



ABOUT THE DEPARTMENT

The Department of Artificial Intelligence & Data Science (AI & DS) is recognized as one of the core departments at Arvind Gavali College of Engineering, established in the academic year 2023–24. The department is committed to academic excellence, innovation, and skill-based education to prepare students for the fast-evolving tech landscape.

All faculty members in the department are UGC-approved, ensuring high standards in both teaching and research. Currently, the department boasts a strong and growing student base with 64 students enrolled in the Third Year and 60 students in the Second Year.

At the heart of the department's philosophy are two key pillars: academic rigor and practical exposure. To uphold these, the department actively arranges industrial training programs and field visits, equipping students with real-world experience and preparing them to meet the professional challenges of the future.

In addition to academics, the department promotes holistic development through co-curricular and extracurricular engagement. An active AI & DS Club is established and run by the students to organize a variety of technical and cultural events throughout the year, fostering teamwork, leadership, and creative thinking.

“Nothing is impossible for Artificial Intelligence & Data Science Engineers with Skill-Oriented Knowledge.”

DEPARTMENT VISION

To emerge as a center of excellence in Artificial Intelligence and Data Science, by developing skilled and competent professionals committed to serve the needs of the industry and society.

DEPARTMENT MISSION

M1	To offer quality education in AI and Data Science through a well-designed curriculum, hands-on learning, and industry exposure.
M2	To build professional competencies by promoting interdisciplinary learning, adaptability to emerging technologies and industry collaboration in a supportive academic environment.
M3	To instill ethical values, environmental consciousness, and a strong sense of social responsibility among the students through value-based education.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEOs 1	Apply core concepts of Artificial Intelligence and Data Science to develop practical solutions for real-world problems.
PEOs 2	Pursue successful careers in industry, academia, or entrepreneurship by adapting to evolving technologies.
PEOs 3	Demonstrate ethical responsibility, effective communication, teamwork, and leadership in multidisciplinary environments.



PROGRAM OUTCOMES (POs)

POs 1	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problem
POs 2	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
POs 3	Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
POs 4	Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
POs 5	Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
POs 6	The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
POs 7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
POs 8	Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
POs 9	Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
POs 10	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
POs 11	Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)



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PROGRAM SPECIFIC OUTCOMES (PSO)

PSO 1	Apply principles of Artificial Intelligence, Machine Learning, and Data Science to design and develop intelligent systems.
PSO 2	Develop solutions for societal and industrial challenges using AI & DS technologies while adhering to ethical and legal standards.

MAPPING OF PEOs TO POs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
PEO 1	2	2	2	1	2	1	1	1	1	1	1
PEO 2	1	1	1	1	1	0	0	0	2	1	2
PEO 3	0	1	1	0	0	2	1	2	2	1	1

MAPPING OF PEOs TO PSOs

	PSO 1	PSO 2
PEO 1	2	1
PEO 2	1	2
PEO 3	1	2



A. Definition of Credit:

1 Hr. Lecture (L) per week 1	1 credit
1 Hr. Tutorial (T) per week	1 credit 1
1 Hr. Practical (P) per week	0.5 credits
2 Hours Practical (Lab)/week	1 credit

B. Range of Credits:

A range of credits from 160 to 176 for a student to be eligible to get Undergraduate degree in Engineering. student will be eligible to get Undergraduate degree with Honors 18 credits and/or Minors 14 credits, if he/she completes additional credits.

C. Structure & Definition:

SR.NO.	DEFINATION	CODE
1.	Basic Science Course	BSC
2.	Engineering Science Course	ESC
3.	Program Core Courses	PCC
4.	Program Elective Course	PEC
5.	Multi Disiplinary Minor	MDM
6.	Open Elective	OE
7.	Vocational and Skill Enhancement Course	VSEC
8.	Ability Enhancement Course	AEC
9.	Entrepreneurship /Economics/ Management Courses (Mgt./Economics/Mkt./Finance)	EEM
10.	Indian Knowledge System	IKS
11.	Value Education Course	VEC
12.	Research Methodology (Project)	ECL
13.	Common Egg. Project/Field Project (PBL/Seminar/Mini Project)	
14.	Project	
15.	Internship/OJT (PBL/Seminar/Mini Project/Virtual Internship/Physical)	
16.	Co-curricular Courses	CC



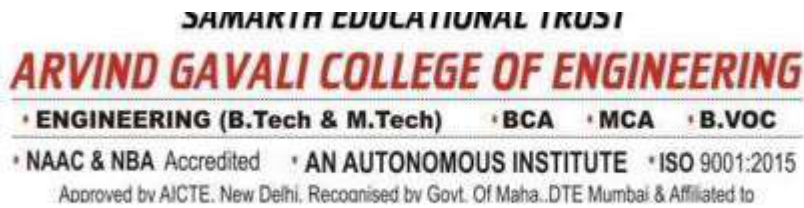
D. Credit Framework:

The minimum and maximum credit structure for different levels under the Four-year Bachelor's UG Program with multiple entry and multiple exit options are as given below:

Level	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	One Year UG Certificate in Engg./ Tech.	40	44	2	1
5.0	Two Years UG Diploma in Engg./ Tech.	80	84	4	2
5.5	Three Years Bachelor's Degree in Vocation (B.Voc.) or B. Sc. (Engg./ Tech.)	120	124	6	3
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech. with Multidisciplinary Minor	160	164	8	4

Credits offered per Semester will be a Minimum 20 and a Maximum 22. While minimum credits are mandatory as per National Credit Framework, the Universities and Autonomous Engineering Colleges can evolve the mechanism for providing Semester/ Level wise credit attainment flexibility within the broad framework.

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F. Semester wise credit distribution: **Class: F.Y**

Semester-I

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	H/W	Cr	Components	Max	Min	
1	BSC	25BSE1101	Engineering Mathematics: Calculus and Algebraic Techniques	3	1	0	4	4	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	BSC	25BSE1001/ 25BSE1002	Engineering Physics/Modern Chemistry	3	0	0	3	3	CA1	15		40
										20		
									CA2	15		
									ESE	50	20	
3	ESC	25BSE1102	Basic Electrical & Electronics Engineering	3	0	0	3	3	CA1	15		40
									MSE	20		
										15		
										50	20	
4	ESC	25BSE1103	C Programming for Problem Solving	2	0	0	2	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
5	AEC	25BSE1104	Communication Skills	2	0	0	2	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
6	BSC	25BSE1001L/25 BSE1002L	Engineering Physics Laboratory / Modern Chemistry Laboratory	0	0	2	2	1	CA1	25		20
									CA2	25		
									OE	--		
7	ESC	25BSE1102L	Basic Electrical & Electronics Engineering Laboratory	0	0	2	2	1	CA1	25		40
									CA2	25		
									OE	50		
8	ESC	25BSE1103L	C Programming for Problem Solving Laboratory	0	0	2	2	1	CA1	25		40
										25		
										50		
9	AEC	25BSE1104L	Communication Skills Laboratory	0	0	2	2	1		25		20
										25		
										--		
10	VSEC	25BSE1105L	Engineering Practice Laboratory	0	0	2	2	1	CA1	25		20
									CA2	25		
									OE	--		
11	CC	25BSE1106L	Yoga	0	0	2	2	1		25		20
										25		
										--		
			Total	13	1	12	26	20		900		
Total Contact Hours –26				Total Credits – 20								



Class: S.Y

Semester-III

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	H/W	Cr	Components	Max	Min	
1.	PCC	25ADS2301	Linear Algebra and Discrete Mathematics	2	1	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
2.	PCC	25ADS2302	Operating System Administration	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
3.	PCC	25ADS2303	Data Structure & Algorithm using C++	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
4.	PCC	25ADS2304	Computer Network	2	1	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
5.	*OE	25OE23XX	OE-I	2	--	--	2	2	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
6.	#MDM	25MMXXX2301	MDM-I	2	--	--	2	2	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
7.	VEC	25VEC2001	Constitution of India	1	--	--	1	1	CA1	25	20	20
									CA2	25		
									ESE	--		
8.	AEC	25AEC2001	Modern Indian Language	1	--	--	1	1	CA1	25	20	20
									CA2	25		
									ESE	-		
9.	VSEC	25ADS2302L	Operating System Administration Laboratory	--	--	2	2	1	CA1	25	20	40
									CA2	25		
									POE	50		
10.	PCCL	25ADS2303L	Data Structures and Algorithm using C++ Laboratory	--	--	2	2	1	CA1	25	20	40
									CA2	25		
									POE	50		
11.	ELC	25ADS2305	FT/Internship/Industrial Tr.	--	--	--		AU	--	--	--	--
Total				16	2	4	22	20		900		

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Open Elective Course-I (OE-I):

Sr. No.	Course Code	Course Name
1.	25OE2301	Enhancing Soft Skill and Personality
2.	25OE2302	Ethics in Engineering Practices
3.	25OE2303	Introduction to Project Management



Class: S.Y

Semester-IV

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	H/W	Cr	Components	Max	Min	
1	PCC	25ADS2401	Probability & Statistics	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	PCC	25ADS2402	Data Engineering and Analysis	2	--	--	2	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3	PCC	25ADS2403	Database Systems	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
4	PCC	25ADS2404	Advanced Data Structure	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
5.	*OE	25OE24XX	OE-II	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
6.	#MDM	25MMXXX2401	MDM – II	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
7.	VEC	25VEC2002	Universal Human Values	1	--	--	1	1	CA1	25		20
									CA2	25		
									ESE	--	20	
8.	PCCL	25ADS2402L	DE&A Laboratory	--	--	2	2	1	CA1	25		20
									CA2	25		
									POE	50	20	
9.	ECL	25ADS2403L	Database Systems Laboratory (PBL)	--	--	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
10.	VSEC	25ADS2404L	Advanced Data Structure Lab	--	--	2	2	1	CA1	25		40
									CA2	25		
									POE	50	20	
Total				18	0	6	24	21		950		

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Open Elective Course-II (OE-II):

Sr. No.	Course Code	Course Name
1.	25OE2401	Business Communication
2.	25OE2402	E-Business
3.	25OE2403	Intellectual Property Rights



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Class: T.Y

Semester-V

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	H/W	Cr	Components	Ma	Min	
1	PCC	25ADS3501	Software Engineering	2	1	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
2	PCC	25ADS3502	Artificial Intelligence and Machine Learning	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
3	PCC	25ADS3503	Time Series Forecasting	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
4	PEC	25PEADS35XX	PEC-1	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
5	*OE	25OE35XX	OE-III	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
6.	#MDM	25MMXXX3501	MDM-III	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
7.	PCCL	25ADS3502L	AIML Laboratory	--	--	2	2	1	CA1	25	20	40
									CA2	25		
									POE	50		
8.	VSEC	25ADS3504L	Object Oriented Programming in Java	--	--	2	2	1	CA1	25	20	40
									CA2	25		
									POE	50		
9.	ELC	25ADS3505P	Community Engagement Mini-Project	--	--	2	2	1	CA1	25	20	40
									CA2	25		
									OE	50		
10.	ELC	25ADS3506	FT/Internship/Industri Tr.	--	--	--	--	AU	--	--	--	--
Total				17	1	6	24	21		900		

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Open Elective Course-III (OE-III):

Sr. No.	Course Code	Course Name
1.	25OE2501	Employability & Skill Development
2.	25OE2502	Business fundamentals for entrepreneur
3.	25OE2503	Patent law for engineers and scientists

PROGRAM ELECTIVE COURSE-I (PEC-I):

Sr. No.	Course Code	Course Name
1.	25PEADS3501	Federated Learning
2.	25PEADS3502	Data Science Optimization
3.	25PEADS3503	Augmented Reality -Virtual Reality



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Class: T.Y

Semester-VI

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme				
				L	T	P	H/W	Cr	Components		Max	Min for Passing	
1	PCC	25ADS3601	Cloud Computing	2	--	--	2	2	CA1	15	20	40	
									MSE	20			
									CA2	15			
									ESE	50			
2	PCC	25ADS3602	Natural Language Processing	3	--	--	3	3	CA1	15	20	40	
									MSE	20			
									CA2	15			
									ESE	50			
3	PCC	25ADS3603	Deep Learning	3	--	--	3	3	CA1	15	20	40	
									MSE	20			
									CA2	15			
									ESE	50			
4	PEC	25PEADS36XX	PEC-II	3	--	--	3	3	CA1	15	20	40	
									MSE	20			
									CA2	15			
									ESE	50			
5	PEC	25PEADS36XX	PEC-III	2	--	--	2	2	CA1	15	20		
									MSE	20			
									CA2	15			
									ESE	50			
6	#MDM	25MMXXX3601	MDM-IV	3	--	--	3	3	CA1	15	20	40	
									MSE	20			
									CA2	15			
									ESE	50			
7.	AEC	25ADS3604	Prompt Engineering	1	1	--	2	2	CA1	25	--	--	
									CA2	25			
									POE	--			
8.	PCCL	25ADS3601L	Cloud Computing Laboratory	--	--	2	2	1	CA1	25	20	40	
									CA2	25			
									POE	50			
9.	PCCL	25ADS3603L	Deep Learning Laboratory	--	--	2	2	1	CA1	25	20	40	
									CA2	25			
									POE	50			
10.	ELC	25ADS3605P	Major-Project-I (Advanced AI Based Project)	--	--	4	4	2	CA1	25	20	40	
									CA2	25			
									OE	50			
Total				17	1	8	26	22			950		

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PROGRAM ELECTIVE COURSE-II (PEC-II):

Sr. No.	Course Code	Course Name
1.	25PEADS3601	Human Computer Interaction
2.	25PEADS3602	Big Data Analytics
3.	25PEADS3603	MLOps

PROGRAM ELECTIVE COURSE-III (PEC-III):

Sr. No.	Course Code	Course Name
1.	25PEADS3604	Cryptography and Network Security
2.	25PEADS3605	Business Intelligence and Data Analytics
3.	25PEADS3606	Sustainable AI



Class: B. Tech

Semester-VII

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	H/W	Cr	Components	Max	Min	
1	PCC	25ADS4701	Generative Artificial Intelligence	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
2	PCC	25ADS4702	Advanced AI	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
3	PCC	25ADS4703	Computer Vision	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
4	PEC	25PEADS47XX	PEC-IV	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
5	PEC	25PEADS47XX	PEC-V	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
6	#MDM	25MMXXX4701	MDM-V	3	--	--	3	3	CA1	15	20	40
									MSE	20		
									CA2	15		
									ESE	50		
7	PCCL	25ADS4701L	GenAI Laboratory		--	2	2	1	CA1	25	20	40
									CA2	25		
									POE	50		
8.	ELC	25ADS4704P	Major Project-II	--	--	4	4	2	CA1	25	20	40
									CA2	25		
									OE	50		
9.	ELC	25ADS4705	FT/Internship/Industri Tr.	--	--	--	--	AU	--	--	--	--
Total				18	--	6	24	21		800		

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PROGRAM ELECTIVE COURSE-II (PEC-II):

Sr. No.	Course Code	Course Name
1.	25PEADS4701	High Performance Computing
2.	25PEADS4702	Social Media Analysis
3.	25PEADS4703	Industrial Internet of Things

PROGRAM ELECTIVE COURSE-III (PEC-III):

Sr. No.	Course Code	Course Name
1.	25PEADS4704	Edge Computing
2.	25PEADS4705	Reinforcement Learning
3.	25PEADS4706	Quantum Computing



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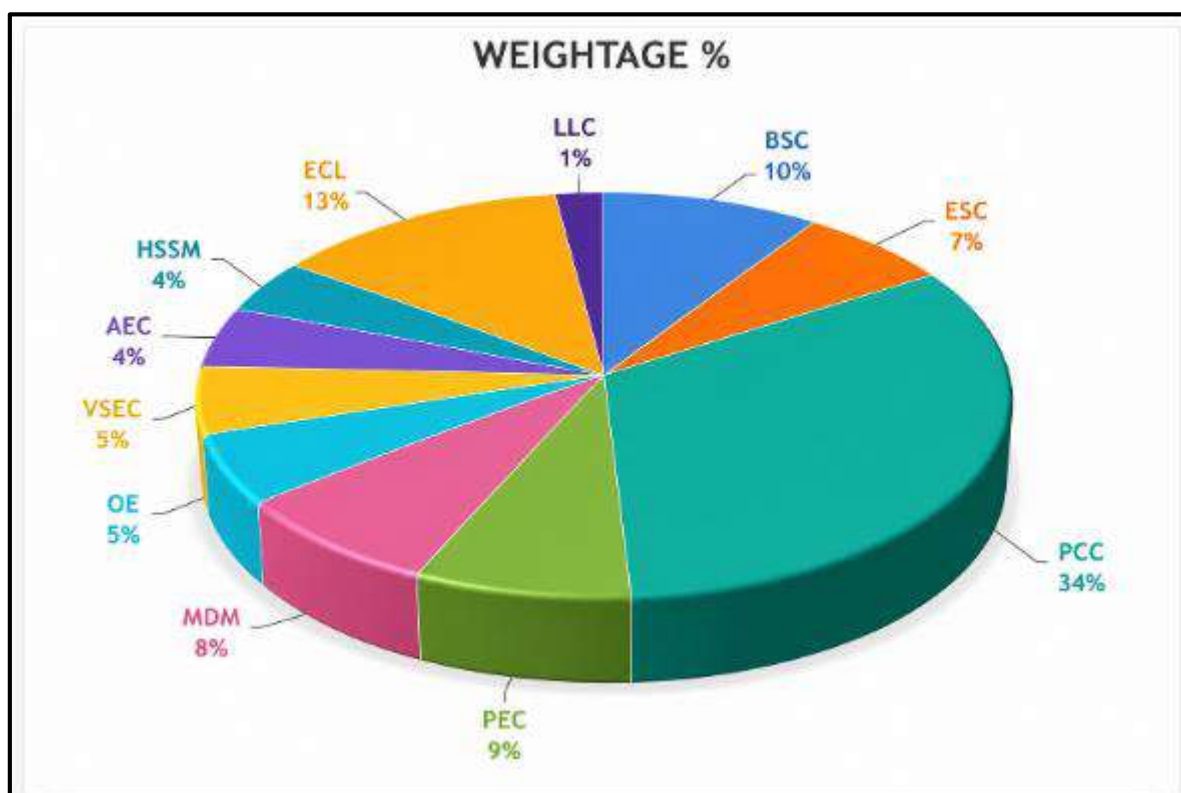
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Class: B. Tech

Semester-VIII

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./ Week	Cr	Components	Max	Min for Passing	
1	HSSM	25HSM4801	Finance Management	3	--	--	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	ELC	25ELC4801	Research Methodology	4	--	--	4	4	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3.	ELC	25ADS4801	Industrial Internship/Research Internship/	--	--	--	30	12	CA	50		40
									OE	50	20	
Total				7	--	--	37	19		300		



*Student must complete a two week internship after the semester, which will be evaluated in the following semester.



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PC: PROGRAM CORE

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25PCC1201	Fundamentals of Industry Evolution	2	--	--	2	2
2.	25ADS2301	Linear Algebra and Discrete Mathematics	3	--	--	3	3
3.	25ADS2302	Operating System Administration	3	--	--	3	3
4.	25ADS2303	Data Structures & Algorithms using C++	3	--	--	3	3
5.	25ADS2304	Computer Network	2	1	--	3	3
6.	25ADS2303L	Data Structures & Algorithms using C++ Laboratory		--	2	2	1
7.	25ADS2401	Probability & Statistics	3	--	--	3	3
8.	25ADS2402	Data Engineering & Data Analytics	2	--	--	2	2
9.	25ADS2403	Database Systems	3	--	--	3	3
10.	25ADS2404	Advanced Data Structure	3	--	--	3	3
11.	25ADS2402L	Data Engineering & Data Analytics Laboratory	-	--	2	2	1
12.	25ADS3501	Software Engineering	3	--	--	3	3
13.	25ADS3502	Artificial Intelligence & Machine Learning	3	--	--	3	3
14.	25ADS3503	Time Series Forecasting	3	--	--	3	3
15.	25ADS3502L	Artificial Intelligence & Machine Learning Laboratory	-	--	2	2	1
16.	25ADS3503L	Object Oriented Programming in JAVA Laboratory	-	--	2	2	1
17.	25ADS3601	Cloud Computing	2	--	--	2	2
18.	25ADS3602	Natural Language Processing	3	--	--	3	3
19.	25ADS3603	Deep Learning	3	--	--	3	3
20.	25ADS3601L	Cloud Computing Laboratory	-	--	2	2	1
21.	25ADS3603L	Deep Learning Laboratory	-	--	2	2	1
22.	25ADS4701	Generative Artificial Intelligence	3	--	--	3	3
23.	25ADS4702	Advanced Artificial Intelligence	3	--	--	3	3
24.	25ADS4703	Computer Vision	3	--	--	3	3
Total			50	--	12	--	57



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PEC: PROGRAM ELECTIVE COURSES

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25PEADS3501	Federated Learning	3	--	--	3	3
2.	25PEADS3502	Data Science Optimization					
3.	25PEADS3503	Augmented Reality -Virtual Reality					
4..	25PEADS3601	Human Computer Interaction	3	--	--	3	3
5.	25PEADS3602	Big Data Analytics					
6.	25PEADS3603	MLOps					
7.	25PEADS3604	Cryptography and Network Security	3	--	--	3	3
8.	25PEADS3605	Business Intelligence and Data Analytics					
9.	25PEADS3606	Sustainable AI					
10.	25PEADS4701	High Performance Computing	3	--	--	3	3
11.	25PEADS4702	Social Media Analysis					
12.	25PEADS4703	Industrial Internet of Things					
13.	25PEADS4704	Edge Computing	3	--	--	3	3
14.	25PEADS4705	Reinforcement Learning					
15.	25PEADS4706	Quantum Computing					
Total			15	--	--	--	--



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OEC: OPEN ELECTIVE COURSES							
Sr. No.	Course Code	Course Name	L	T	P	H/ W	Credits
1.	25OE2301	Enhancing Soft Skill and Personality	2	--	--	2	2
2.	25OE2302	Ethics in Engineering Practices					
3.	25OE2303	Introduction to Project Management					
4.	25OE2401	Business Communication	3	--	--	3	3
5.	25OE2402	E-Business					
6.	25OE2403	Intellectual Property					
5.	25OE2501	Employability & Skill Development	3	--	--	3	3
6.	25OE2502	Business Fundamentals for Entrepreneur					
7.	25OE2503	Patent Law for Engineers					
Total			8	--	--	8	8



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VSEC: VOCATIONAL AND SKILL ENHANCEMENT COURSES

Sr. No.	Course Code	Course Name	L	T	P	Hrs./ Week	Credits
1.	25ADS2305L	Object Oriented Programming with Java Laboratory	1	--	2	3	2
2.	25ADS2306L	Prompt Engineering Laboratory	--	--	2	2	1
3.	25ADS2405L	Web Development Laboratory	1	--	2	3	2
Total			2	--	6	8	5

HUMANITIES SOCIAL SCIENCE AND MANAGEMENT COURSES

Sr. No.	Course Code	Course Name	L	T	P	Hrs./ Week	Credits
1.	25BSE1104	Communication Skills	1	--	2	3	3
2.	25BSE1205	Ecology, Energy & Environment	2	--	--	2	2
3	25HS2401	Financial Management	1	--	--	1	1
4.	25VEC2001	Constitution of India	1	--	--	1	1
5	25VEC2002	Universal Human Values	1	--	--	1	1
6	25AEC2302	Modern Indian Language	1	--	--	1	1
Total			7	--	2	9	9



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EXPERIENTIAL LEARNING

Sr. No.	Course Code	Course Name	L	T	P	H / W	Credits
1.	25ADS2403L	Project Based Learning (DBMS)	--	--	2	2	1
2.	25ADS3505P	Mini Project	--	--	2	2	1
3	25ADS3605P	Major Project-I	--	--	4	4	2
4.	25ADS4704P	Major Project-II	--	--	4	4	2
5	25ADS4803P	Industrial Internship/Research Internship	--	--	--	30	12
Total			--	--	--	--	18



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Multi-Disciplinary Minor: MDM Courses to be offered by AI & DS Department								
Sr. No.	Course Code	Semester	Course Name	L	T	P	H/ W	Credits
1.	25MMADS2301	III	Statistics for Engineers	3	--	--	3	3
2.	25MMADS2401	IV	Data Analytics & Visualization	2	--	--	2	2
3.	25MMADS3501	V	Fundamentals of Artificial Intelligence	3	--	--	3	3
4.	25MMADS3601	VI	Machine Learning & Algorithms	3	--	--	3	3
5.	25MMADS4701	VII	Prompt Engineering	3				3
Total				14	--	--	14	14

Multi-Disiplinary Minor: MDM Course offered by CSE Department (Minor Machine Learning & Data Science)							
Sr. No.	Course Code	Course Name	L	T	P	H/ W	Credits
1.	25MMCSE2301	Data Structure and Algorithms	2			2	2
2.	25MMCSE2401	Mastering Object-Oriented Programming	2		2	3	3
3.	25MMCSE3501	Database engineering & Distributed System	2	1		3	3
4.	25MMCSE3601	Machine Learning & Its Applications	2		2	3	3
5.	25MMCSE4701	Deep Learning and Applied Generative AI	2	1		3	3
Total			10	2	4	14	14



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Multi-Disiplinary Minor: MDM Course offered by E&TC Department (Minor in IOT & Its Application)

Sr. No.	Course Code	Course Name	L	T	P	H/ W	Credits
1.	25MMETC2301	Digital Electronics & Microprocessor	3	--	--	3	3
2.	25MMETC2401	Fundamentals of Embedded Systems	3	--	--	2	3
3.	25MMETC3501	Microcontrollers & Interfacing	2	--	2	3	3
4.	25MMETC3601	IOT Architectures & Protocols	2	--	--	2	2
5.	25MMETC4701	IOT Application Development Using Cloud and AI	3	--	--	3	3
Total			12	--	1	14	14

Multi-Disiplinary Minor: MDM Course offered by ELE Department (Minor in Electric Vehicle Technology)

Sr. No.	Course Code	Course Name	L	T	P	H/ W	Credits
1.	25MMEEE2301	Fundamental of Electric Vehicles	3	--	--	3	3
2.	25MMEEE2401	Embedded System for EV	3	--	--	3	3
3.	25MMEEE3501	AI & IOT in Electric Vehicles	3	--	--	3	3
4.	25MMEEE3601	Autonomous & EV Technology	2	--	--	2	2
5.	25MMEEE4701	Emerging Trends in EV	3	--	--	3	3
Total			14	--	--	14	14



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Multi-Disiplinary Minor: MDM Course offered by E&C Department (Minor in Full Stack Development)

Sr. No.	Course Code	Course Name	L	T	P	H/ W	Credits
1.	25MMECE2301	Introduction to web Development	2	--	--	3	2
2.	25MMECE2401	Front End development React JS	2	--	2	2	3
3.	25MMECE3501	Backend Development with Node Js & express JS	2	--	2	3	3
4.	25MMECE3601	Database Management with MongoDB	3	--	--	3	3
5.	25MMECE4701	Cloud Deployment for MERN Application	2	--	2	3	3
Total			11	--	--	14	14

Multi-Disiplinary Minor: MDM Course offered by MECH Department (Minor in Mechatronics)

Sr. No.	Course Code	Course Name	L	T	P	H/ W	Credits
1.	25MMMEC2301	Introduction of Mechatronics	2	--	--	2	2
2.	25MMMEC2401	Design of Mechatronics	2	--	1	3	3
3.	25MMMEC3501	Sensor technology	3	--	--	3	3
4.	25MMMEC3601	Mechatronics in Automotive System	3	--	--	3	3
5.	25MMMEC4701	Industrial Automation	3	--	--	3	3
Total			14	--	--	14	14



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EXIT COURSE AFTER FIRST YEAR: ONE YEAR UG CERTIFICATION IN ARTIFICIAL INTELLIGENCE

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hr./W	Cr	Components		Max	Min for Passing
1	VSEC	25ADSEX101	Operating System & Administration Laboratory	--	--	4	4	2	CA1	25	--	--
									MSE	--		
									CA2	25		
									ESE	--		
2	VSEC	25ADSEX102	Database System Laboratory	--	--	4	4	2	CA1	25	--	--
									MSE	--		
									CA2	25		
									ESE	--		
3	ELC	25ADSEX103	Internship	--	--	8	8	4	CA1	25	--	--
									CA2	25		
									OE	--		
Total				--	--	16	16	8		150		

EXIT COURSE AFTER SECOND YEAR: TWO YEAR UG DIPLOMA IN ARTIFICIAL INTELLIGENCE

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./W	Cr	Components		Max	Min for Passing
1	VSEC	25ADSEX201	Object Oriented Programming in Java	--	--	4	4	2	CA1	25	--	--
									MSE	--		
									CA2	25		
									POE	--	--	
2	PCCL	25ADSEX202	Prompt Engineering	--	--	4	4	2	CA1	25	--	--
									MSE	--		
									CA2	25		
									ESE	--	--	
3	ELC	25ADSEX203	Internship	--	--	8	8	4	CA1	25	--	--
									CA1	25	--	
										--		
Total				--	--	16	16	8		150		

EXIT COURSE AFTER THIRD YEAR: THIRD YEAR BACHELOR'S DEGREE IN VOCATION (B.VOC) IN AI

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./W	Cr	Components		Max	Min for Passing
1	PPCL	25ADSEX301	Advanced Artificial Intelligence Laboratory	--	--	4	4	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	ELC	25ADSEX302	Mejor-Project	--	--	4	4	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3	ELC	25ADSEX303	Internship	--	--	8	8	4	CA	50		40
									OE	50		
Total				--	--	16	16	8		300		



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Emerging Minor Degree: Minor in Financial Data Science

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25ADSEM001	Fundamentals of Finance and Financial Markets	3	--	--	3	3
2.	25ADSEM002	Financial Mathematics and Statistics	3	--	--	3	3
3.	25ADSEM003	Data Analytics for Finance	3	--	--	3	3
4.	25ADSEM004	Financial Data Visualization and Business Intelligence	3	--	--	3	3
5.	25ADSEM005	Machine Learning for Financial Applications	3	--	--	3	3
6.	25ADSEM006	Financial Forecasting and Risk Analytics	3	--	--	3	3
Total			18	--	--	18	18

Honors Structure: Honors in Generative AI

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25ADSHS001001	Advanced Generative Models	3	--	--	3	3
2.	25ADSHS001002	Large Language Models	3	--	--	3	3
3.	25ADSHS001003	Prompt Engineering & RAG	3	--	--	3	3
4.	25ADSHS001004	Multimodal & Cross Model GenAI	3	--	--	3	3
5.	25ADSHS001005	GenAI Systems MLOps and Deployment	3	--	--	3	3
6.	25ADSHS001006	AI Agents and Autonomous Systems	3	--	--	3	3
Total			18	--	--	18	18

Title of the Course: Linear Algebra and Discrete Mathematics Course Code: 25ADS2301	L	T	P	Credit
	2	1	-	3

Course Pre-Requisite:

1. Basic knowledge of mathematics
2. Logical reasoning and analytical skills

Course Description: This course introduces the fundamental mathematical concepts required in Artificial Intelligence and Data Science. The course covers vector algebra, matrices, linear transformations, spectral concepts, mathematical logic, set theory, relations, functions, algebraic structures, and graph theory. Students will learn mathematical techniques used in data representation, optimization, reasoning, and computational problem solving. The course emphasizes conceptual understanding and applications relevant to AI, machine learning, data analysis, and computer science.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Apply vector and matrix methods to solve linear algebra problems.
CO2	Analyze linear transformations, orthogonality, and spectral concepts.
CO3	Apply logical reasoning using propositional and predicate logic.
CO4	Use sets, relations, functions, and induction in problem solving.
CO5	Apply algebraic structures and graph theory concepts in computational problems.

CO-PO Mapping:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	3	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2	2
CO4	3	2	2	2	1	-	-	-	-	-	-	2	2
CO5	3	3	3	3	3	1	-	-	1	1	-	2	2

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 30%, 20% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1	Vector Algebra and Matrices Vectors,vector spaces, subspaces, linear combination,span, linear independence, basis, dimension, inner product space, normed vector space, orthogonality, Matrices:Special matrices, partitioned matrices, inner and outer products, matrix norms, condition numbers, systems of linear equations, LU decomposition, Gauss-Jacobi, Gauss-Seidel methods.	10
2	Linear Transformations and Spectral Theory Linear transformations, geometric transformations, matrix representation of linear transformations, composition and inverse of transformations.Kernel, range, rank, nullity,Rank–Nullity Theorem,Gram–Schmidt process, eigenvalues, eigenvectors, orthogonal diagonalization,positive definite matrices, quadratic forms, maxima, minima and saddle points.	09

3	Mathematical Logic and Reasoning Propositions, truth values, logical connectives, truth tables, precedence of operators.,Conjunctive Normal Form (CNF), Disjunctive Normal Form (DNF),Predicates, quantifiers, nested quantifiers, negation, translating English Statements into logic, rules of inference,validity of arguments,, resolution method, consistency of premises, indirect proof, fallacies.	10
4.	Sets, Relations and Functions Sets, types of sets, cardinality, Venn diagrams, Set operations, Cartesian product, binary relations, properties, representation of relations, equivalence relations and equivalence classes, partitions of sets, partial ordering, POSET, Hasse diagrams, functions, types of functions,composition of functions,inverse functions, sum and product of functions, Examples.	9
5.	Algebraic Structures and Graph Theory Binary operations, closure, associativity, identity, inverse, semigroups and monoids,homomorphism,congruence relation, quotient structures, graphs,subgraphs, isomorphism, degree of vertices, walks, paths, circuits, connectedness,components.eulerian graphs, hamiltonian paths and circuits,graph coloring	7

Text Books	
Sr. No	Title
1	Linear Algebra and Its Applications - by Gilbert Strang, 4th Edition, Thomson Brooks/Cole
2	Linear Algebra, 4th Ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2004,Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence,
3.	Discrete Mathematical Structures with Application to Computer Science- J. P. Tremblay & R. Manohar (MGH International).
4.	Discrete Mathematics and its Applications- Kenneth H. Rosen (AT&T Bell Laboratories)
5.	Elements of Discrete Mathematics, 2nd Ed., C. L. Liu, Tata McGraw-Hill, 2000.
6.	Discrete Mathematics, Norman L. Biggs, Seymour Lipschutz, Marc Lipson, Oxford University Press, Schaum's Outline Series, 2nd Edition

Reference Books	
1	Numerical Linear Algebra, Allaire, Grégoire, Kaber, Sidi Mahmoud, Springer (2008)
2	Applied Numerical Linear Algebra, by James W. Demmel, SIAM (1997)
1.	J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Ed., Jones and Bartlett, 2010.
2.	V. K. Balakrishnan, Schaum's Outline of Graph Theory, McGraw-Hill Education, 1st Edition, 1997.
3.	Eric Gossett, Discrete Mathematics with Proof, Wiley Publication, 2 nd Edition, 2009.
4.	Dr. Sukhendu Dey, Graph Theory with Applications, SPD Publications, 1st Edition, 2012.

Title of the Course: Operating System Administration	L	T	P	Credit
Course Code: 25ADS2302	3	-	-	3

Course Pre-Requisite:

1. Basic knowledge of Computer Fundamentals,
2. C Programming, Computer Organization,

Course Description:

This course provides a comprehensive understanding of operating system concepts, memory management, deadlocks, file systems, and operating system administration. It covers OS functions, security, process and memory management, virtual memory, file system organization, and deadlock handling techniques. The course also introduces Linux/UNIX administration, shell scripting, user management, system security, networking, storage management, virtualization, cloud basics, backup and recovery, and system performance tuning for practical system administration skills.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand basic Linux/UNIX operating system administration concepts and commands.
CO2	Manage users, groups, file permissions, and system security in Linux environments.
CO3	Develop shell scripts for automation of administrative tasks.
CO4	Perform package management, process monitoring, and storage administration.
CO5	Configure network services, backup systems, virtualization, and optimize system performance.

CO-PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	1	-	-	1	-	1	-	3	1
CO2	3	3	2	1	2	-	-	-	-	-	-	3	2
CO3	3	3	2	2	1	-	-	1	-	-	-	3	2
CO4	3	2	2	2	2	-	-	1	1	-	-	2	2
CO5	3	2	3	2	3	1	-	1	2	1	-	3	2

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 30%, 20% and 50% weightage respectively.

Assessment	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Content

Unit No.	Unit Title and Contents	Hours
1.	Operating Systems overview: Functions, Protection and Security, Distributed Systems, Special-Purpose Systems, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating System Generation.	10
2.	Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing Case Studies - UNIX, Linux, Windows.	9
3.	Principles Of Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock, Resource Allocation Graph (RAG) ,Safe State and Unsafe State ,Distributed Deadlock Handling, Deadlock in Distributed Systems.	7

4.	File System Interface : File Concepts, Access Methods,, Directory Structure, File System Mounting, File Sharing, File Protection, File System Implementation, Disk Scheduling Algorithms and Storage Optimization, File System Consistency and Recovery Techniques, Distributed and Network File Systems RAID Levels and Fault Tolerance Mechanisms, Modern File Systems	7
5.	Operating System Administration: Linux/UNIX Administration Basics, Linux Commands, User and Group Management, File Permissions and Security,Shell,Scripting,Package Management, Process Monitoring and Management, Disk and Storage Administration, Network Administration, Backup and Recovery, Virtualization and Cloud Basics, System Performance Tuning.	9

Text Books

Sr.No	Title
1.	William Stallings, Operating System: Internals and Design Principles, Prentice Hall, ISBN-10:0-13-380591-3, ISBN-13: 978-0-13-380591-8, 8th Edition
2.	UNIX and Linux System Administration Handbook Evi Nemeth Garth Snyder Edition: 5th Edition Publisher: Pearson

Reference Books

1.	Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, WILEY,ISBN 978-1-118-06333-0, 9th Edition
2.	Modern Operating Systems Author: Andrew S. Tanenbaum Edition: 4th Edition Publisher: Pearson
3.	Linux Administration: A Beginner's Guide Author: Wale Soyinka Edition: 8th Edition Publisher: McGraw Hill

Title of the Course: Data Structures & Algorithms Using C++ Course Code: 25ADS2303	L	T	P	Credit
	3	-	-	3

Course Pre-Requisite:

1. Basic programming knowledge
2. Familiarity with functions, sets and basic logic

Course Description:

This course focuses on the organization and management of data using various data structures. It covers arrays, linked lists, stacks, queues, trees, and graphs. Students gain knowledge of algorithm design techniques and complexity analysis. The course improves problem-solving and programming skills. It serves as a foundation for advanced computing subjects.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Analyze and implement searching and sorting algorithms for problem solving.
CO2	Implement fundamental data structures and analyze their performance.
CO3	Implement stack and queue operations using suitable data structures.
CO4	Design and implement linked list operations for different applications.
CO5	Implement tree and graph traversals and related operations.

CO-PO Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	2	-	-	-	-	-	1	3	2
CO2	3	2	1	1	2	-	-	-	-	-	1	3	2
CO3	3	3	2	2	2	-	-	-	-	-	1	3	3
CO4	3	3	2	2	2	-	-	-	-	-	2	3	2
CO5	3	3	3	3	3	-	-	-	2	2	1	3	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 30%, 20% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1.	Searching and Sorting Linear and binary search, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort. Case Study: Student result analysis and ranking system. Activity: Compare execution time of different sorting algorithms.	07
2.	Introduction to Data Structure Introduction to data structures, Types of data structures, Abstract Data Type (ADT), Characteristics of algorithms, Algorithm efficiency and asymptotic notations, Divide and conquer technique, Recursive algorithms, Arrays and basic hashing concepts. Case Study: Data organization in library management systems. Activity: Analyze time complexity of basic operations.	09
3.	Stacks and Queues: Stack as ADT, Queue as ADT, Array and linked implementation, Circular queue and deque, Expression evaluation and conversion Recursion and applications Case Study: CPU scheduling and browser history management. Activity: Implement stack and queue operations using arrays and linked lists.	10
4.	Linked List: Singly linked list, Doubly linked list, Circular linked list, Insertion, deletion, traversal, Dynamic memory management, Garbage collection basics Case Study: Music playlist management system. Activity: Perform insertion, deletion, and traversal operations.	08
5.	Trees and Graphs Tree terminology and representations, Binary trees and traversals, Binary Search Trees, Graph representation, Breadth First Search (BFS), Depth First Search (DFS) Case Study: Social network graph traversal. Activity: Implement BFS and DFS traversal using sample graphs	08

Text Books	
Sr. No	Title
1.	S. Lipschutz, Data Structures, McGraw-Hill Publication, Revised.
2.	E. Horowitz, S. Sahani, Fundamentals of Data Structures, Galgotia Publication, 1st Edition, 1983.

Reference Books	
1.	Alfred V. Aho, John E. Hopcroft, J. D. Ullman, “Data structures and Algorithms”, (Addison-Wesley Series)
2.	Ashok N. Kamthane, “Introduction to Data Structures in C”, Pearson Education.

Title of the Course: Computer Networks Course Code: 25ADS2304	L	T	P	Credit
	2	1	–	3

Course Pre-Requisite:

1. Basic knowledge of computer fundamentals
2. Understanding of digital electronics concepts
3. Familiarity with basic programming concepts
4. Basic understanding of mathematics

Course Description: This course introduces the fundamental concepts of computer networks, data communication, and layered network architecture. It covers transmission media, multiplexing techniques, error detection and correction methods, and encoding schemes. The course also focuses on network addressing, IPv4 and IPv6, subnetting, and routing concepts. Application layer protocols such as HTTP, FTP, DNS, and email protocols are discussed along with network devices and standards. Emphasis is placed on understanding real-world networking operations and protocol functionality.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand basic concepts of computer networks, data communication, and network models.
CO2	Analyze transmission media, multiplexing techniques, and encoding methods.
CO3	Apply error detection and correction techniques in data communication.
CO4	Perform IP addressing, subnetting, and analyze IPv4 and IPv6 networks.
CO5	Explain the working of network protocols, application layer services, and networking devices.

CO-PO Mapping:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	1	-	-	-	-	1	-	2	2
CO2	3	3	-	2	2	-	-	-	-	1	-	3	2
CO3	3	3	2	2	2	-	-	-	-	1	-	2	1
CO4	3	3	2	3	2	-	-	-	-	2	-	2	2
CO5	3	3	2	2	3	-	-	-	2	2	-	2	2

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 30%, 20% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1.	Introduction to Computer Networks - Introduction of Computer Networks, Data communication, networks, Internet, protocols and standards, Network Topologies, Network models: OSI, TCP/IP, analog and digital data	7
2.	Physical Layer & Transmission Media - Physical Layer Topics- Guided and Unguided Media, Errors in Transmission, Analog and Digital Signals, Encoding, Techniques Line and Block Encoding Data Link Layer Topics- Error Detection and Correction Techniques	10
3.	Data Link Layer & Error Control -Functions of Data Link Layer ,Framing,Error Types, Error Detection Techniques:Parity Check, CRC, Checksum, Error Correction Techniques, Flow Control, Ethernet Basics, IEEE Standards	8
4.	Network Layer & Addressing - Logical Addressing, IPv4 and IPv6, Classful and Classless Addressing, Subnetting and Supernetting, Subnet Mask, Address Mapping: ARP, DHCP, BOOTP, Routing Basics ,Introduction to Wireless Networks and Wi-Fi	9
5.	Transport & Application Layer & Networking Devices - Transport Layer Functions, TCP vs UDP, Port Numbers and Sockets, Application Layer Protocols: DNS, HTTP/HTTPS, FTP, SMTP, IMAP, SNMP, WWW & URL, Networking Devices: Hub, Switch, Router, Gateway, Introduction to Cloud and IoT Networking	8

Text Books	
Sr.No	Title
1.	B.A. Forouzan, “Data Communications and Networking”, TMH, ISBN-13: 97800705473645.
2.	A.S. Tanenbaum, “Computer Networks”, Pearson Education, ISBN-8177581651.
3.	A. S. Tanenbaum, "Computer Networks", 5th Edition, PHI 2010

Reference Books	
1.	Behrouz A. Forouzan (2006), Data communication and Networking, 4th Edition, Mc Graw-Hill, India.

Title of the Course: Enhancing Soft Skills and Personality Course Code: 25OE2301	L	T	P	Credit
	2	-	-	2

Course Pre-Requisite:

1. Basic communication skills in English.
2. Willingness to participate in individual and group activities.
3. Interest in personal and professional development.
4. Basic awareness of workplace and social interactions.
5. Positive attitude toward self-improvement and lifelong learning.

Course Description:

Enhancing Soft Skills and Personality is designed to develop the personal, interpersonal, and professional competencies required for academic success and career growth. The course focuses on self-awareness, personality development, communication skills, emotional intelligence, leadership, teamwork, professional etiquette, employability skills, and lifelong learning. Students learn to improve their communication abilities, strengthen interpersonal relationships, build confidence, and develop professional behavior required in modern organizations.

Course Outcomes:

CO	After the completion of the course, the students should be able to
CO1	Analyze personal strengths, weaknesses, emotions, and personality traits for self-development.
CO2	Demonstrate effective verbal, non-verbal, written, and interpersonal communication skills.
CO3	Apply leadership, teamwork, negotiation, and conflict resolution skills in professional settings.
CO4	Exhibit professional etiquette, emotional intelligence, and workplace behavior.
CO5	Develop career planning, employability, interview, and lifelong learning skills.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1	-	-	-	-	-	-	1	2	3	-	1
CO2	-	-	-	-	-	-	-	-	3	-	1
CO3	-	-	-	-	-	-	2	2	3	-	1
CO4	-	-	-	-	-	-	2	2	3	-	1
CO5	-	-	-	-	-	-	-	2	3	-	2

Assessment Scheme:

Two components of Continuous Assessment (CA1 & CA2), one Mid Semester Examination (MSE) and one End Semester Examination (ESE), have 30%, 20% and 50% weightage, respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on the Assignment/ Surprise test/ Quiz/Seminar/Group discussions / presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1	Self-Awareness and Personality Development – Self-concept, Self-esteem, SWOT Analysis, Personality Traits, Goal Setting, Positive Attitude, Confidence Building, Time Management, Personal Effectiveness	07
2	Emotional Intelligence and Communication Skills – Self-Awareness, Verbal Communication, Non-Verbal Communication, Listening Skills, Speaking Skills, Reading Skills, Writing Skills, Interpersonal Communication, Workplace Communication, Self-Regulation, Motivation, Empathy, Social Skills, Relationship Management, Conflict Resolution, Negotiation Skills	08
3	Leadership and Team Building – Leadership Styles, Team Dynamics, Team Building, Collaboration, Decision Making, Problem Solving, Workplace Ethics, Professional Etiquette	07
4	Career Development and Employability Skills – Resume Writing, Cover Letter Preparation, Group Discussions, Interview Skills, Personal Branding, Professional Networking, Career Planning, Lifelong Learning	07

Text Books	
Sr.No	Title
1	Personality Development and Soft Skills, Barun K. Mitra, Oxford University Press
2	Soft Skills: Know Yourself and Know the World, Dr. Alex K. World, S. Chand Publications

Reference Books	
Sr.No	Title
1	Developing Communication Skills, Krishna Mohan & Meera Banerji, Macmillan
2	Communication Skills for Engineers and Scientists, Sangeeta Sharma & Binod Mishra, PHI Learning
3	Seven Habits of Highly Effective People, Stephen R. Covey, Simon & Schuster

Title of the Course: Ethics in Engineering Practices Course Code: 25OE2302	L	T	P	Credit
	2	-	-	2

Course Pre-Requisite:

1. Basic communication and comprehension skills.
2. Awareness of social and professional responsibilities.
3. Fundamental understanding of engineering disciplines.
4. Interest in ethical, environmental, and societal issues.
5. Ability to analyze situations and make reasoned judgments.

Course Description:

Ethics in Engineering Practices is designed to develop ethical awareness, professional responsibility, and decision-making skills among engineering students. The course examines moral values, professional ethics, accountability, integrity, sustainability, environmental responsibility, and the societal impact of engineering decisions. Students learn to identify ethical dilemmas, evaluate professional responsibilities, apply ethical principles, and contribute to sustainable and socially responsible engineering solutions. The course emphasizes ethical leadership, workplace professionalism, and responsible use of emerging technologies.

Course Outcomes:

CO	After the completion of the course, the students should be able to
CO1	Explain ethical principles, moral values, and professional responsibilities..
CO2	Analyze ethical dilemmas and make responsible engineering decisions..
CO3	Evaluate societal, environmental, and sustainability concerns in engineering practices.
CO4	Deliver effective presentations and negotiate professionally.
CO5	Apply professional ethics, integrity, accountability, and legal responsibilities..

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1	-	-	-	-	-	-	3	3	3	-	1
CO2	-	3	-	-	-	-	3	-	-	-	-
CO3	-	-	-	-	-	3	3	-	-	-	-
CO4	-	-	3	-	-	-	-	3	3	-	2
CO5	-	-	-	-	-	-	3	3	3	-	-

Assessment Scheme:

Two components of Continuous Assessment (CA1 & CA2), one Mid Semester Examination (MSE) and one End Semester Examination (ESE), have 30%, 20% and 50% weightage, respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on the Assignment/ Surprise test/ Quiz/Seminar/Group discussions / presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1	Foundations of Engineering Ethics- Meaning and Importance of Ethics, Engineering as a Profession, Moral Values and Ethical Principles, Rights Duties and Responsibilities, Ethical Dilemmas in Engineering, Engineering Case Studies	07
2	Professional Responsibility- Professional Codes of Ethics, Accountability and Integrity, Confidentiality and Intellectual Property Rights, Whistleblowing, Ethical Leadership, Workplace Professionalism	07
3	Technology, Society and Sustainability- Engineers and Society, Sustainable Development Goals (SDGs), Environmental Ethics, Green Engineering, Corporate Social Responsibility (CSR), Ethical Use of Emerging Technologies	07
4	Ethical Decision Making and Leadership - Ethical Decision Models, Value-Based Leadership, Organizational Ethics, Governance and Compliance, Stakeholder Management, Ethical Risk Assessment	07

Text Books	
Sr.No	Title
1	Ethics in Engineering, Mike W. Martin & Roland, Schinzinger, McGraw-Hill Education
2	Engineering Ethics, Charles E. Harris Jr., Michael, Pritchard & Michael Rabins, Cengage Learning

Reference Books	
Sr.No	Title
1	Engineering Ethics: Concepts and Cases, Charles E. Harris Jr, Cengage Learning
2	Ethics, Technology and Engineering, Ibo van de Poel & Lambèr Royakkers, Wiley-Blackwell
3	Practical Ethics for Engineers, John R. Boatright, CRC Press
4	Professional Ethics and Human Values, R. S. Naagarazan, New Age International

Title of the Course: Introduction to Project Management Course Code: 25OE2303	L	T	P	Credit
	2	--	-	2

Course Pre-Requisite:

1. Basic understanding of engineering and technology concepts.
2. Fundamental communication and teamwork skills.
3. Logical thinking and problem-solving ability.
4. Awareness of organizational and business environments.

Course Description:

This course introduces students to the fundamentals of project management, including project planning, scheduling, execution, monitoring, and closure. It covers the project life cycle, stakeholder management, risk management, quality management, and the use of common project management tools and techniques. The course aims to develop the ability to plan and manage projects effectively in engineering and business environments.

Course Outcomes:

CO	After completion of the course, the students should be able to
CO1	Explain the principles, objectives, and life cycle of project management.
CO2	Prepare project plans, schedules, and resource allocation strategies.
CO3	Identify and manage project risks, costs, quality, and stakeholder expectations.
CO4	Apply monitoring, control, and project closure techniques to improve project success.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	-	-	-	1	2	2
CO2	3	3	2	2	2	-	-	-	2	2	2
CO3	2	3	3	2	2	1	1	-	2	2	2
CO4	2	2	3	3	2	1	-	1	3	3	2

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 30%, 20% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents:

Unit No.	Unit Title and Contents	Hours
1.	Introduction Concept and characteristics of projects, Project management fundamentals, Importance and objectives of project management, Project life cycle, Roles and responsibilities of project manager ,Stakeholders and organizational structures, Project selection and feasibility analysis	07
2.	Project Planning and Scheduling Project scope definition, Work Breakdown Structure (WBS), Project planning process, Resource planning and allocation, Scheduling techniques, Gantt Charts, Critical Path Method (CPM), Introduction to PERT	07
3.	Project Cost, Risk, and Quality Management Cost estimation and budgeting, Project financing basics, Risk identification and risk assessment, Risk mitigation strategies, Quality planning and quality assurance, Performance measurement and documentation, Communication management	08
4.	Project Execution, Monitoring, and Closure Project execution and coordination, Team management and leadership, Project monitoring and control, Change management, Performance evaluation, Project documentation and reporting, Project closure and lessons learned, Introduction to project management software tools	08

Text Books:

Sr. No	Title
1.	Project Management: The Managerial Process, Clifford F. Gray, Erik W. Larson, McGraw-Hill Education

Reference Books:

1.	Project Management: A Systems Approach to Planning, Scheduling, and Controlling, Harold Kerzner, John Wiley & Sons
2.	Information Technology Project Management, Kathy Schwalbe, Cengage Learning
3.	A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Project Management Institute (PMI), Project Management Institute (PMI)

Certification Course NPTEL Link:

Sr. No.	Course	Provider /Platform	Level	Mode	Certification Authority
1.	Project Management	nptel.ac.in/courses/110104073?utm_source=chatgpt.com	UG	Online	NPTEL
2.	Project Management For Managers	Project management for managers - Course	UG	Online	NPTEL

Title of the Course: Statistics for Engineers Course Code: 25MMADS2301	L	T	P	Credit
	2	–	--	2

Course Pre-Requisite:

1. Basic mathematical and analytical foundation

Course Description:

This course introduces fundamental statistical concepts and their applications in engineering, focusing on data analysis, probability, quality control, and predictive techniques. It emphasizes practical problem-solving using real-world case studies from core engineering domains and basic data analysis tools.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand and analyze engineering data using descriptive statistical measures.
CO2	Apply basic probability concepts to evaluate uncertainty and reliability in engineering systems.
CO3	Interpret and use common probability distributions in engineering contexts.
CO4	Perform basic statistical inference and hypothesis testing for engineering decision-making.
CO5	Apply statistical techniques like correlation, regression to real-world engineering problems.

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	2	2	-	-	-	-	1	-
CO2	3	2	-	2	1	-	-	-	-	1	-
CO3	3	2	-	2	1	-	-	-	-	1	-
CO4	3	3	-	3	2	-	-	-	-	1	-
CO5	3	3	2	3	3	1	1	-	1	2	1

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 30%, 20% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

Course Contents

Unit No.	Contents	Hours
1.	Basics of Data and Descriptive Statistics Types of data: discrete, continuous, categorical, Data collection methods , Measures of central tendency: Mean, Median, Mode , Measures of dispersion: Range, Variance, Standard Deviation, Data representation: Tables, histograms, bar charts	8
2.	Probability Fundamentals Basic probability concepts, Conditional probability, Bayes' theorem, Random variables ,Basic reliability concepts	6
3.	Probability Distributions Binomial distribution, Normal distribution, Poisson distribution Concept of standard normal curve	7
4.	Statistical Inference Sampling techniques, Confidence intervals, Hypothesis testing: z-test, t-test, Errors and significance levels Applications: Statistical Quality Control: Control charts, Correlation analysis, Simple Linear Regression Case studies: 1. Manufacturing quality control (Mechanical) 2. Electrical load analysis (Electrical) 3. Signal noise analysis (Electronics/Telecom)	9

Textbooks:

Textbooks	
Sr.No	Title
1.	Statistical Analysis Handbook, A Comprehensive guide to statistical concepts methods and tools, Dr. Michael J de Smith, The Winchelsea Press, Drumlin Security Ltd, Edinburgh, 2018 edition https://www.statsref.com/HTML/index.html
2.	Applied Statistics and Probability for Engineers, Douglas C. Montgomery, George C. Runger, Wiley, 2013
3.	Probability and Statistics for Engineers, Dr. Ravichandran ,First Edition Wiley, 2010

Reference Books:	
Sr.No.	Title
1.	Mining of Massive Datasets. v2.1, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman., Cambridge University Press, 2014. (free online)
2.	Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking, Foster Provost and Tom Fawcett, ISBN 1449361323

Title of the Course: Constitution of India	L	T	P	Credit
Course Code: 25VEC2001	1	-	-	1

Course Pre-Requisite:

1. Basic understanding of civics and political science at school level
2. Awareness of Indian governance system

Course Description: This course provides a comprehensive understanding of the foundations, structure, and functioning of the Indian political and administrative system. It begins with the meaning and sources of the Constitution, tracing its historical evolution and key features such as the Preamble, Fundamental Rights, Duties, and Directive Principles. The course further explores the structure and functioning of Union, State, and Local Governments, including their roles, powers, and interrelationships. It also covers grassroots democracy through Panchayati Raj Institutions and urban local bodies. Finally, the course examines the role of constitutional bodies like the Election Commission and welfare institutions aimed at promoting social justice for marginalized groups.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Explain the meaning, sources, history, and key features of the Constitution of India.
CO2	Analyze the structure and functioning of the Union Government.
CO3	Evaluate the organization and functioning of State Government
CO4	Describe the structure and importance of Local Administration in grassroots democracy.
CO5	Assess the role and functioning of the Election Commission of India

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	2	2	2	1	1	2	1	2	2	2
CO2	3	2	2	2	2	3	1	1	2	2	2	2	1
CO3	3	2	2	2	2	2	1	1	2	2	2	1	2
CO4	2	2	2	2	2	2	2	2	2	2	2	2	1
CO5	2	2	2	2	3	2	1	1	2	2	2	2	2

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 30%, 20% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
MSE	--
CA2	25
ESE	--

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Unit No.	Unit Title and Contents	Hours
1.	Introduction: Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive, Principles of State Policy.	5
2.	Union Government and its Administration: Structure of the Indian Union: Federalism, Centre- State, relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha	5
3.	State Government and its Administration Governor: Role and Position, CM and Council of Ministers, State Secretariat: Organization, Structure and Functions.	4
4	Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati Raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.	5
5	Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.	5

Text Books	
Sr. No	Title
1.	Sastry, T. S. N., (2005). India and Human Rights: Reflections, Concept Publishing Company India (P Ltd.).
2.	Nirmal, C.J., (1999). Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.

Title of the Course: Modern Indian Language - Marathi Course Code: 25AEC2302	L	T	P	Credit
	1	--	-	1

Course Description: हा अभ्यासक्रम मराठी भाषेचा उगम व विकास, व्याकरण नियम, लेखन कौशल्ये आणि कथा या वाङ्मयप्रकाराचा अभ्यास यांचा समावेश करतो. तसेच भाषा व व्यक्तिमत्त्व विकास, प्रभावी संवाद कौशल्य आणि साहित्यिक आकलन विकसित करण्यावर भर देतो.

Course Outcome:

CO	After the completion of the course the student should be able to
CO1	विद्यार्थी मराठी भाषेच्या ऐतिहासिक प्रवासाची समज वाढवतील आणि तिच्या विकासातील टप्पे स्पष्टपणे सांगू शकतील
CO2	शुद्ध व प्रमाणबद्ध लेखन करण्याची क्षमता प्राप्त होईल
CO3	विविध प्रकारच्या लेखन शैली आत्मसात करून सज्जनशील, विश्लेषणात्मक आणि औपचारिक लेखन करू शकतील
CO4	अचूक, स्पष्ट आणि भाषिक-सांस्कृतिक दृष्टिकोनातून योग्य भाषांतर करू शकतील
CO5	व्यावसायिक आणि साहित्यिक भाषांतरात प्रावीण्य मिळवू शकतील

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	1	-	-	-	2	1
CO2	2	2	-	-	-	1	-	-	1	3	1
CO3	3	3	-	-	-	-	-	-	-	2	1
CO4	2	3	-	-	-	1	-	-	1	3	1
CO5	2	2	-	-	-	1	-	-	-	3	1

Assessment Scheme:

Two components of Continuous Assessment (CA1 & CA2)

Assessment Component	Marks
CA1	25
MSE	-
CA2	25
ESE	-

CA1 and CA2 are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

Course Contents:

Unit No.	Unit Title and Contents	Hours
1.	मराठीचा उगम आणि विकास: मराठीचा उगम आणि विकास, भाषा आणि व्यक्तिमत्त्व विकास: सहज संबंध, भाषक कौशल्य विकास : नैसर्गिक आकलनासह	04
2.	मराठी लेखनाचे नियम आणि व्याकरण: संधी, वाक्यप्रकार (विधानाथ वाक्य, प्रश्नाथ वाक्य, आज्ञाथ वाक्य इ.), विरामचिन्हे आणि त्यांचे उपयोग, शुद्धलेखन, समानाथ शब्द (पया यवाची शब्द), विरुद्धाथ शब्द.	03
3.	लेखन कौशल्य: लेखन कौशल्याचा परीक्षण, लेखन कौशल्याचे महत्त्व आणि आवश्यकता, पत्रलेखन, निबंध लेखन, वृत्तलेखन (वृत्तपत्रीय लेखन), इतिवृत्त लेखन आणि सारांश लेखन हे लेखन कौशल्याच्या अभ्यासातील महत्त्वाचे घटक आहेत.	05
4.	कथा: एकवाङ्मयप्रकार – कथा : संकल्पना व स्वरूप, कथेचे घटक आणि मराठी कथेची वाटचाल हे कथा या वाङ्मयप्रकाराच्या अभ्यासातील महत्त्वाचे घटक आहेत.	03

Textbooks:

Sr. No	Title
1.	सुगम मराठी व्याकरण व लेखन, मो. रा. वाळंबे
2.	अनुवाद तत्वांत आणि प्रयोग, डॉ. भालचंद्र नेमाडे, लोकवाङ्मय गृह प्रकाशन
3.	मराठी भाषा आणि साहित्याचा इतिहास, व. का. राजवाडे, राजवाडे संशोधन मंडळ, धुळे

References:

1.	मराठी साहित्य : प्रेरणा आणि स्वरूप, डॉ. गो. मा. पवार, डॉ. ह. दा. हातकणंगलेकर, पॉप्युलर प्रकाशन, १९८६
2.	साहित्यमूल्य आणि अभिरुची, डॉ. गो. मा. पवार, साकेत प्रकाशन.
3.	कथा : संकल्पना आणि समीक्षा , सुधा जोशी मौज प्रकाशन, २०००.

Title of the Course: Data Structures and Algorithm Laboratory Course Code: 25ADS2303L	L	T	P	Credit
	-	-	2	1

Course Pre-Requisite:

1. Basic programming knowledge
2. Familiarity with functions, sets and basic logic.

Course Description:

This course focuses on the organization and management of data using various data structures. It covers arrays, linked lists, stacks, queues, trees, and graphs. Students learn algorithm design and complexity analysis. The course improves problem-solving and programming skills. It serves as a foundation for advanced computing subjects.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Apply recursion and implement stack and queue operations to solve computational problems.
CO2	Develop programs to create and manipulate linear data structures.
CO3	Implement hashing techniques and tree-based structures
CO4	Design and implement various graph algorithms
CO5	Implement and analyze searching and sorting algorithms.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PSO1	PSO2
CO1	3	2	2	1	3	-	-	-	-	-	1	3	2
CO2	3	3	2	2	3	-	-	-	-	-	1	3	3
CO3	3	3	2	2	3	-	-	-	-	-	1	3	3
CO4	3	3	3	2	3	-	-	-	1	-	1	3	3
CO5	3	3	3	2	3	-	-	-	1	-	1	3	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
CA2	25
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents

Practical No.	List of Experiments	Hours
1.	Assignment 1: Develop a recursive solution for an automated disk backup system using the Tower of Hanoi concept to simulate data transfer between servers.	02
2.	Assignment 2: Design a cafeteria tray management system using stack operations to manage tray insertion and removal efficiently.	02
3.	Assignment 3: Implement a student database search system using hash tables for fast retrieval of student records.	02
4.	Assignment 4: Develop an expression evaluation and palindrome checking system using stack data structures for compiler and text processing applications.	02
5.	Assignment 5: Create a ticket booking management system using circular queues to handle customer requests in a cyclic manner.	02
6.	Assignment 6: Design a railway reservation waiting-list management system using singly linked lists.	02

7.	Assignment 7: Implement an employee payroll management system using doubly linked lists to allow forward and backward navigation through employee records.	02
8.	Assignment 8: Develop a multiplayer gaming turn management system using circular linked lists.	02
9.	Assignment 9: Create a hierarchical file management system using tree traversal algorithms to represent folders and files.	02
10.	Assignment 10: Design a social network friend connection analyzer using graph traversal algorithms such as BFS and DFS.	02
11.	Assignment 11: Implement an online product catalog management system using Binary Search Trees for efficient searching and sorting of products.	02
12.	Assignment 12: Develop a GPS-based route optimization system using shortest path algorithms such as Dijkstra's and Bellman-Ford algorithms.	02
13.	Assignment 13: Create a library book search system using linear and binary searching techniques.	02
14.	Assignment 14: Design a student result processing application using sorting algorithms to arrange records based on marks, names, or roll numbers.	02
15.	Assignment 15: Hospital Patient Record Management System Using Priority Queues	02

Text Books

Sr. No	Title
1.	S. Lipschutz, Data Structures, McGraw-Hill Publication, Revised.
2.	E. Horowitz, S. Sahani, Fundamentals of Data Structures, Galgotia Publication, 1st Edition, 1983.

Reference Books

1.	Alfred V. Aho, John E. Hopcroft, J. D. Ullman, "Data structures and Algorithms", (Addison-Wesely Series)
2.	Ashok N. Kamthane, "Introduction to Data Structures in C", Pearson Education.

Title of the Course: Operating System Administration Laboratory Course Code: 25ADS2305L	L	T	P	Credit
	-	-	2	1

Course Pre-Requisite:

Basic knowledge of Computer Fundamentals
 Basic understanding of Operating Systems
 Basic programming knowledge (C language preferred)
 Familiarity with Linux/UNIX environment

Course Description: This course provides hands-on knowledge of Operating System concepts such as process management, memory management, file systems, scheduling algorithms, synchronization, multithreading, and system administration using Linux/UNIX environment.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Use UNIX/Linux commands and shell scripting.
CO2	Implement CPU scheduling and memory management algorithms.
CO3	Understand process, threads, and synchronization.
CO4	Solve classical OS problems like Producer-Consumer and Banker's Algorithm.
CO5	Design and implement synchronization and deadlock avoidance solutions for operating system problems.

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	-	-	-	-	-	-	-	-
CO2	3	3	2	1	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-
CO4	2	2	3	2	-	-	-	-	-	-	-
CO5	3	3	2	1	-	-	-	-	-	-	-

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), End Semester Practical Oral Examination (POE), have 25%, 25% and 50% weightage, respectively.

Assessment	Marks
CA1	25
CA2	25
POE	50

CA1 and **CA2** are based on 50% practical assignments.

POE is based on 100% Experiments

Course Contents

Practical No.	Practical Title and Contents	Hours
1.	Assignment 1: UNIX/Linux Commands a. Execute basic Linux commands (ls, pwd, cd, mkdir, rm) b. Study file and directory management commands	2
2.	Assignment 2: File Handling Commands c. Study file handling commands (cp, mv, cat) d. Perform file and directory operations in Linux	2
3.	Assignment 3: Shell Programming Basics e. Write simple shell scripts for displaying messages f. Write shell scripts using variables and input statements	2
4.	Assignment 4: Shell Programming for File Operations g. Write shell scripts for file creation and deletion h. Write shell scripts for file handling operations	2
5.	Assignment 5: Shell Scripting using grep, awk and sed i. Write shell scripts using grep command j. Write shell scripts using awk and sed commands	2
6.	Assignment 6: Process Management and System Calls k. Study process creation using fork() and vfork() l. Demonstrate basic process management commands	2
7.	Assignment 7: CPU Scheduling Algorithms m. Implement FCFS Scheduling Algorithm n. Implement SJF Scheduling Algorithm	2
8.	Assignment 8: Priority Scheduling Algorithm o. Implement Priority Scheduling Algorithm p. Compare FCFS, SJF and Priority Scheduling	2
9.	Assignment 9 :Page Replacement Algorithms q. Implement FIFO Page Replacement Algorithm r. Study LRU Page Replacement Algorithm	2
10.	Assignment 10 :Memory Management Techniques s. Study First Fit and Best Fit algorithms t. Implement memory allocation techniques	2

Practical No.	Assignment Title	Hours
11.	Assignment 11 :POSIX Threads u. Create and execute threads using pthreads v. Study thread creation and synchronization	2
12.	Assignment 12 :Synchronization Techniques w. Implement Semaphores for synchronization x. Study Locks and Condition Variables	2
13.	Assignment 13 :Banker's Algorithm y. Implement Banker's Algorithm for deadlock avoidance z. Study safe state and resource allocation	2
14.	Assignment 14 :Operating System Administration aa. Study user management and file permissions in Linux bb. Monitor system performance using Linux administration tools	2
15	Assignment 15: Operating System Administration cc. Package Management, Backup & Recovery, and System dd. Performance Tuning in Linux.	2

Textbooks/Software:

Textbooks	
Sr.No.	Title
1.	Operating System Concepts, Abraham Silberschatz Peter B. Galvin, Wiley, 2018
2.	Modern Operating Systems, Andrew S. Tanenbaum, Pearson, 2014

Reference Books:	
Sr.No.	Title
1.	Unix and Linux System Administration, Handbook Evi Nemeth Garth Snyder, Trent R. Hein, Pearson,2017
2.	Linux Command Line and Shell Scripting Bible, Richard Blum, Christine Bresnahan, Wiley,2016