries are consistently on time, with complete details of the industry internship, clear documentation of tasks, and use of relevant evidence (e.g., visuals, charts). (7-10)	The diary is adequately detailed but may lack consistency. Details of the industry internship and documentation are present but somewhat incomplete. Evidence is limited. (4-6)	The diary is missing significant content, disorganized, and poorly written. Details of the internships are absent or irrelevant, with no evidence provided. (0-3)
Deliverables and Outcomes (PO 3, PO4 & PO 5)	10	Deliverables exceed expectations and provide significant value. (7-10)	Deliverables are completed but with limited impact or quality. (4-6)	Fails to deliver tasks or creates no measurable outcomes. (0-3)
Presentation Skills (PO 9)	05	Contents of the presentations are appropriate and well delivered. (4-5)	Contents of the presentations are appropriate but not well delivered. (2-3)	Contents of the presentations are not appropriate and not well delivered. (0-1)

RUBRICS FOR INDUSTRY INTERNSHIP (CIE)

Review 1

TO BE EVALUATED BY THE EXTERNAL GUIDE for 25 Marks

***** Institute has to make an arrangement to send a mail to the external guide and to obtain the marks. Required to keep the mail copy received from the External guide.**

Performance Indicator	Maximum Marks	HIGH	MODERATE	LOW
Technical Knowledge (PO 1 & PO 2)	10	Demonstrates in-depth understanding and exceeds expectations. (7-10)	Demonstrates adequate knowledge but requires moderate guidance. (4-6)	Lacks understanding and fails to contribute meaningfully. (0-3)
Work Ethics (PO 7)	05	Consistently exceeds expectations in punctuality, reliability, and professionalism. (4-5)	Occasionally falls short of expectations in punctuality or reliability. (2-3)	Consistently fails to demonstrate professionalism or reliability. (0-1)
Deliverables and Outcomes (PO 3, PO4 & PO 5)	05	Deliverables exceed expectations and provide significant value. (4-5)	Deliverables are completed but with limited impact or quality. (2-3)	Fails to deliver tasks or creates no measurable outcomes. (0-1)

RUBRICS FOR RESEARCH INTERNSHIP (CIE)

Review 1

TO BE EVALUATED BY THE INTERNAL COMMITTEE for 25 Marks

A committee shall be constituted comprising the Head of the concerned Department (or the HoD's nominee) and three faculty members, including one from the parent department, the project guide, and one faculty member from another department

Performance Indicator	Maximum Marks	HIGH	MODERATE	LOW
Literature Survey & Relevance to Present Context (PO 2 & PO 4)	5	An extensive literature survey was conducted and collected good information about the existing system. (4-5)	A moderate literature survey was made and some basic information about the existing system was collected. (2-3)	Inadequate literature survey was made and not basic information about the existing system was collected. (0-1)
Problem Identification and Objectives (PO 1 and PO 2)	5	Detailed and extensive explanation of the purpose of the Project. Objectives are clear, specific, measurable, and aligned with the project's purpose. They effectively guide the project's direction. (4-5)	Brief explanation of the purpose of the project. Objectives are somewhat clear and relevant but may lack specificity, measurability, or full alignment with the project's purpose. (2-3)	Problem Identification is not clear. Objectives are vague, lack focus, or do not align well with the project's purpose. They fail to provide a clear direction. (0-1)
Implementation (Theoretical analysis/ Experimental observations/ Fabrication / Testing) (PO 1, PO 2, PO 3, PO 4, PO 5 & PO 10)	5	Implementation methodology of each of the objectives are very well defined. Well planned methodology. (4-5)	Implementation methodology of each of the objectives are moderately done. Moderately planned methodology. (2-3)	The defined objectives are not implemented properly. Poor planning was observed. (0-1)

Research Internship daily report (PO 9)	10	The diary is exceptionally detailed, well-organized, and comprehensive. Entries are consistently on time, with complete details of the research internship, clear documentation of tasks, and use of relevant evidence (e.g., visuals, charts). (7-10)	The diary is adequately detailed but may lack consistency. Details of the research internship and documentation are present but somewhat incomplete. Evidence is limited. (4-6)	The diary is missing significant content, disorganized, and poorly written. Details of the research internships are absent or irrelevant, with no evidence provided. (0-3)

RUBRICS FOR RESEARCH INTERNSHIP (CIE)

Review 1

TO BE EVALUATED BY THE EXTERNAL GUIDE for 25 marks

***** Institute has to make an arrangement to send a mail to the external guide and to obtain the marks. Required to keep the mail copy received from the External guide.**

Performance Indicator	Maximum Marks	HIGH	MODERATE	LOW
Literature Survey & Relevance to Present Context (PO 2 & PO 4)	5	An extensive literature survey was conducted and collected good information about the existing system. (4-5)	A moderate literature survey was made and some basic information about the existing system was collected. (2-3)	Inadequate literature survey was made and not basic information about the existing system was collected. (0-1)
Problem Identification (PO 2)	5	Detailed and extensive explanation of the purpose of the Project. (4-5)	Brief explanation of the purpose of the project. (2-3)	Problem Identificationis not clear. (0-1)
Objectives (PO 1)	5	Objectives are clear, specific, measurable, and aligned with the project's purpose. They effectively guide the project's direction.	Objectives are somewhat clear and relevant but may lack specificity, measurability, or full alignment with the project's purpose.	Objectives are vague, lack focus, or do not align well with the project's purpose. They fail to provide a clear direction.

		(4-5)	(2-3)	(0-1)
Implementation (Theoretical analysis/ Experimental observations/ Fabrication / Testing) (PO 1, PO 2, PO 3, PO 4, PO 5 & PO 10)	10	Implementation methodology of each of the objectives are very well defined. Well planned methodology. (7-10)	Implementation methodology of each of the objectives are moderately done. Moderately planned methodology. (4-6)	The defined objectives are not implemented properly. Poor planning was observed. (0-3)

RUBRICS FOR SKILL ENHANCEMENT TRAINING (CIE)

Review 1

TO BE EVALUATED BY THE INTERNAL COMMITTEE for 50 Marks

A committee shall be constituted comprising the Head of the concerned Department (or the HoD's nominee) and three faculty members, including one from the parent department, the project guide, and one faculty member from another department

Performance Indicator	Maximum Marks	HIGH	MODERATE	LOW
Conceptual Understanding (PO 1)	10	Demonstrates strong conceptual clarity; explains and applies concepts independently	Basic understanding; able to explain with some support	Limited understanding; unable to explain concepts clearly
Application in Real-World Context (PO 2)	5	Effectively applies knowledge to real-world/industry scenarios independently	Applies knowledge to familiar problems with guidance	Unable to apply knowledge in practical situations

Use of Tools & Technologies (PO 5)	5	Uses tools/technologies efficiently and appropriately without assistance	Uses tools with basic proficiency; occasional errors	Limited or incorrect use of tools
Problem Solving and Practical Skill Competency (PO 2 and PO 3)	10	Solves problems independently with effective practical skills and accuracy	Solves basic problems with guidance; moderate skill level	Struggles to solve problems; lacks practical competency
Industry Readiness & Professionalism (PO 7 and PO 11)	5	Demonstrates professional behavior, responsibility, and adaptability to industry environment	Shows acceptable professionalism with minor gaps	Lacks professional attitude and workplace readiness
Skill Enhancement Training daily report (PO 9)	10	The diary is exceptionally detailed, well-organized, and comprehensive. Entries are consistently on time, with complete details of the research internship, clear documentation of tasks, and use of relevant evidence (e.g., visuals, charts). (4-5)	The diary is adequately detailed but may lack consistency. Details of the research internship and documentation are present but somewhat incomplete. Evidence is limited. (2-3)	The diary is missing significant content, disorganized, and poorly written. Details of the research internships are absent or irrelevant, with no evidence provided. (0-1)
Presentation Skills (PO 9)	5	Contents of the presentations are appropriate and well delivered. (4-5)	Contents of the presentations are appropriate but not well delivered. (2-3)	Contents of the presentations are not appropriate and not well delivered. (0-1)

RUBRICS FOR INDUSTRY INTERNSHIP (CIE)

Review 2

TO BE EVALUATED BY THE INTERNAL COMMITTEE for 50 Marks

A committee shall be constituted comprising the Head of the concerned Department (or the HoD's nominee) and three faculty members, including one from the parent department, the project guide, and one faculty member from another department

Performance Indicator	Maximum Marks	HIGH	MODERATE	LOW
Industry Internship daily report (PO 9)	10	The diary is exceptionally detailed, well-organized, and comprehensive. Entries are consistently on time, with complete details of the industry internship, clear documentation of tasks, and use of relevant evidence (e.g., visuals, charts). (7-10)	The diary is adequately detailed but may lack consistency. Details of the industry internship and documentation are present but somewhat incomplete. Evidence is limited. (4-6)	The diary is missing significant content, disorganized, and poorly written. Details of the internships are absent or irrelevant, with no evidence provided. (0-3)
Deliverables and Outcomes (PO 3, PO4 & PO 5)	10	Deliverables exceed expectations and provide significant value. (7-10)	Deliverables are completed but with limited impact or quality. (4-6)	Fails to deliver tasks or creates no measurable outcomes. (0-3)
Presentation Skills (PO 9)	05	Contents of the presentations are appropriate and well delivered. (4-5)	Contents of the presentations are appropriate but not well delivered. (2-3)	Contents of the presentations are not appropriate and not well delivered. (0-1)
Technical Knowledge (PO 1 & PO 2)	15	Demonstrates in-depth understanding and exceeds expectations. (10-15)	Demonstrates adequate knowledge but requires moderate guidance. (5-9)	Lacks understanding and fails to contribute meaningfully. (0-4)

Ability to learn independently, adapt to new and emerging technologies, and exhibit critical thinking **(PO 11)**	**05**	**Consistently demonstrates independent learning, adapts quickly to new technologies, and applies critical thinking to solve problems. (4-5)**	**Sometimes demonstrates independent learning and adaptability; applies basic critical thinking in familiar contexts. (2-3)**	**Rarely demonstrates independent learning; struggles to adapt or think critically without direct instruction.** **(0-1)**
Individual / Working in a group **(PO 8)**	**05**	**Function effectively as an individual. Collaborates and communicates well in a group situation and integrates the views of others.** **(4-5)**	**Moderately active as an individual and Exchanges some views but requires guidance to collaborate with others.** **(2-3)**	**No individual contribution and Make little or no attempt to collaborate in a group situation.** **(0-1)**

RUBRICS FOR RESEARCH INTERNSHIP (CIE)

Review 2

TO BE EVALUATED BY THE INTERNAL COMMITTEE for 50 Marks

A committee shall be constituted comprising the Head of the concerned Department (or the HoD's nominee) and three faculty members, including one from the parent department, the Research Internship guide, and one faculty member from another department

Performance Indicator	**Maximum Marks**	**HIGH**	**MODERATE**	**LOW**
Research Internship daily report (PO 9)	10	The diary is exceptionally detailed, well-organized, and comprehensive. Entries are consistently on time, with complete details of the research internship, clear documentation of tasks, and use of relevant evidence (e.g., visuals, charts). (7-10)	The diary is adequately detailed but may lack consistency. Details of the research internship and documentation are present but somewhat incomplete. Evidence is limited. (4-6)	The diary is missing significant content, disorganized, and poorly written. Details of the research internships are absent or irrelevant, with no evidence provided. (0-3)
Literature Survey & Relevance to Present Context (PO 2 & PO 4)	05	An extensive literature survey was conducted and collected good information about the existing system. (4-5)	A moderate literature survey was made and some basic information about the existing system was collected. (2-3)	Inadequate literature survey was made and not basic information about the existing system was collected. (0-1)
Problem Identification and Objectives (PO 1 and PO 2)	05	Detailed and extensive explanation of the purpose of the Project. Objectives are clear, specific, measurable, and aligned with the project's purpose. They effectively guide the project's direction (4-5)	Brief explanation of the purpose of the project. Objectives are somewhat clear and relevant but may lack specificity, measurability, or full alignment with the project's purpose. (2-3)	Problem Identification is not clear. Objectives are vague, lack focus, or do not align well with the project's purpose. They fail to provide a clear direction. (0-1)

Implementation (Theoretical analysis/ Experimental observations/ Fabrication / Testing) (PO 1, PO 2, PO 3, PO 4, PO 5 & PO 10)	08	Implementation methodology of each of the objectives are very well defined. Well planned methodology. (6-8)	Implementation methodology of each of the objectives are moderately done. Moderately planned methodology. (3-5)	The defined objectives are not implemented properly. Poor planning was observed. (0-2)
Results, Analysis and Conclusions (PO 4)	07	All the results obtained are well presented and analyzed. The conclusions drawn are justifiable. (5-7)	All the results obtained are moderately presented and analyzed. The conclusions drawn are moderately justifiable. (3-4)	Poor presentation of the results. Analysis of the result was not proper, and conclusions are not valid. (0-2)
Communication / Presentation Skills (PO 9)	05	Communicates clearly, effectively, and appropriately for the audience. (4-5)	Communication is adequate but occasionally unclear or inappropriate. (2-3)	Communication is unclear, incomplete, or inappropriate. (0-1)
Individual / Working in a group (PO 8)	05	Function effectively as an individual. Collaborates and communicates well in a group situation and integrates the views of others. (4-5)	Moderately active as an individual and Exchanges some views but requires guidance to collaborate with others. (2-3)	No individual contribution and Make little or no attempt to collaborate in a group situation. (0-1)
Research Publications (PO 4 & PO 11)	05	Paper published / submitted to an indexed Journal / Conference proceeding. (4-5)	Paper prepared to an indexed Journal / Conference. (2-3)	Not prepared the technical paper itself. (0-1)

RUBRICS FOR SKILL ENHANCEMENT TRAINING (CIE)

Review 2

TO BE EVALUATED BY THE INTERNAL COMMITTEE for 50 Marks

A committee shall be constituted comprising the Head of the concerned Department (or the HoD's nominee) and three faculty members, including one from the parent department, the Skill enhancement training guide, and one faculty member from another department

Performance Indicator	**Maximum Marks**	**HIGH**	**MODERATE**	**LOW**
Skill Enhancement Training daily report (PO 9)	10	The diary is exceptionally detailed, well-organized, and comprehensive. Entries are consistently on time, with complete details of the research internship, clear documentation of tasks, and use of relevant evidence (e.g., visuals, charts). (4-5)	The diary is adequately detailed but may lack consistency. Details of the research internship and documentation are present but somewhat incomplete. Evidence is limited. (2-3)	The diary is missing significant content, disorganized, and poorly written. Details of the research internships are absent or irrelevant, with no evidence provided. (0-1)
Conceptual Understanding (PO 1)	10	Demonstrates strong conceptual clarity; explains and applies concepts independently	Basic understanding; able to explain with some support	Limited understanding; unable to explain concepts clearly
Application in Real-World Context (PO 2)	5	Effectively applies knowledge to real-world/industry scenarios independently	Applies knowledge to familiar problems with guidance	Unable to apply knowledge in practical situations
Use of Tools & Technologies (PO 5)	5	Uses tools/technologies efficiently and appropriately without assistance	Uses tools with basic proficiency; occasional errors	Limited or incorrect use of tools

Problem Solving and Practical Skill Competency (PO 2 and PO 3)	10	Solves problems independently with effective practical skills and accuracy	Solves basic problems with guidance; moderate skill level	Struggles to solve problems; lacks practical competency
Industry Readiness & Professionalism (PO 7 and PO 11)	5	Demonstrates professional behavior, responsibility, and adaptability to industry environment	Shows acceptable professionalism with minor gaps	Lacks professional attitude and workplace readiness
Presentation Skills (PO 9)	5	Contents of the presentations are appropriate and well delivered. (4-5)	Contents of the presentations are appropriate but not well delivered. (2-3)	Contents of the presentations are not appropriate and not well delivered. (0-1)