



Department of Computer Science and Engineering

ABOUT THE DEPARTMENT

Computer Science & Engineering is the Core Department of the Arvind Gavali College of Engineering.

The Department of Computer Science and Engineering (CSE) was established in 2010, affiliated with Dr. Babasaheb Ambedkar Technological University (DBATU), Lonere. The CSE department is originally offering a 60-student intake for the B. Tech. program. The undergraduate intake has doubled to 120 seats. The department was accredited by National Assessment and Accreditation Committee (NAAC 1st cycle) in 2016 and 2023(NAAC 2nd cycle) and National Board of Accreditation (NBA) in the year 2023.

The department has all UGC approved faculty members. The department has well-equipped laboratories. With the growing demand for Computer Science Engineers in the Government and private sectors, the department is making the best efforts to produce highly trained and capable engineers who can take up the challenges of the real world. The quality of academic instructions, guidelines, and college activities are designed to produce competent and successful engineers. In the Department, the focus is on preparing professional engineers.

Over the past decade, nine batches have graduated from the department. Students have consistently secured placements in respected companies and also pursued higher studies at prestigious universities. We actively support internships and facilitate participation in national and international competitions, hackathons, project exhibitions, and sports events. Our students have earned accolades at contests such as Diplex, Avishkar, and Rotarex.

The department is well-equipped: we feature smart classrooms with interactive panels, modern laboratories loaded with industry-standard software and hardware, and other academic resources. Our infrastructure supports hands-on and experiential learning, vital for today's tech-oriented education.

For the extra curriculum activities, the Departmental Association (CESA) has been established by the students. This association conducts various technical and cultural events regularly.

“Nothing is impossible for Computer Science Engineers with Skill Oriented Knowledge.”



DEPARTMENT VISION

To emerge as a prominent computer science and engineering center to produce quality professionals to meet industrial and societal needs.

DEPARTMENT MISSION

M1	To produce IT professionals with intellectual ability by imparting quality education.
M2	To induce competency among the students by engaging them in requisite skills and aptitude.
M3	To develop consciousness of societal and ethical needs in the field of computer science and engineering.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO 1	The graduate will be able to analyze and solve industry problems by applying basics of mathematics and algorithms.
PEO 2	The graduate will be able to develop solutions using modern engineering tools and techniques to solve real life problems.
PEO 3	The graduates will become ethical professionals in ITES industries contributing to societal progress and respecting the environment.

PROGRAM OUTCOMES (PO)

PO 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 problems.
PO 2	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO 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)
PO 4	Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modeling, analysis & interpretation of data to provide valid conclusions. (WK8)
PO 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)



PO 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).
PO 7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO 8	Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 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
PO 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.
PO 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)

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO 1	Ability to learn latest software technology in the area of computer science & engineering
PSO 2	Ability to develop software solutions for catering to the environmental and societal needs.

MAPPING OF PEO'S TO PO'S

	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	-	-	-	2	1	2
PEO 3	-	1	1	-	-	2	1	2	2	1	1

MAPPING OF PEO's TO PSO's

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



A. Definition of Credit:

1 Hr. Lecture (L) per week 1	1 credit
1 Hr. Tutorial (T) per week	1 credit
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 an undergraduate degree in engineering. Students will be eligible to get undergraduate degree with honors 18 credits and/or minors 14 credits, if one 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 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 Programme 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.



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**

▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**

Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
Tal.& Dist.-Satara.-415 015 (Maharashtra)
▪ Phone : 02162 - 261122 , 200100
▪ e-mail : agcenggsatara@gmail.com
▪ Website :-www.agce.edu.in
▪ Institute Code : Engg. DTE EN-6545

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



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
 ▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
 Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye, Tal.& Dist.-Satara.-415 015 (Maharashtra)
 ▪ Phone : 02162 - 261122 , 200100
 ▪ e-mail : agcenggsatara@gmail.com
 ▪ Website :-www.agce.edu.in
 ▪ Institute Code : Engg. DTE EN-6545

Second Year B. Tech

SEMESTER IV

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs/W eek	Cr	Components	Max	Min for Passing	
1	PCC	25CSE2401	Object Oriented Programming	3	0	0	3	3	CA1	15	40	
									MSE	20		
									CA2	15		
									ESE	50		
2	PCC	25CSE2402	Database System	3	0	0	3	3	CA1	15	40	
									MSE	20		
									CA2	15		
									ESE	50		
3	PCC	25CSE2403	Probability and Statistics	3	0	0	3	3	CA1	15	40	
									MSE	20		
									CA2	15		
									ESE	50		
4	PCC	25CSE2404	Software Engineering	2	0	0	3	2	CA1	15	40	
									MSE	20		
									CA2	15		
									ESE	50		
5	*OE	25OE24XX	Open Elective-II	3	0	0	3	3	CA1	15	40	
									MSE	20		
									CA2	15		
									ESE	50		
6	VEC	25VEC2002	Universal Human Values	1	0	0	1	1	CA1	25	20	
									CA2	25	--	
									ESE	--		
7	VESC	25CSE2405L	Full Stack Web Development Laboratory	0	0	2	2	1	CA1	25	20	
									CA2	25		
									POE	50		
8	PCC	25CSE2401L	Object Oriented Programming Laboratory using Java	0	0	2	2	1	CA1	25	20	
									CA2	25		
									POE	50		
9	PCC	25CSE2402L	Database System Laboratory	0	0	2	2	1	CA1	25	20	
									CA2	25		
									POE	--	--	
10	#MDM Lab	25MMXXX2401L	MDM-II Lab	0	0	2	2	1	CA1	25	40	
									CA2	25		
									POE	50		
11	#MDM	25MMXXX2401	Multi-Disciplinary Minor-II: Mastering Object Oriented Programming	2	0	0	2	2	CA1	15	40	
									MSE	20		
									CA2	15		
									ESE	50		
				17	0	8	25	21	1000			
Total Contact Hours –25								Total Credits – 21				



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**

▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**

Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
Tal.& Dist.-Satara.-415 015 (Maharashtra)
▪ Phone : 02162 - 261122 , 200100
▪ e-mail : agcenggsatara@gmail.com
▪ Website :-www.agce.edu.in
▪ Institute Code : Engg. DTE EN-6545

Open Elective Course – II (OE-II):

SR. NO	Course code	Course Name
1.	25OE2401	Business Communication
2.	25OE2402	E-Business
3.	25OE2402	Intellectual Property Rights



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
Tal.& Dist.-Satara.-415 015 (Maharashtra)
▪ Phone : 02162 - 261122 , 200100
▪ e-mail : agcenggsatara@gmail.com
▪ Website :-www.agce.edu.in
▪ Institute Code : Engg. DTE EN-6545

Program Elective Course – I (PEC-I):

Sr. No.	Course code	Course Name
1.	25PECSE3501	Information and Cyber Security
2.	25PECSE3502	Artificial Intelligence
3.	25PECSE3503	Theory of Computation

Open Elective Course – III (OE-III):

Sr. No.	Course Name 1	Course Name
1.	25OE3501	Employability and Skill Development
2.	25OE3501	Business Fundamentals for Entrepreneurs
3.	25OE3501	Patent law for engineers and scientists



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**

▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**

Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
Tal.& Dist.-Satara.-415 015 (Maharashtra)
▪ Phone : 02162 - 261122 , 200100
▪ e-mail : agcenggsatara@gmail.com
▪ Website :-www.agce.edu.in
▪ Institute Code : Engg. DTE EN-6545

Program Elective Course – II (PEC-II):

SR. NO	Course code	Course Name
1.	25PECSE3601	Digital Image Processing
2.	25PECSE3602	Generative AI
3.	25PECSE3603	Software Project Planning and Management

Program Elective Course – III (PEC-III):

SR. NO	Course code	Course Name
1.	25PECSE3604	DevOps and Clean Coding Practices
2.	25PECSE3605	Big Data Analytics
3.	25PECSE3606	Business Intelligence



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**

▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**

Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

- Address : At.Panmalewadi, Post.-Varye, Tal.& Dist.-Satarra.-415 015 (Maharashtra)
- Phone : 02162 - 261122 , 200100
- e-mail : agcenggsatarra@gmail.com
- Website :-www.agce.edu.in
- Institute Code : Engg. DTE EN-6545

Final Year B. Tech-2025-26

SEMESTER: VII

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./ Week	Cr	Components	Max	Min for Passing	
1	PCC	25CSE4701	Deep Learning	3	0	0	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	PCC	25CSE4702	Computer Vision	3	0	0	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3	PCC	25CSE4703	Natural Language Processing	3	0	0	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
4	PEC	25PECSE47XX	MOOC Course	2	0	0	2	2	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
6	PCC	25CSE4701L	Deep Learning Laboratory	0	0	2	2	1	CA1	25	20	40
									CA2	25		
									POE	50	20	
7	PCC	25PECSE47XX L	MOOC Course Laboratory	0	0	4	4	2	CA1	25		40
									CA2	25		
									POE	50	20	
8	ELC	25CSE4704P	Project Phase-I	0	0	8	8	4	CA	50	20	40
									POE	50		
9	Internship	25CSE4705	Field Training/ Internship/ Industrial Training Evaluation	--	--	--	--	AU	--	--	--	--
5	#MDM	25MMXXX47XX	MDM V : Deep Learning & Applied Generative AI	2	1	0	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
			Total	13	1	14	28	21		800		



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

- Address : At.Panmalewadi, Post.-Varye, Tal.& Dist.-Satara.-415 015 (Maharashtra)
- Phone : 02162 - 261122 , 200100
- e-mail : agcenggsatara@gmail.com
- Website : www.agce.edu.in
- Institute Code : Engg. DTE EN-6545



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**

▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**

Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

- Address : At.Panmalewadi, Post.-Varye, Tal.& Dist.-Satara.-415 015 (Maharashtra)
- Phone : 02162 - 261122 , 200100
- e-mail : agcenggsatara@gmail.com
- Website :-www.agce.edu.in
- Institute Code : Engg. DTE EN-6545

Final Year 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	25HSSM4801	Finance Management	3	0	0	3	3	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
2	ELC	25ELC4801	Research Methodology	4	0	0	4	4	CA1	15		40
									MSE	20		
									CA2	15		
									ESE	50	20	
3	ELC	25CSE4801	Industrial Internship/Research Internship	--	--	--	30	12	CA	50		40
									OE	50		
				7	0	0	37	19		300		



SAMARTH EDUCATIONAL TRUST

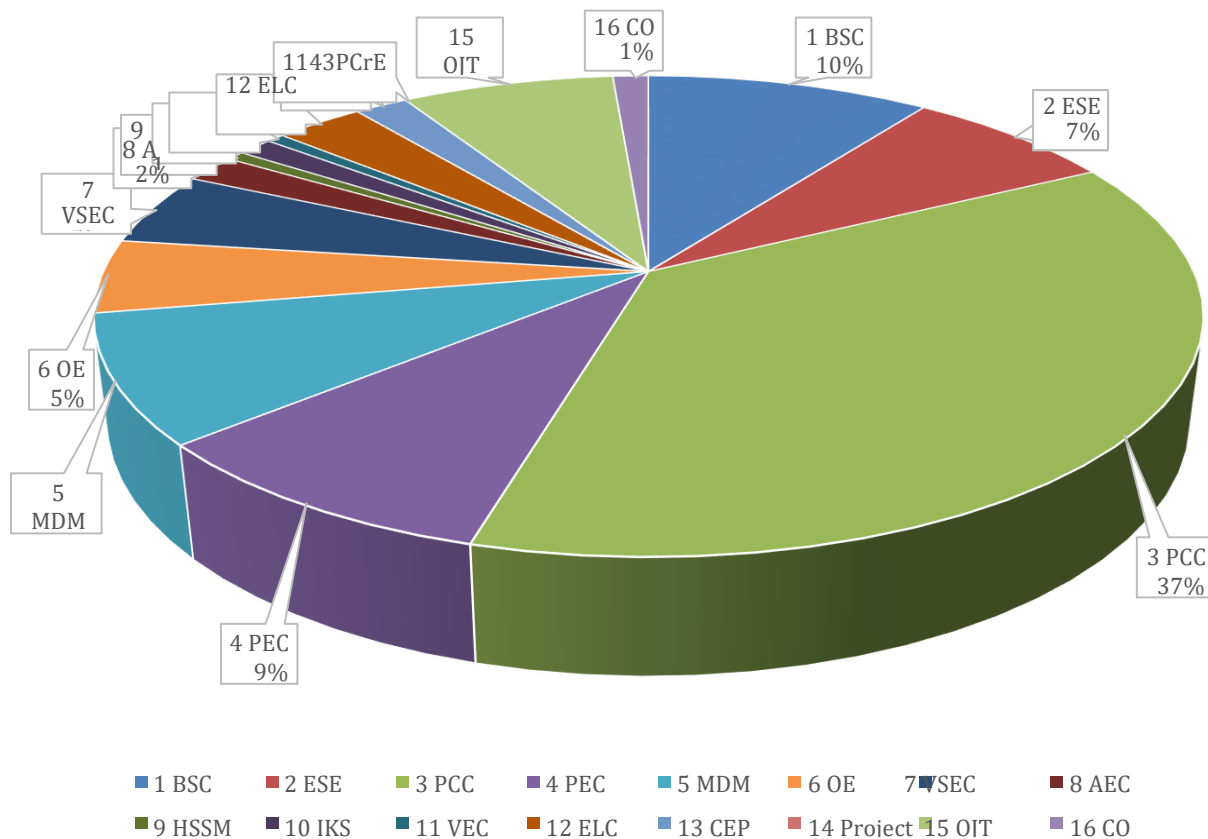
ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
 ▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
 Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
 Tal.& Dist.-Satara.-415 015 (Maharashtra)
 ▪ Phone : 02162 - 261122 , 200100
 ▪ e-mail : agcenggsatara@gmail.com
 ▪ Website :-www.agce.edu.in
 ▪ Institute Code : Engg. DTE EN-6545

G.Category wise Credit Distribution

Credit





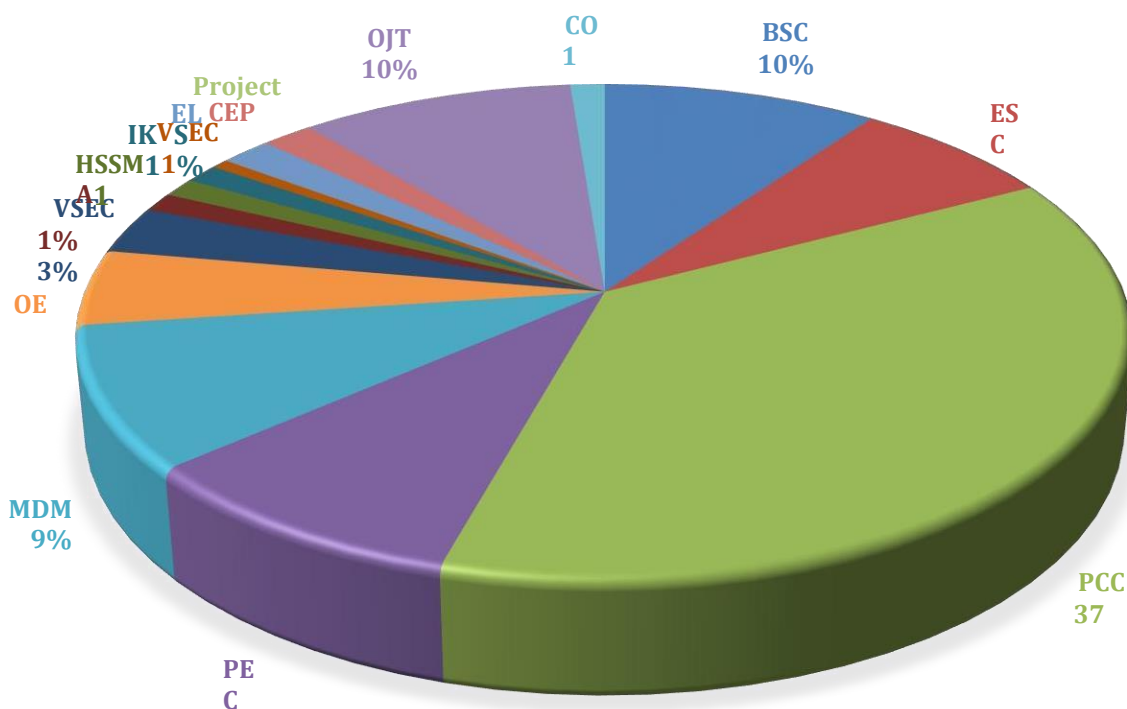
SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
Tal.& Dist.-Satara.-415 015 (Maharashtra)
▪ Phone : 02162 - 261122 , 200100
▪ e-mail : agcenggsatara@gmail.com
▪ Website :-www.agce.edu.in
▪ Institute Code : Engg. DTE EN-6545

CREDIT





SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
 ▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
 Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye, Tal.& Dist.-Satara.-415 015 (Maharashtra)
 ▪ Phone : 02162 - 261122 , 200100
 ▪ e-mail : agcenggsatara@gmail.com
 ▪ Website :-www.agce.edu.in
 ▪ Institute Code : Engg. DTE EN-6545

H. Program Core Courses:

PCC: PROGRAM CORE COURSES							
Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25PCC1201	Fundamentals of Industry Evolution	2	0	0	2	2
2.	25CSE2301	Fundamentals of Data Structures	3	0	0	3	3
3.	25CSE2302	Discrete Mathematical Structures	3	0	0	3	3
4..	25CSE2303	Operating System	2	0	0	2	2
5.	25CSE2304	Computer Architecture and Organization	3	0	0	3	3
6.	25CSE2301L	Data Structure Laboratory	0	0	2	2	1
7.	25CSE2303L	Operating System Laboratory	0	0	2	2	1
8.	25CSE2401	Object Oriented Programming	3	0	0	3	3
9.	25CSE2402	Database System	3	0	0	3	3
10.	25CSE2403	Probability and Statistics	3	0	0	3	3
11.	25CSE2404	Software Engineering	2	0	0	2	2
12.	25CSE2401L	Object Oriented Programming Laboratory Using JAVA	0	0	2	2	1
13.	25CSE2402L	Database System Laboratory	0	0	2	2	1
14.	25CSE3501	Cloud Computing	3	0	0	3	3
15.	25CSE3502	Design & Analysis of Algorithm	3	0	0	3	3
16.	25CSE3503	Computer Networks	3	0	0	3	3
17.	25CSE3501L	Database System Laboratory	0	0	2	2	1
18.	25CSE3503L	Computer Networks Laboratory	0	0	2	2	1
19.	25CSE3601	Compiler Design	3	0	0	3	3
20..	25CSE3602	Machine Learning	3	0	0	3	3
21.	25CSE3602L	Machine Learning Laboratory	0	0	2	2	1
22.	25CSE4701	Deep Learning	3	0	0	3	3
23.	25CSE4702	Computer Vision	3	0	0	3	3
24.	25CSE4703	Natural Language Processing	3	0	0	3	3
25.	25CSE4701L	Deep Learning Lab	0	0	2	2	1
Total			48	0	16	64	56



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
 ▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
 Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
 Tal.& Dist.-Satara.-415 015 (Maharashtra)
 ▪ Phone : 02162 - 261122 , 200100
 ▪ e-mail : agcenggsatara@gmail.com
 ▪ Website :-www.agce.edu.in
 ▪ Institute Code : Engg. DTE EN-6545

I. Program Elective Courses:

PEC: PROGRAM ELECTIVE COURSES							
Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25PECSE135XX	A. Information & Cyber Security	3	-	-	3	3
2.		B. Artificial Intelligence					
3.		C. Theory of Computation					
4.	25CSEPE236XX	A. Digital Image Processing	3	-	-	3	3
5.		B. Generative AI					
6.		C. Software project Planning & Management					
7.	25CSEPE336XX	A. DevOps & Clean Coding Practices	3	-	-	3	3
8.		B. Big Data Analytics					
9.		C. Business Intelligence					
10.	25CSEPE447XX	A. MOOC Course	3	-	-	3	3
Total			12	-	-	12	12

J. Open Elective Courses:

OEC: OPEN ELECTIVE COURSES							
Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25OE23X X OE-I	Enhancing Soft Skill and Personality	2	--	--	2	2
2.		Ethics in Engineering Practices					
		Introduction to Project Management					
3.	25OE24X X OE-II	Business Communication	3	--	--	3	3
4.		E-Business					
		Intellectual property					
5.	25OE35X X OE-III	Employability Skill Development.	3	--	--	3	3
6.		Business Fundamentals for Entrepreneur					
		Patent law for Engineers and scientists					
Total			8	--	--	8	8



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
 ▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
 Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
 Tal.& Dist.-Satara.-415 015 (Maharashtra)
 ▪ Phone : 02162 - 261122 , 200100
 ▪ e-mail : agcenggsatara@gmail.com
 ▪ Website :-www.agce.edu.in
 ▪ Institute Code : Engg. DTE EN-6545

K. Vocational and Skill Enhancement Courses:

VSEC: VOCATIONAL AND SKILL ENHANCEMENT COURSES							
Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25BSE1105L	Engineering Practice Laboratory	--	--	2	2	1
2.	25BSE1204	Computer Aided Engineering Drawing	2	--	--	2	2
3.	25BSE1204L	Computer Aided Engineering Drawing Laboratory			2	2	1
4.	25BSE1205L	Design Thinking			2	2	1
5.	25CSE2405L	Full Stack Web Development Laboratory	0	0	2	2	1
Total			2	--	8	10	6

L. Humanities Social Science And Management Courses

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	25HSSM4801	Financial Management	1	--	--	1	1
4.	25VEC2001	Constitution of India	1	--	--	1	1
5	25VEC2002	Universal Human Values	1	--	--	1	1
6	25AEC2001	Modern Indian Language	1	--	--	1	AU
Total			7	--	2	9	8



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
 ▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
 Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye, Tal.& Dist.-Satara.-415 015 (Maharashtra)
 ▪ Phone : 02162 - 261122 , 200100
 ▪ e-mail : agcenggsatara@gmail.com
 ▪ Website :-www.agce.edu.in
 ▪ Institute Code : Engg. DTE EN-6545

M. Experiential Learning:

EXPERIENTIAL LEARNING							
Sr. No.	Course Code	Course Name	L	T	P	H / W	Credits
1.	25CSE2305	Technical Seminar	0	0	2	2	1
2.	25CSE3504L	Mini Project	0	0	2	2	1
3	25CSE4704P	Project Phase-I	0	0	8	8	4
Total			--	--	12	12	6

N. Multi-Disciplinary Minor : MDM Courses to be offered by and for CSE Department and

Multi-Disciplinary Minor : MDM Courses to be offered by CSE Department							
Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1	25CSE306	Data Structure And Algorithms	2	--	--	2	2
2	25CSE406	Mastering in Object Oriented Programming	2	--	2	4	3
3	25CSE506	Database Engineering & Distributed System	2	1	--	3	3
4	25CSE606	Machine Learning & It's Applications	2	--	1	3	3
5	25CSE706	Deep Learning & Generative AI	2	1	--	3	3
Total			14	--	--	14	14



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
 ▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
 Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
 Tal.& Dist.-Satara.-415 015 (Maharashtra)
 ▪ Phone : 02162 - 261122 , 200100
 ▪ e-mail : agcenggsatara@gmail.com
 ▪ Website :-www.agce.edu.in
 ▪ Institute Code : Engg. DTE EN-6545

Multi-Disiplinary Minor For CSE Department Students (Minor in IOT & Its Application)							
Sr. No.	Course Code	Course Name	L	T	P	H./ W	Credits
1.	25MMXXX23XX	Digital Electronics	3	--	--	3	3
2.	25MMXXX24XX	Fundamentals of Embedded Systems	2	--	--	2	2
3.	25MMXXX35XX	Microcontrollers & Interfacing	3	--	--	3	3
4.	25MMXXX36XX	IOT Architectures & Protocols	3	--	--	3	3
5.	25MMXXX47XX	IOT Application Development	3	--	--	3	3
Total			14	--	--	14	14

Multi-Disciplinary Minor For CSE Department Students(Minor in Electric Vehicle Technology)							
Sr. No.	Course Code	Course Name	L	T	P	H./ W	Credits
1.	25MMXXX23XX	Fundamental of Electric Vehicles	3	--	--	3	3
2.	25MMXXX24XX	Embedded System for EV	2	--	--	2	2
3.	25MMXXX35XX	AI & IOT in Electric Vehicles	3	--	--	3	3
4.	25MMXXX36XX	Autonomous & EV Technology	3	--	--	3	3
5.	25MMXXX47XX	Emerging Trends in EV	3	--	--	3	3
Total			14	--	--	14	14

Multi-Disciplinary Minor For CSE Department Students(Minor in Full Stack Development)

Sr. No.	Course Code	Course Name	L	T	P	H./ W	Credits
1.	25MMXXX23XX	Introduction to web Development	3	--	--	3	3
2.	25MMXXX24XX	Front End development React JS	2	--	--	2	2
3.	25MMXXX35XX	Backend Development with Node Js & express JS	3	--	--	3	3
4.	25MMXXX36XX	Database Management with MongoDB	3	--	--	3	3
5.	25MMXXX47XX	Cloud Deployment for MERN Application	3	--	--	3	3
Total			14	--	--	14	14

Multi-Disciplinary Minor For CSE Department Students(Minor in Mechatronics)

Sr. No.	Course Code	Course Name	L	T	P	H./ W	Credits
1.	25MMXXX23XX	Introduction of Mechatronics	3	--	--	3	3
2.	25MMXXX24XX	Design of Mechatronics	2	--	--	2	2
3.	25MMXXX35XX	Sensor technology	3	--	--	3	3
4.	25MMXXX36XX	Mechatronics in Automotive System	3	--	--	3	3
5.	25MMXXX47XX	Industrial Automation	3	--	--	3	3
Total			14	--	--	14	14



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**

▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**

Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
Tal.& Dist.-Satara.-415 015 (Maharashtra)
▪ Phone : 02162 - 261122 , 200100
▪ e-mail : agcenggsatara@gmail.com
▪ Website :-www.agce.edu.in
▪ Institute Code : Engg. DTE EN-6545

O. Exit Courses:

EXIT COURSE AFTER FIRST YEAR: ONE YEAR UG CERTIFICATION IN COMPUTER SCIENCE AND ENGINEERING										
Sr. No.	Course Code	Course Name	Teaching Scheme					Evaluation Scheme		
			L	T	P	Hr/Wk	Credits	Components	Max	Min for Passing
1	25CSEEX101	Certificate in Foundations of Computer Science & Discrete Mathematics	--	--	4	4	2	CA1	25	20
								MSE	--	
								CA2	25	
2	25CSEEX102	Certificate in Object-Oriented Programming	--	--	4	4	2	CA1	25	20
								MSE	--	
								CA2	25	
3	25CSEEX103	Certificate in Professional Communication & Workplace Etiquette	--	--	8	8	4	CA1	25	20
								MSE	--	
								CA2	25	
Total					16	16	8	Total marks : 150 Total Credit : 08		

EXIT COURSE AFTER SECOND YEAR: TWO YEAR UG DIPLOMA IN COMPUTER SCIENCE AND ENGINEERING										
Sr. No.	Course Code	Course Name	Teaching Scheme					Evaluation Scheme		
			L	T	P	Hr/ Wk	Credits	Components	Max	Min for Passing
1	25CSEEX201	Certificate in Database Systems & Infrastructure (SQL/NoSQL)			4	4	2	CA1	25	20
								MSE		
								CA2	25	
2	25CSEEX202	Certificate in Full-Stack Web Development (MERN Stack)			4	4	2	CA1	25	20
								MSE		
								CA2	25	
3	25CSEEX203	Certificate in Software Engineering Methodologies			8	8	4	CA1	25	20
								MSE		
								CA2	25	
Total					16	16	8	Total marks : 150 Total Credit : 08		



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**
 ▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**
 Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye, Tal.& Dist.-Satara.-415 015 (Maharashtra)
 ▪ Phone : 02162 - 261122 , 200100
 ▪ e-mail : agcenggsatara@gmail.com
 ▪ Website :-www.agce.edu.in
 ▪ Institute Code : Engg. DTE EN-6545

EXIT COURSE AFTER THIRD YEAR: THIRD YEAR BACHELOR’S DEGREE IN VOCATION (B.VOC) IN CSE											
Sr. No.	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
			L	T	P	Hrs./W	Cr	Components	Max	Min for Passing	
1	25CSEEX301	Deep Learning Laboratory	0	0	2	2	1	CA1	15		40
								MSE	20		
								CA2	15		
								ESE	50	20	
2	25CSEEX302	Mejor-Project	--	--	4	4	2	CA1	15		40
								MSE	20		
								CA2	15		
								ESE	50	20	
3	25CSEEX303	Internship	--	--	8	8	4	CA1	25		40
								CA2	25		
								OE	50	20	
Total			--	--	16	16	8		300		

P. Emerging Minor Degree: Cyber Security

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25CSEEM001	Networking Protocol	3	--	--	3	3
2.	25ADSEM002	Network Security	3	--	--	3	3
3	25ADSEM003	Cryptography	3	--	--	3	3
4.	25ADSEM004	Secure Operating System	3	--	--	3	3
5	25ADSEM005	Ethical Hacking	3	--	--	3	3
6	25ADSEM006	Intrusion Detection and Prevention System (IDPS)	3	--	--	3	3
Total			18	--	--	18	18



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**

▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**

Approved by AICTE, New Delhi. Recognised by Govt. Of Maha..DTE Mumbai & Affiliated to

▪ Address : At.Panmalewadi, Post.-Varye,
Tal.& Dist.-Satara.-415 015 (Maharashtra)
▪ Phone : 02162 - 261122 , 200100
▪ e-mail : agcenggsatara@gmail.com
▪ Website :-www.agce.edu.in
▪ Institute Code : Engg. DTE EN-6545

Q. Honors Degree: Artificial Intelligence and Data Science

Sr. No.	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	25CSEHS001	Mathematical Foundations for Data Science	3	--	--	3	3
2.	25CSEHS002	Exploratory Data Analysis and Visualization	3	--	--	3	3
3.	25CSEHS003	Predictive Analytics and Machine Intelligence	3	--	--	3	3
4.	25CSEHS004	Deep Learning and Neural Networks	3	--	--	3	3
5.	25CSEHS005	Natural Language Processing and Generative AI	3	--	--	3	3
6	25CSEHS006	MLOps and Big Data Engineering	3			3	3
Total			18	--	--	18	18

Title of the Course: Fundamentals of Data Structures	L	T	P	Credit
Course Code: 25CSE2301	3	--	-	3

COURSE PRE-REQUISITE:

A student should know basic programming (such as C programming language or Python), fundamental mathematics, and problem-solving skills before studying Data Structures.

COURSE DESCRIPTION:

This course explores the fundamental concepts and implementation of core data structures like arrays, lists, trees, and graphs, while equipping students with the ability to evaluate algorithmic efficiency for real-world computational problems

COURSE OBJECTIVES:

- To understand fundamental concepts and implementation of core data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
- To develop the ability to analyze and evaluate algorithm efficiency using time and space complexity.
- To design and implement efficient algorithms using appropriate data structures for real-world problems.
- To apply problem-solving techniques and logical thinking in optimizing computational solutions.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Implement and use various data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
CO2	Describe algorithms using time and space complexity techniques.
CO3	Select appropriate data structures for solving specific computational problems.
CO4	Explain efficient algorithms and apply problem-solving strategies to real-world scenarios.
CO5	Demonstrate understanding of memory utilization and optimize data storage and retrieval mechanisms.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1	3	2	1	-	2	-	-	-	1	-	1
CO2	3	3	2	2	1	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	-	1	-	2
CO4	3	3	3	3	2	-	-	-	1	-	2
CO5	3	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 20%, 30% 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	Fundamentals & Complexity: Introduction to Data Structures & ADT, Algorithm design principles, Time & Space Complexity (Big-O, Big-Theta, Big-Omega), Recursion and applications, Arrays and Strings, Memory representation.	9
2	Linear Data Structures: Arrays: operations and applications, Linked Lists: singly, doubly, circular, Stack: implementation & applications (expression evaluation, recursion), Queue: simple, circular, priority queue, deque, Applications of linear structure.	9
3	Non-Linear Data Structures (Trees): Tree terminology and representation, Binary Trees and traversals, Binary Search Trees (BST), AVL Trees (balancing techniques), Heaps and Priority Queues, Applications of trees.	8
4	Graphs: Graph representation (Adjacency Matrix & List), Traversals: BFS, DFS, Shortest Path Algorithms (Dijkstra's), Minimum Spanning Trees (Prim's, Kruskal's) and Applications of Graphs.	8
5	Searching, Sorting & Hashing: Searching: Linear and Binary Search, Sorting: Bubble, Selection, Insertion, Merge, Quick, Heap Sort, Hashing: hash functions, collision resolution (chaining, probing), Introduction to file structures, Performance comparison of Algorithms.	8

TEXT BOOKS:

Sr. No.	Title	Author	Publisher
1	Data Structures and Algorithms Made Easy	Narasimha Karumanchi	CareerMonk Publications
2	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	MIT Press
3	Data Structures and Algorithms in Python.	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser	Wiley India Pvt. Ltd..
4	Data Structures.	P. Sudarshan, J John Manoj Kumar	CBS Publishers & Distributors
5	Problem Solving with Algorithms and Data Structures Using Python	Bradley N. Miller, David L. Ranum	Franklin, Beedle & Associates

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	MIT Press
2	The Algorithm Design Manual	Steven S. Skiena	Springer
3	Advanced Data Structures	Peter Brass	Cambridge University Press

Resource link like NPEL - <https://nptel.ac.in/courses/NOC18-CS34>

Title of the Course: Discrete Mathematical Structures	L	T	P	Credit
Course Code: 25CSE2302	2	--	-	2

COURSE PRE-REQUISITE: Basic knowledge of mathematics and logical reasoning skills.

COURSE DESCRIPTION: This Course covers basic discrete mathematical concepts and develops logical and problem - solving skills for computer science applications.

COURSE OBJECTIVES:

By the end of this course, the students will be able to:

- To develop logical and analytical thinking required for solving computational problems.
- To introduce fundamental concepts of discrete structures such as sets, relations and functions.
- To enable students to apply counting techniques and combinatorial methods in problem solving.
- To provide knowledge of graph theory and trees for applications in computer science and data structures.
- To familiarize students with algebraic structures and Boolean algebra used in digital systems.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Apply concepts of sets and propositional logic to solve problems
CO2	Use functions and relations for problem modeling
CO3	Solve problems using counting techniques and recurrence relations
CO4	Apply graph theory and tree concepts in computational problems
CO5	Understand algebraic structures and Boolean algebra concepts

CO-PO Mapping:

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

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	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	Fundamental Structures and Logic: Sets, Venn diagrams, Cartesian product, propositional logic, Logical connectives, Truth tables, Normal forms, Predicate logic (basic concepts only)	09
2	Functions and Relations : Properties of Binary Relations, Injective, Subjective, Bijective functions, Composition of function, Relations, Reflexivity, Symmetry, Transitivity, Equivalence relations,	08
3	Combinatorics: Basic counting techniques (Permutations, Combinations), Simple recurrence relations, the principles of Inclusion – Exclusion. Pigeon hole principles and its application.	07
4	Graph Theory and Trees: Basic graph terminology, Isomorphism and Sub graphs, Paths, Circuits, Euler path, Graph representation, Trees: Basic Concepts, Binary trees, Spanning trees.	09
5	Algebraic Systems: Groups (basic definition and examples), Semigroups, Monoids, Boolean algebra	07

TEXT BOOKS:

Sr. No.	Title	Author	Publisher
1	Elements of Discrete Mathematics	C.L. Liu	McGraw-Hill Publication
2	Discrete Mathematics and its Applications	Kenneth H. Rosen	McGraw-Hill Publication
3	Discrete Mathematical Structures	Y. N. Singh	Wiley Publication
4	Graph Theory with Applications	Dr. Sukhendu Dey	SPD Publication

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1	Discrete mathematics	Lipschutz Lipson	McGraw- Hill
2	Schaum's Outline of Graph Theory	V. K. Balakrishnan	McGraw- Hill
3	Discrete mathematics with Proof	Eric Gossett	Wiley Publication

Title of the Course: Operating System	L	T	P	Credit
Course Code: 25CSE2303	2	--	--	2

COURSE Pre-Requisite: The prerequisite for this course is prior knowledge of Computer Architecture and Organization.

COURSE DESCRIPTION:

Introduction to Operating Systems is a graduate-level introductory course in operating systems. This course teaches basic operating system abstractions, mechanisms, and their implementations. The core of the course focuses on OS support for concurrency (threads) and synchronization, resource management (CPU, memory, I/O), and distributed services

COURSE OBJECTIVES:

- Understand basic concepts of Operating Systems.
- Understand process life-cycle and CPU scheduling algorithms.
- Apply memory management strategies.
- Understand file System concepts, protection and security.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Build the basic knowledge of operating systems.
CO2	Make use of the CPU Scheduling Algorithms and Memory Management strategies.
CO3	Apply the file management concepts along with protection and security features.
CO4	Make use of the knowledge of storage devices for disk management.
CO5	Understand the architecture of file systems and mass-storage structures, and analyze security mechanisms implemented to protect system resources.

CO-PO MAPPING:

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

ASSESSMENT SCHEME:

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

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

ASSESSMENT DETAILS:

- **CA1** and **CA2** are based on 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	Introduction and Operating system: Introduction to Operating System (OS), Functions of OS, Types of OS, OS Concepts: Process, Files, Shell and its types, System calls, Kernel and its types, Introduction to Virtual Machine, Case Study of introduction to UNIX Operating System.	08
2	Processes and CPU Scheduling: Process Concept, Operations on Processes: Creation and Termination, States Transition and Context Switching, Scheduling Criteria, Scheduling Algorithm, First-Come First-Serve (FCFS), Shortest Job First (SJF), Round-Robin (RR), Introduction to Threads and Benefits, Comparison of Thread and Process, Case Study of UNIX Process Management.	08
3	Process Synchronization: The critical-section problem, Critical regions, Peterson 's Solution, Synchronization Hardware, Semaphores, Classical Problems of synchronization, and Monitors Deadlocks: Systems Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined approach to deadlock Handling.	08
4	Memory Management: Memory Management Contiguous and Non-Contiguous Memory, Swapping, Paging, Segmentation, Comparison of Paging and Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms First-In First-Out (FIFO), Least Recently Used (LRU), Optimal, Trashing, Case Study of UNIX memory management.	08
5	File Management: File Concepts, File Attributes, File Operations, File Types, File Sharing, File Structure, Allocation Methods, Types of Users, Access Modes, Directory Overview, Types of Directories, Introduction to Protection and Security, Case Study of UNIX File Structure.	08

TEXT BOOKS:

Sr. No	Title	Author	Publisher
1	Operating System Concepts	Abraham Silberschatz, Peter B. Galvin and Greg Gagne	Wiley publication, 8th Edition, 2008.
2	Operating System-Internals and Design Principles	William Stallings	Prentice Hall India, (5/e) ISBN: 81-297-0 1 094-3
3	Modern Operating Systems	Andrew S. Tanenbaum	Prentice Hall India, (4/e), ISBN: 81-203- 2063

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1	Modern Operating System	Andrew S. Tanenbaum	PHI Publication, 4th Edition, 2015.
2	Systems Programming and Operating Systems	M. Dhamdhare	McGraw-Hill, 2nd Edition, 1996.
3	Operating Systems Concept	Garry Nutt	Pearson Publication, 3rd Edition, 2003
4	An Introduction to Operating Systems	Harvey M. Deitel	Addison Wesley Publication,
5	Operating System in Depth: Design and Programming	Thomas W. Doeppner	Wiley Publication, 2011.

CERTIFICATION COURSES:

Sr. No.	Course/Certification	Provider/Platform	Level	Mode	Certification Authority
1	Operating Systems and You: Becoming a Power User	Google	UG	Online	Google
2	Operating System Fundamentals	https://onlinecourses.nptel.ac.in/noc24_cs108/preview	UG	Online	NPTEL

Title of the Course: Computer Architecture and Organization	L	T	P	Credit
Course Code: 25CSE2304	3	--	--	3

COURSE PRE-REQUISITE: Digital Electronics / Computer Basics.

COURSE DESCRIPTION:

This course provides a comprehensive introduction to the internal structure and organization of a modern digital computer. It focuses on the functional units, instruction set architecture, and the interaction between hardware and software. Topics include CPU structure, integer and floating-point arithmetic, memory hierarchy (including cache and virtual memory), and I/O organization. The course aims to help students understand how performance is optimized through design.

COURSE OBJECTIVES:

- To understand the basic hardware components and functional units of a computer system.
- To describe the instruction set architecture, including addressing modes and instruction formats.
- To explain computer arithmetic techniques for integer and floating-point representations.
- To comprehend memory management, hierarchy, and data transfer techniques such as DMA.
- To study the operation of control units, I/O interfaces, and the basic concept of pipelining.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO 1	Explain the basic structure, functional units, and working of a computer system.
CO 2	Describe instruction set architecture, addressing modes, and instruction execution process.
CO 3	use number representation techniques and perform basic computer arithmetic operations.
CO 4	Explain memory organization, cache, and data transfer mechanisms in a computer system.
CO 5	Describe control unit operations, I/O organization, and basic pipelining concepts.

CO-PO MAPPING:

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

ASSESSMENT SCHEME:

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

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

ASSESSMENT DETAILS:

- CA1 and CA2 are based on 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 MS

COURSE CONTENTS:

Unit No.	Unit Title and Contents	Hours
1	Introduction to Computer Organization: Concept of Computer Organization and Architecture, Functional Units of Computer, Basic Operational Concepts, CPU Structure and Functions, Register Organization basics, Bus Structure and Interconnection.	08
2	Instruction Set Architecture (ISA): Instruction Cycle, Types of Instructions and Operands, Addressing Modes, Instruction Format basics, Instruction Execution, Introduction to RISC and CISC.	08
3	Computer Arithmetic: Integer Representation (Sign, 1's & 2's Complement), Basic Arithmetic Operations (Add/Subtract), Multiplication and Division, Floating Point Representation (IEEE 754 – basic idea), Arithmetic Logic Unit (ALU).	08
4	Memory Organization: Memory System Overview, RAM and ROM Types, Basic Cache Memory concept, Memory Hierarchy, Introduction to Virtual Memory, Direct Memory Access concept (DMA)	08
5	Control Unit and I/O Organization: Control Unit: Micro-operations basics, Hardwired Control Unit, Introduction to Micro programmed Control Unit Input / Output Organization: I/O Devices and Interfaces, Programmed I/O, Interrupt-Driven I/O, DMA (concept), Bus Structure and Arbitration, Pipelining: Basic Concept of Pipelining, Simple Pipeline Example.	08

TEXTBOOKS:

Sr. No.	Title	Author	Publisher
1	Computer Organization and Architecture: Designing for Performance	William Stallings	Pearson / Prentice Hall, 8th Edition, 2009

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1	Computer Organization and Embedded Systems	Carl Hamacher et al.	McGraw-Hill
2	Computer Architecture and Organization	John P. Hayes	McGraw-Hill
3	Computer System Architecture	Morris Mano	Pearson
4	Digital Electronics	Floyd and Jain	Pearson

Online Chapters:

William Stallings – Computer Organization and Architecture
<http://williamstallings.com/COA/COA8e.html>

CERTIFICATION COURSES:

Sr. No.	Course/Certification	Provider/Platform	Level	Mode	Certification Authority
1	Computer Architecture and Organization	https://onlinecourses.nptel.ac.in/noc25_cs154/preview	UG	Online	NPTEL
2	Digital System Design	https://nptel.ac.in/courses/117105080/	UG	Online	NPTEL

Title of the Course: Enhancing Soft Skills and Personality	L	T	P	Credit
Course Code: 25OE2301	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	PO11
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 20%, 30% 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	Author	Publisher
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	Author	Publisher
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	L	T	P	Credit
Course Code: 25OE2302	2	-	-	2

Course Pre-Requisite:

- Basic communication and comprehension skills.
- Awareness of social and professional responsibilities.
- Fundamental understanding of engineering disciplines.
- Interest in ethical, environmental, and societal issues.
- 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 Objectives:

- To develop ethical awareness and professional responsibility among engineering students.
- To understand the impact of engineering decisions on society and the environment.
- To cultivate ethical decision-making skills in professional practice.
- To promote sustainable and socially responsible engineering solutions.

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	PO11
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 20%, 30% 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	Author	Publisher
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	Author	Publisher
1	Engineering Ethics: Concepts and Cases	Charles E. Harris Jr	Cengage Learnin
2	Ethics, Technology and Engineering	Ibo van de Poel & Lambèr Royakkers	Wiley-Blackwel
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	L	T	P	Credit
Course Code: 25OE2303	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	Author	Publisher
1	Project Management: The Managerial Process	Clifford F. Gray, Erik W. Larson	McGraw-Hill Education

Reference Books:

Sr.No	Title	Author	Publisher
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: Constitution of India	L	T	P	Credit
Course Code: 25CSE2307	1	--	--	1

COURSE PRE-REQUISITE: Basic understanding of civics and social sciences.

COURSE DESCRIPTION: This course introduces students to the fundamental principles and philosophy of the Indian Constitution. It aims to create awareness about constitutional values, rights, duties, governance structures, and the role of citizens in a democratic nation. The course emphasizes legal literacy, constitutional morality, and responsible citizenship essential for engineers in society.

COURSE OBJECTIVES:

- To introduce students to the basic framework, philosophy, and evolution of the Constitution of India.
- To create awareness about Fundamental Rights, Duties, and Directive Principles and their relevance in modern society.
- To familiarize students with the structure and functioning of Union, State, and Local Governments.
- To develop an understanding of constitutional provisions related to equality, freedom, and justice.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to :-
CO1	Understand the concept of Constitution and constitutionalism.
CO2	Describe the historical development of the Indian Constitution.
CO3	Explain fundamental rights, duties, and directive principles.
CO4	Analyze the structure and functioning of Indian government.

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	0	0	0	0	0	1	0	2	2	1	1
CO2	0	0	0	0	0	2	0	3	3	3	0
CO3	0	0	0	0	0	3	0	2	2	1	2
CO4	0	0	0	0	0	2	3	2	1	0	0

ASSESSMENT SCHEME:

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

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

ASSESSMENT DETAILS:

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

COURSE CONTENTS:

Unit No.	Contents	Hours
1	Meaning of the constitution law and constitutionalism, Historical perspective of the Constitution of India	05
2	Salient features and characteristics of the Constitution of India, Scheme of the fundamental rights, The scheme of the Fundamental Duties and its legal status	05
3	The Directive Principles of State Policy – Its importance and implementation, Federal structure and distribution of legislative and financial powers between the Union and the States, Parliamentary Form of Government in India – The constitution powers and status of the President of India.	05
4	Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, Scheme of the Fundamental Right to Equality, Scope of the Right to Life and Personal Liberty under Article 21.	05

TEXT BOOKS:

Sr. No.	Title	Author
1	Introduction to the Constitution of India.	D.D. Basu
2	The Constitution of India	P.M. Bakshi

REFERENCE BOOKS:

Sr. No.	Title	Author
1	Indian Polity,	M. Laxmikanth
2	Our Constitution	Subhash Kashyap
3	The Indian Constitution: Cornerstone of a Nation	Granville Austin

Title of the Course: Modern Indian Language - Marathi	L	T	P	Credit
Course Code: 25AEC2001	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 OBJECTIVES:

- मराठी भाषेचा ऐतिहासिक प्रवास, तिच्या निर्मितीतील संस्कृत, प्राकृत आणि अपभ्रंश भाषांचा प्रभाव समजून घेणे.
- मराठी लेखनाचे नियम, व्याकरण व शुद्धलेखन यांची अचूकता आत्मसात करणे.
- समजशील आणि औपचारिक लेखन कौशल्ये विकसित करणे.
- भाषांतर तत्त्वे, प्रक्रिया आणि सांस्कृतिक संदर्भांचा विचार करून मराठीतून इंग्रजी आणि इंग्रजीतून मराठी भाषांतर करण्याचे कौशल्य प्राप्त करणे.

COURSE OUTCOMES:

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 सर्जनशील, 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	-
CO2	2	2	-	-	-	1	-	-	1	3	-
CO3	3	3	-	-	-	-	-	-	-	2	-
CO4	2	3	-	-	-	1	-	-	1	3	-
CO5	2	2	-	-	-	1	-	-	-	3	-

ASSESSMENT SCHEME:

Two components of Continuous Assessment (CA1 & CA2)

Assessment Component	Marks
CA1	25
MSE	-
CA2	25
ESE	-

ASSESSMENT DETAILS:

- CA1 and CA2 are based on Assignment/Surprise test/Quiz/Seminar/Group discussions/presentation,

COURSE CONTENTS:

Unit No.	Contents	Hours
1	मराठीचा उगम आणि विकास: मराठीचा उगम आणि विकास, भाषा आणि व्यक्तिमत्त्व विकास : सहज संबंध, भाषिक कौशल्य विकास : नैसर्गिक आकलनासह	04
2	मराठी लेखनाचे नियम आणि व्याकरण: संधी, वाक्यप्रकार (विधानार्थ वाक्य, प्रश्नार्थ वाक्य, आज्ञार्थ वाक्य इ.), विरामचिन्हे आणि त्यांचे उपयोग, शुद्धलेखन, समानार्थी शब्द (पर्यायवाची शब्द), विरुद्धार्थी शब्द.	03
3	लेखन कौशल्य : लेखन कौशल्याचा परिचय, 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 : एक वाङ्मयप्रकार – कथा : संकल्पना व स्वरूप, कथेचे घटक आणि मराठी कथेची वाटचाल हे कथा या वाङ्मयप्रकाराच्या अभ्यासातील महत्त्वाचे घटक आहेत.	03

TEXT BOOKS:

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

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
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: Fundamentals of Data Structure Laboratory	L	T	P	Credit
Course Code: 25CSE2301L	--	--	2	1

COURSE PRE-REQUISITE: A student should know basic programming (such as C programming language or Python), fundamental mathematics, and problem-solving skills before studying Data Structures.

COURSE DESCRIPTION: This course explores the fundamental concepts and implementation of core data structures like arrays, lists, trees, and graphs, while equipping students with the ability to evaluate algorithmic efficiency for real-world computational problems.

COURSE OBJECTIVES:

- To understand fundamental concepts and implementation of core data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
- To develop the ability to analyze and evaluate algorithm efficiency using time and space complexity.
- To design and implement efficient algorithms using appropriate data structures for real-world problems.
- To apply problem-solving techniques and logical thinking in optimizing computational solutions.
- To understand memory management and data organization for efficient data storage and retrieval.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Students will be able to implement and use various data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
CO2	Students will be able to analyze algorithms using time and space complexity techniques.
CO3	Students will be able to select appropriate data structures for solving specific computational problems.
CO4	Students will be able to design efficient algorithms and apply problem-solving strategies to real-world scenarios.
CO5	Students will be able to demonstrate understanding of memory utilization and optimize data storage and retrieval mechanisms.

CO-PO MAPPING:

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

ASSESSMENT SCHEME:

Two components of Continuous Assessment (CA-1, CA-2),

Assessment Component	Marks
CA1	25
CA2	25
POE	50

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	Array Operations: Write a C++ program to perform insertion, deletion, and traversal on arrays (lists).	2
2	Stack Implementation: Implement a stack using C++ list and perform push, pop, and peek operations.	2
3	Queue Implementation: Implement a queue using list and perform enqueue and dequeue operations.	2
4	Circular Queue: Implement circular queue and demonstrate overflow and underflow conditions.	2
5	Linked List: Implement singly linked list with operations: insertion, deletion, and display.	2
6	Doubly Linked List: Implement doubly linked list and perform forward and backward traversal.	2
7	Tree Traversals: Create a binary tree and implement in order, preorder, and post order traversal.	2
8	Binary Search Tree (BST): Implement BST with insertion, deletion, and searching operations.	2
9	Sorting Algorithms: Implement Bubble Sort, Selection Sort, and Merge Sort and compare performance.	2
10	Graph Traversal: Implement graph using adjacency list and perform BFS and DFS traversal.	2

TEXT BOOKS:

Sr. No.	Title	Author	Publisher
1	Data Structures and Algorithms Made Easy	Narasimha Karumanchi	CareerMonk Publications
2	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	MIT Press
3	Data Structures and Algorithms in Python.	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser	Wiley India Pvt. Ltd..
4	Data Structures.	P. Sudarshan, J John Manoj Kumar	CBS Publishers & Distributors
5	Problem Solving with Algorithms and Data Structures Using Python	Bradley N. Miller, David L. Ranum	Franklin, Beedle & Associates

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	MIT Press
2	The Algorithm Design Manual	Steven S. Skiena	Springer
3	Advanced Data Structures	Peter Brass	Cambridge University Press

Resource link like NPEL - <https://nptel.ac.in/courses/NOC18-CS34>

Title of the Course: Operating Systems Laboratory	L	T	P	Credit
Course Code: 25CSE2303L	--	--	2	1

COURSE PRE-REQUISITE: Fundamental knowledge of programming in C, C++, Java, or Python.

COURSE DESCRIPTION:

This is one of the core courses of the Computer Science & Engineering. In this course you will become familiar with the core concepts of OS - how OS works, how processes & threads are created, inter-process communication & synchronization, the various scheduling algorithms, memory management & memory allocation strategies, etc.

COURSE OBJECTIVES:

- To write programs in Linux environment using system calls
- To implement the scheduling algorithms.
- To implement page replacement algorithms.
- To implement file allocation methods.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Design and implement programs using system calls with process & thread management
CO2	Implement process/thread synchronization mechanism to prevent race conditions
CO3	Apply the concepts of inter-process communication in practical ways.
CO4	Write programs to evaluate the performance of various scheduling, page replacement & disk scheduling algorithms

CO-PO MAPPING:

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

ASSESSMENT SCHEME:

Two components of Continuous Assessment (CA-1, CA-2), having 50% weightage for each component respectively.

Assessment Component	Marks
CA1	25
CA2	25
OE	50

- CA1 AND CA2 based on 50% of course content, attendance, lab overall performance.
- OE based on 100% of course content, attendance, lab overall performance.

COURSE CONTENTS:

Expt. No.	Practical Title and Contents	Hours
1	Process Management System Calls - fork (), exit (), exec (), wait (), waitpid(), getpid(), getppid().	2
2	Thread Management POSIX threads. pthread_create(), pthread_join(), pthread_exit(), pthread_self().	2
3	Process Scheduling Evaluate performance of scheduling algorithms-FCFS, SJF, SRTN, RR, Priority Scheduling in terms of turnaround time, response time.	2
4	Process Synchronization Inter-process Synchronization using semaphores.	2
5	Classical problems of Process Synchronization Classical problems of Synchronization-Bounded Buffer, Dining Philosophers Problem, and The Reader and Writer Problem.	2
6	Inter-process Communication Inter-process Communication using pipes, shared memory, and message passing	2
7	Banker's Algorithm to find a safe sequence of process execution.	2
8	Implementation of naming algorithm conversion of pathname to inode.	2

TEXT BOOKS:

Sr. No.	Title	Edition	Author/s	Publisher	Year
1	Operating System Concepts	8	Abraham Silberschatz, Peter B. Galvin and Greg Gagne	Wiley publication, 8th Edition, 2008.	2008
2	Operating System-Internals and Design Principles	5	William Stallings	Prentice Hall India, (5/e) ISBN: 81-297-0 1 094-3	-
3	Modern Operating Systems	4	Andrew S. Tanenbaum	Prentice Hall India, (4/e), ISBN: 81-203-2063	-

REFERENCE BOOKS:

Sr. No.	Title	Edition	Author/s	Publisher	Year
1	Modern Operating System	4	Andrew S. Tanenbaum	PHI Publication, 4th Edition, 2015.	2015
2	Systems Programming and Operating Systems	2	D. M. Dhamdhare	McGraw-Hill, 2nd Edition, 1996.	1996
3	Operating Systems Concept	3	Garry Nutt	Pearson Publication, 3rd Edition, 2003	2003

Title of the Course: Technical Seminar	L	T	P	Credit
Course Code: 25CSE2309	–	--	02	1

COURSE PRE-REQUISITE: students must possess a basic understanding of core concepts within their academic program to effectively identify and explore emerging trends or interdisciplinary topics in engineering and technology.

COURSE DESCRIPTION: This Seminar course is designed to empower students to explore and present on emerging trends or interdisciplinary topics in engineering and technology that directly align with expected industry outcomes. Tailoring the experience to their unique aptitudes, students will independently select a theme and finalize it with a faculty mentor to investigate the logic development behind the practical industry applications of various technologies. The course emphasizes effective technical communication by requiring students to utilize appropriate software tools to prepare detailed write-ups and deliver formal presentations. Additionally, it serves as a critical foundation for real-world application through a project initiation phase, where students form small batches to adopt an inquiry-driven approach, identify specific program-related problem statements, propose solutions, and assess both their practical feasibility

COURSE OBJECTIVES:

- To encourage students to explore emerging trends or interdisciplinary themes in engineering and technology, and effectively present their findings using relevant software tools
- To foster an inquiry-driven approach that allows students to understand the logic behind practical industry applications, identify specific problem statements, and evaluate the practical feasibility.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to :-
CO1	list emerging trends and interdisciplinary approaches to select a seminar theme that aligns with expected industry outcomes.
CO2	analyze the logic development behind the practical industry applications of various technologies and processes.
CO3	develop detailed write-ups and deliver formal presentations utilizing appropriate software tools.
CO4	identify problem statements and to decide the solution by assessing its practical feasibility.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	3	1	1	0	1	3	1	0
CO2	3	3	2	2	1	2	0	0	1	2	0
CO3	1	0	0	0	3	0	0	1	2	3	0
CO4	2	3	3	2	1	2	1	1	3	2	3

ASSESSMENT SCHEME:

Two components of Continuous Assessment CA1 & CA2

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

ASSESSMENT DETAILS:

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

GUIDELINES FOR SEMINAR:

- 1. Align with Emerging Trends & Industry Needs** The seminar topic must focus on emerging trends in engineering and technology, or adopt an interdisciplinary/multidisciplinary approach. The chosen theme must directly align with the expected industry outcomes of your academic program.
- 2. Select a Theme Based on Individual Strengths** Because every student has unique aptitudes, you are required to independently choose a seminar Title (Theme) that best matches your personal strengths, skills, and interests.
- 3. Finalize the Title with a Faculty Mentor** You cannot finalize your seminar topic in isolation. Your selected title must be discussed, reviewed, and officially approved in consultation with your assigned faculty mentor.
- 4. Focus on Logic and Industry Application** The core content of your seminar must go beyond theory; it must actively involve the logic development behind how various technologies and processes are practically applied within the industry.
- 5. Work Individually, Present Collaboratively** The seminar is strictly an individual assignment. However, while you are solely responsible for the research and content, you are permitted to seek logistical or operational support from other students during the actual presentation.
- 6. Utilize Relevant Tools and Prepare Write-ups** You must prepare your presentation using appropriate software tools relevant to your topic. Additionally, you are required to draft detailed write-ups to accompany and support your presentation.
- 7. Submit Both Hard and Soft Copies** Upon completion of your seminar preparation, you must submit exactly one physical (hard) copy and one digital (soft) copy of your final presentation materials.
- 8. Record Your Presentation** While not strictly mandatory, it is highly encouraged that you keep a recorded video or audio copy of the presentation you make during the live seminar for future reference.

Title of the Course: Data Structures & Algorithms	L	T	P	Credit
Course Code: 25MMCSE2301	2	--	-	2

COURSE PRE-REQUISITE:

A student should know basic programming (such as C programming language or Python), fundamental mathematics, and problem-solving skills before studying Data Structures.

COURSE DESCRIPTION:

This course explores the fundamental concepts and implementation of core data structures like arrays, lists, trees, and graphs, while equipping students with the ability to evaluate algorithmic efficiency for real-world computational problems

COURSE OBJECTIVES:

- To understand fundamental concepts and implementation of core data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
- To develop the ability to analyze and evaluate algorithm efficiency using time and space complexity.
- To design and implement efficient algorithms using appropriate data structures for real-world problems.
- To apply problem-solving techniques and logical thinking in optimizing computational solutions.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	implement and use various data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
CO2	describe algorithms using time and space complexity techniques.
CO3	select appropriate data structures for solving specific computational problems.
CO4	explain efficient algorithms and apply problem-solving strategies to real-world scenarios.
CO5	demonstrate understanding of memory utilization and optimize data storage and retrieval mechanisms.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	-	2	-	-	-	1	-	1
CO2	3	3	2	2	1	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	-	1	-	2
CO4	3	3	3	3	2	-	-	-	1	-	2
CO5	3	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 20%, 30% 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	Fundamentals & Complexity: Introduction to Data Structures & ADT, Algorithm design principles, Time & Space Complexity (Big-O, Big-Theta, Big-Omega), Recursion and applications, Arrays and Strings, Memory representation.	9
2	Linear Data Structures: Arrays: operations and applications, Linked Lists: singly, doubly, circular, Stack: implementation & applications (expression evaluation, recursion), Queue: simple, circular, priority queue, deque, Applications of linear structure.	9
3	Non-Linear Data Structures (Trees): Tree terminology and representation, Binary Trees and traversals, Binary Search Trees (BST), AVL Trees (balancing techniques), Heaps and Priority Queues, Applications of trees.	8
4	Graphs: Graph representation (Adjacency Matrix & List), Traversals: BFS, DFS, Shortest Path Algorithms (Dijkstra's), Minimum Spanning Trees (Prim's, Kruskal's), Applications of Graphs.	8
5	Searching, Sorting & Hashing: Searching: Linear and Binary Search, Sorting: Bubble, Selection, Insertion, Merge, Quick, Heap Sort, Hashing: hash functions, collision resolution (chaining, probing), Introduction to file structures, Performance comparison of Algorithms.	8

TEXT BOOKS:

Sr. No.	Title	Author	Publisher
1	Data Structures and Algorithms Made Easy	Narasimha Karumanchi	CareerMonk Publications
2	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	MIT Press
3	Data Structures and Algorithms in Python.	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser	Wiley India Pvt. Ltd..
4	Data Structures.	P. Sudarshan, J John Manoj Kumar	CBS Publishers & Distributors
5	Problem Solving with Algorithms and Data	Bradley N. Miller, David L. Ranum	Franklin, Beedle & Associates

	Structures Using Python		
--	-------------------------	--	--

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	MIT Press
2	The Algorithm Design Manual	Steven S. Skiena	Springer
3	Advanced Data Structures	Peter Brass	Cambridge University Press

Resource link like NPEL - <https://nptel.ac.in/courses/NOC18-CS34>

SEM IV

Title of the Course: Object Oriented Programming	L	T	P	Credit
Course Code: 25CSE2401	3	--	-	3

COURSE PRE-REQUISITE: This course requires that the students are familiar with programming language such as C.

COURSE DESCRIPTION: This course introduces students to the paradigm of Object-Oriented Programming (OOP), shifting the focus from procedural logic to data-driven design. Using the Java programming language, students will learn to model real-world problems into modular, reusable, and maintainable software components.

The curriculum covers core OOP pillars—Encapsulation, Inheritance, Polymorphism, and Abstraction—alongside Java-specific features like the Java Virtual Machine (JVM) architecture, Exception Handling, Multithreading, and the Collection Framework. By the end of the course, students will be equipped to design robust applications used in modern software development.

COURSE OBJECTIVES:

- Analyse the differences between procedural and object-oriented programming.
- Implement robust applications using Java syntax and class hierarchies.
- Apply error-handling mechanisms using Java's Exception Handling framework.
- Develop multi-threaded applications to handle concurrent tasks.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Explain the fundamental principles of object-oriented programming, including encapsulation and abstraction, as well as basic Java elements and the Java Virtual Machine (JVM) environment.
CO2	Apply inheritance, polymorphism, and method overloading or overriding, along with arrays and strings, to write reusable Java code.
CO3	Design modular applications by integrating abstract classes, interfaces, user-defined packages, and Java Collection Framework elements like ArrayList and HashSet.
CO4	Develop robust programs by implementing effective error-handling mechanisms using try, catch, throw, throws, and finally keywords.
CO5	Construct multithreaded applications to execute concurrent tasks by managing thread creation, thread management, and thread life cycles.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	0	2	0	0	0	0	0	0
CO2	3	3	2	0	1	0	0	0	0	0	0
CO3	2	2	3	0	2	0	0	0	0	0	0
CO4	2	2	3	1	1	0	0	0	0	0	0
CO5	2	2	3	2	1	0	0	0	0	0	0

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	15
MSE	20
CA2	15
ESE	50

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

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 Object Oriented Programming: class, objects, Features of Java, Command line arguments. Programming Elements -Data Types, Class, Object, Constructor, Inheritance, Polymorphism, Encapsulation, Abstraction, Constructor, The Java Programming Environment- JVM	08
2	Polymorphism and Inheritance: Static method, This Keyword, function overloading, String, Arrays in Java, Types of Inheritance, base class, derived class, access specifiers, Method Overriding.	08
3	Abstract class Interfaces and Packages: Abstract class, interfaces, runtime polymorphism, creating and importing packages, Java collection Framework-Array List, HashSet,	08
4	Exception Handling: Errors and Exceptions, Types of Exceptions try, catch, throw, throws and finally Keyword, Building Exceptions. Handling Arithmetic Exceptions and Input Mismatch Exceptions, when to use exception handling, Java exception hierarchy, finally block. Java Iterator Methods Parametrized classes in Java.	08
5	Multithreading: Thread Creation and Management, Process vs Thread, Benefits of multithreading, Life cycle of a thread. Runnable Interface and Thread Class, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Thread States, Thread Properties, Joins, Synchronization	08

TEXT BOOKS:

Sr. No	Title	Author	Publisher
1	JAVA Complete Reference	Herbert Schildt	Tata McGraw Hill, (12th Edition)
2	Thinking in Java	Eckel B.	Pearson Education, (4th Edition)
3	Java: An Introduction to Problem Solving and Programming	Walter Savitch	Pearson Education.

REFERENCE BOOKS:

Sr. No	Title	Author	Publisher
1	Headfirst Java	Kathy Sierra & Bert Bates	O'reilly publication, (2nd Edition) (2009)
2	Beginning Programming with Java for Dummies	Barry Burd	O'reilly publication, (5th Edition) (2017)
3	Java How to program	Paul Deital and Harvey Deital	Prentice Hall Publication, (11th Edition)
4	The Complete Reference JAVA	Herbert Schildt	4th Edition, McGraw Hill

Title of the Course: Database System	L	T	P	Credit
Course Code: 25CSE2402	3	--	--	3

COURSE PRE-REQUISITE:

A student should know basic programming logic, fundamental set theory and discrete mathematics, and basic file handling concepts before studying Database Management Systems.

COURSE DESCRIPTION:

This course provides a comprehensive introduction to the design, implementation, and management of database systems. It covers the core principles of conceptual modeling, relational database design, query languages (SQL), transaction processing, concurrency control, and storage architectures. Students will learn how to transform real-world data requirements into secure, optimized, and scalable relational databases, while also gaining a foundational overview of modern NoSQL technologies.

COURSE OBJECTIVES:

- To understand the fundamental concepts, architecture, and applications of Database Management Systems (DBMS). To develop the ability to analyze and evaluate algorithm efficiency using time and space complexity.
- To develop the ability to design conceptual data models using Entity-Relationship (ER) diagrams and map them to relational schemas.
- To design, write, and optimize complex database queries using Structured Query Language (SQL) and Relational Algebra.
- To apply normalization techniques to ensure database integrity, minimize redundancy, and optimize data storage.
- To understand transaction management, concurrency control protocol, database recovery techniques, and modern storage architectures.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Implement and use relational databases, schemas, and integrity constraints to model real-world data.
CO2	Analyze relational expressions and synthesize complex data retrieval requests using SQL and Relational Algebra.
CO3	Select appropriate normalization forms and decomposition techniques to design efficient, anomaly-free database schemas.
CO4	Design robust transaction strategies and apply concurrency control and recovery mechanisms to maintain data consistency.
CO5	Demonstrate understanding of indexing, storage structures, and alternative data models like NoSQL for optimized database performance.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	-	2	-	-	-	1	-	1
CO2	3	3	2	2	1	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	-	1	-	2
CO4	3	3	3	3	2	-	-	-	1	-	2
CO5	3	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 20%, 30% 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	Unit 1: Introduction & Conceptual Data Modeling : Introduction to DBMS, Purpose of Database Systems, View of Data, Data Models, Database Architecture (Three-Schema Architecture), Data Independence. Entity-Relationship (ER) Model: Entities, Attributes, Relationships, Constraints, Keys (Primary, Foreign, Candidate). Extended ER features (Generalization, Specialization, Aggregation), Converting ER Diagrams to Relational Schemas.	9
2	Unit 2: Relational Model & Structured Query Language (SQL) : Relational Model Concepts, Integrity Constraints. Relational Algebra: Core Operators (Select, Project, Join, Set Operations). SQL Fundamentals: DDL (Data Definition Language) and DML (Data Manipulation Language). Advanced SQL: Joins, Nested Queries, Subqueries, Aggregate Functions, Views, Triggers, and Stored Procedures.	9
3	Unit 3: Relational Database Design & Normalization : Database Design Pitfalls, Functional Dependencies, Closure of a Set of Functional Dependencies, Canonical Cover. Normalization Forms: First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF), Boyce-Codd Normal Form (BCNF). Dependency Preservation and Lossless-Join Decomposition.	8
4	Unit 4: Transaction Management & Concurrency Control : Transaction Concepts, ACID Properties, Transaction States. Concurrency Control: Lock-Based Protocols (Two-Phase Locking - 2PL), Timestamp-Based Protocols, Deadlock Handling (Prevention, Detection, Recovery). Database Recovery Management: Failure Classification, Recovery Algorithms (Log-Based Recovery, Checkpoints).	8
5	Unit 5: Storage, Indexing & Modern Databases : File Organization and Storage Structures, Indexing Concepts: Primary and Secondary Indexing, B-Trees and B+ Trees Indexing, Hashing in Databases. Performance Tuning & Query Optimization Basics. Introduction to Distributed Databases and NoSQL Databases (Key-Value, Document-oriented, Column-family, Graph data models).	8

TEXT BOOKS:

Sr. No.	Title	Author	Publisher
1	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	McGraw-Hill Education
2	Fundamentals of Database	SystemsRamez Elmasri, Shamkant B. Navathe	Pearson Education
3	Database Management	SystemsRaghu Ramakrishnan, Johannes	GehrkeMcGraw-Hill
4	Database Systems: A Practical Approach to Design, Implementation, and Management	Thomas Connolly, Carolyn Begg	Pearson

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1	An Introduction to Database Systems	C.J. Date	Addison-Wesley
2	Database Systems: Design, Implementation, & Management	Carlos Coronel, Steven Morris	Cengage Learning

Resource link like NPEL - <https://nptel.ac.in/courses/106105175>

Title of the Course: Probability and Statistics	L	T	P	Credit
Course Code: 25CSE2403	3	--	--	3

COURSE PRE-REQUISITE: A student should know basic programming (such as C programming language or Python), fundamental mathematics, and problem-solving skills before studying Data Structures.

COURSE DESCRIPTION: Probability Theory course is a strong foundation in discrete mathematics.

COURSE OBJECTIVES:

- To introduce the fundamental concepts of probability and random variables.
- To develop the ability to analyze and solve problems involving probability distributions.
- To understand basic statistical measures and their applications in engineering.
- To apply sampling methods and statistical techniques for data analysis.
- To enable interpretation of data using correlation, regression, and hypothesis testing.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Solve statistical engineering problems by computing probabilities using addition and multiplication theorems, conditional probability, and Bayes' theorem.
CO2	Compute the mathematical expectation, variance, and standard deviation for discrete and continuous random variables utilizing PMF, PDF, and CDF functions.
CO3	Demonstrate the properties of Binomial, Poisson, and Normal distributions to calculate probabilities for specific engineering applications.
CO4	Summarize datasets by measuring central tendency and dispersion, and estimate population parameters using appropriate sampling methods and confidence intervals.
CO5	Compute Z-test and t-test statistics to validate hypotheses

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	-	2	-	-	-	1	-	1
CO2	3	3	2	2	1	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	-	1	-	2
CO4	3	3	3	3	2	-	-	-	1	-	2
CO5	3	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 20%, 30% 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.

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	Probability Basics: Random experiment, sample space, events, Types of probability (classical, empirical, axiomatic), Addition and multiplication theorems, Conditional probability, Bayes' theorem	8
2	Random Variables & Expectation: Discrete and continuous random variables, PMF, PDF, CDF, Mathematical expectation, Variance and standard deviation, Joint and marginal distributions	8
3	Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Basic properties and applications.	8
4	Descriptive Statistics & Sampling: Measures of central tendency (mean, median, mode), Measures of dispersion (variance, standard deviation), Skewness (basic idea) Sampling methods, Estimation and confidence intervals	8
5	Hypothesis Testing & Regression: Hypothesis testing (Z-test, t-test – basic idea), Errors (Type I & II) Correlation (Karl Pearson), Linear regression	8

TEXT BOOKS:

Sr. No	Title	Author	Publisher
1	Probability and Statistics for Engineers	Richard L. Scheaffer, Madhuri Mulekar, James T. McClave	Cengage Learning
2	Probability, Random Variables and Data Analytics with Engineering Applications	P. Mohana Shankar	Springer
3	Probability and Statistics for Engineering and the Sciences	Leif Ellingson, Anna Panorska	Cengage Learning
4	Introduction to Probability and Statistics for Engineers	Milan Holický	Springer
5	Probability and Statistics for Engineers	Irwin Miller, John E. Freund	Prentice Hall

REFERENCE BOOKS

Sr. No.	Title	Author	Publisher
1	Introduction to Probability and Statistics for Engineers and Scientists	Sheldon M. Ross	Elsevier
2	Applied Statistics and Probability for Engineers	Douglas C. Montgomery, George C. Runger	Wiley
3	Introduction to Mathematical Statistics	Robert V. Hogg, Joseph McKean, Allen T. Craig	Pearson

Add resource link like NPEL - https://nptel.ac.in/courses/NOC24_MA39

Title of the Course: Software Engineering	L	T	P	Credit
Course Code: 25CSE2404	2	--	--	2

COURSE PRE-REQUISITE: Knowledge of Software Engineering Process, Programming Languages.

COURSE DESCRIPTION: This course provides fundamentals of Software Development Life Cycle (SDLC), principles of software engineering practices and introductory concepts of software project management.

COURSE OBJECTIVES:

- **Knowledge of Software Development Lifecycle (SDLC):** Gain a comprehensive understanding of the core phases of software engineering—from initial requirements gathering and architectural design to coding, quality assurance, and long-term system evolution.
- **Evaluate and Apply Process Methodologies:** Develop the critical thinking skills necessary to select and implement the most effective software process models (such as Agile, Waterfall, or Iterative) based on specific project constraints, industry demands, and environmental factors.
- **Execute Phase-Specific Workflows:** Acquire the practical expertise required to perform technical tasks within each project stage, including structural analysis, system modeling, rigorous testing protocols, and post-deployment maintenance.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Summarize the holistic software engineering lifecycle, identifying critical milestones from initial requirements elicitation through to final beta testing phases.
CO2	Categorize diverse user requirements to compare and contrast various software development life cycle (SDLC) models for the most efficient project alignment.
CO3	Write Software Requirements Specification (SRS) by formulating structured system models using decision tables, state transition diagrams, and UML use case representations.
CO4	Summarize the application of Unified Modeling Language (UML) standards and modular design principles to ensure system scalability.
CO5	Demonstrate industry-standard project management tools to validate software functionality through systematic testing and verification..

CO-PO MAPPING:

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

ASSESSMENT SCHEME:

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

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

ASSESSMENT DETAILS:

- **CA1** and **CA2** are based on 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	Introduction: Programming in the small vs. programming in the large; software project failures and importance of software quality and timely availability; of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline, Software engineering ethics.	08
2	Software Project Management: Basic concepts of life cycle models – different models and milestones; software project planning – identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation. Model. Agile Software Engineering: Concepts of Agile Methods, Extreme Programming; Agile Process Model – Scrum.	08
3	Software Requirements Analysis, Design and Construction: Software Requirements Specifications (SRS), Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management techniques for requirement modelling – decision tables, event tables, state transition tables; requirements documentation through use cases; introduction to UML.	08
4	Software Design: Design Concepts, Function Oriented Design: Structure Charts, Structured Design Methodology, An Example. Object Oriented Design: OO Concepts, Unified Modelling Language (UML), A Design Methodology, Examples. Detailed Design, Verification, Metrics Case Study design of Railway Reservation Software / o any appropriate project statement	08
5	Software Testing: Introduction to faults and failures; basic testing concepts; Testing Axioms, concepts of verification and validation; black box and white box tests; Static and Dynamic Testing, Functional and non-functional testing. boundary value tests, testing use cases; Alpha and Beta Testing, performance and efficiency; concepts of inspection and walkthroughs; Unit Testing, Integration Testing, System Testing and Acceptance Testing.	08

TEXT BOOKS:

Sr. No	Title	Author	Publisher
1	Software Engineering	Pressman, Roger S.,	Practitioner's Approach(7th). Mcgraw-Hill.
2	An Integrated Approach to Software Engineering	Pankaj Jalote	Narosa Publishing House3
3	Fundamentals of Software Engineering	Rajib Mall	PHI Learning Pvt. Ltd.
4	Software Engineering (Principles and Practice)	Waman S. Jawadekar	Tata McGraw-Hill

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1.	Software Engineering for Students	Douglas Bell	Pearson Education (Open Access via Academic Repositories)
2.	Software Engineering: Principles and Practice	Hans van Vliet	Wiley (Available on Internet Archive / Open Library)
3.	A Concise Introduction to Software Engineering	Pankaj Jalote	Springer (Lecture drafts/Open versions available via IITK)
4.	Agile Software Development: A Gentle Introduction	Various Authors	Open-Source Community
5.	Software Engineering	S.A. Kelkar	Prentice Hall of India, 2007

Title of the Course: Business Communication	L	T	P	Credit
Course Code: 250E2401	3	-	-	3

Course Pre-Requisite:

1. Basic proficiency in the language of instruction (usually English).
2. Reading and writing skills at a high school or equivalent level.
3. Basic listening and speaking abilities for presentations, meetings, and discussions.
4. Fundamental computer skills (email, word processing, online communication tools) in many modern courses.
5. An understanding of basic business concepts can be helpful, but is usually not required for introductory classes.

Course Description:

Business Communication is a course designed to develop effective communication skills required in professional and organizational environments. It focuses on the principles, methods, and practices of communicating clearly, accurately, and persuasively in business settings. The course covers both written and oral communication, including business correspondence, reports, presentations, meetings, interpersonal communication, and digital communication. Students learn how to communicate with diverse audiences, manage professional relationships, and use communication strategies to support organizational goals. Emphasis is placed on professionalism, ethical communication, teamwork, and the effective use of modern communication technologies.

Course Outcomes:

CO	After the completion of the course, the students should be able to
CO1	Demonstrate effective verbal, non-verbal, and written communication skills.
CO2	Draft professional business documents and digital communications.
CO3	Apply interpersonal, emotional intelligence, and teamwork skills.
CO4	Deliver effective presentations and negotiate professionally.
CO5	Exhibit career readiness through interviews, group discussions, and personal branding.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	2	-	-	3	-	2
CO2	-	-	-	-	2	2	2	2	3	-	2
CO3	-	-	-	-		2	2		3	-	2
CO4	-	-	-	-	2	2	2	2	3	-	2
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 20%, 30% 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 Business Communication: Elements of communication Communication barriers Communication networks Verbal communication Non-verbal communication Visual communication Active listening Empathetic listening Feedback mechanisms Workplace behavior Business manners Corporate culture	7
2	Business Writing and Digital Communication: Clarity Conciseness ,Correctness, Letters, Memos, Notices, Circulars, Professional email writing, Email etiquette, Social media communication, Virtual meetings, Online collaboration tools AI writing tools ,Ethical use of AI in communication	7
3	Interpersonal Communication and Team Effectiveness: Relationship building ,Trust development Self-awareness, Self-regulation, Empathy Team dynamics, Conflict resolution Collaboration strategies, Global business communication,Cultural sensitivity	7
4	Presentation, Leadership and Negotiation Skills: Planning presentations,Audience analysis, Visual aids. Public Speaking,Confidence building ,Speech delivery techniques,Influencing skills,Motivational communication ,Negotiation process Persuasion techniques ,Win-win strategies	7
5	Career Communication and Employability Skills: Resume formats ,Cover letter drafting ,Group Discussion techniques,Evaluation criteria ,HR interviews,Technical interviews,Virtual interviews ,Linked In profile,Professional networking, Remote work communication ,Digital professionalism ,Lifelong learning	7

Text Books

Sr.No	Title	Author	Publisher
1	Developing Communication Skills	Krishna Mohan Meera Banerji	Macmillan Publishers India Ltd.
2	Communication Skills for Engineers and Scientists	Sangeeta Sharma Binod Mishra	PHI Learning Private Limited.

Reference Books

Sr.No	Title	Author	Publisher
1	Professional Communication Skills	Er. A.K.Jain, Dr.Pravin S.R.Bhatia, Dr. A.M.Shaikh	S.Chand
2	Personality Development and Soft skills	Barun K.Mitra	Oxford University Press
3	Communication Skills for Engineers	Sunita Mishra C.Muralikrishna	Pearson Education
4	Effective Technical Communication	M.Ashraf Rizvi	McGraw Hill Education Pvt.Ltd.

Title of the Course: E-Business	L	T	P	Credit
Course Code: 250E2402	3	-	-	3

Course Pre-Requisite:

1. Basic understanding of business concepts and organizational functions.
2. Fundamental knowledge of computer systems, internet technologies, and web applications.
3. Familiarity with digital communication tools such as email, web browsers, and online platforms.
4. Basic awareness of information technology and its role in modern business operations.
5. Interest in digital transformation, e-commerce, and emerging business technologies.

Course Description:

E-Business is a comprehensive course that explores how digital technologies are transforming modern business operations and creating new opportunities in the digital economy. The course covers e-commerce models, online business platforms, digital marketing, electronic payment systems, cybersecurity, and emerging technologies such as Artificial Intelligence, Blockchain, and the Internet of Things (IoT). Students will gain practical knowledge of how organizations leverage digital tools to improve customer engagement, streamline operations, and achieve competitive advantage. Emphasis is placed on understanding digital business strategies, technological innovations, ethical practices, and future trends shaping the global business environment.

Course Outcomes:

CO	After the completion of the course, the students should be able to
CO1	Explain E-Business concepts, models, and digital transformation.
CO2	Analyze E-Commerce platforms and online business models.
CO3	Apply digital marketing and social commerce strategies.
CO4	Evaluate digital payment systems and cybersecurity practices.
CO5	Assess emerging technologies and their impact on future businesses.

CO-PO Mapping:

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

Assessment Scheme:

Two components of Continuous Assessment (CA1 & CA2), one Mid Semester Examination (MSE) and one End Semester Examination (ESE), have 20%, 30% 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	1. Introduction to E-Business and Digital Economy : Concept and Evolution of E-Business, Traditional business vs E-Business, Growth of digital economy, B2B, B2C, C2C, C2B, D2C models, Digital transformation, Industry 4.0 & 5.0, Applications in retail, banking, education, healthcare and government services.	7
2	E-Commerce Platforms and Business Models: Online business models, Marketplace, Subscription, Freemium, Aggregator models, Website architecture, Mobile commerce, Cloud computing basics, UI, UX, Customer journey mapping, Case studies of Amazon, Flipkart, Shopify and Zomato.	7
3	Digital Marketing and Social Commerce: Digital marketing fundamentals, Consumer behaviour, SEO, Keywords, Search rankings, Social media marketing, Content marketing, Influencer marketing, Video marketing, Live commerce and customer engagement.	7
4	Electronic Payment Systems and Cyber Security : UPI, Mobile wallets, Internet banking, Payment gateways, Cyber threats, Data privacy, Encryption, IT Act, Consumer protection, Data protection regulations, Fraud prevention, Security audits and digital trust.	7
5	Emerging Trends in E-Business : Artificial Intelligence, Chatbots, Predictive analytics, Personalization, Business analytics, Blockchain, Smart contracts, Cryptocurrency overview, Sustainable digital business, Metaverse, IoT and Industry 5.0.	7

Text Books

Sr.No	Title	Author	Publisher
1	E-Commerce: Strategy, Technologies and Applications	David Whiteley	McGraw Hill Education
2	E-Business and E-Commerce Management	Dave Chaffey	Pearson Education

Reference Books

Sr.No	Title	Author	Publisher
1	Electronic Commerce	Gary P. Schneider	Cengage Learning
2	E-Commerce: Business, Technology, Society	Kenneth C. Laudon, Carol G. Traver	Pearson Education
3	Digital Business and E-Commerce Management	Dave Chaffey	Pearson Education
4	E-Business and ERP: Transforming the Enterprise	Murthy CSV	Himalaya Publishing House

Title of the Course: Intellectual Property Rights (IPR)	L	T	P	Credit
Course Code: 250E2403	3	-	-	3

Course Pre-Requisite:

- Basic understanding of science and technology concepts.
- Awareness of innovation, research, and product development.
- Fundamental knowledge of legal and ethical issues in technology.
- Ability to understand technical documents and reports.
- Interest in entrepreneurship, startups, and intellectual property protection.

Course Description: This course provides engineering students with a thorough understanding of intellectual property rights and patents. Students will explore the fundamentals of IP, the patent process, and the legal protection of inventions, trademarks, and creative works. They will also learn practical skills like patent searches, drafting, and technology commercialization. By the end, students will be prepared to manage IP in technology-driven industries and innovation contexts.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand the basics of intellectual property and its importance.
CO2	Apply patentability criteria to inventions.
CO3	Follow the steps of patent filing and protection.
CO4	Distinguish between different types of IP, like copyrights and trademarks.
CO5	Plan IP strategies to support innovation in their careers.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	2	–	–	–	–	–	–
CO2	3	3	2	2	2	–	–	–	–	–	–
CO3	3	3	2	2	2	–	–	–	–	–	–
CO4	3	3	2	2	2	–	–	–	–	–	–
CO5	3	3	3	2	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	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	Unit I: Introduction to Intellectual Property Rights: Concept and significance of Intellectual Property (IP), Types of Intellectual Property, Need for IP protection, National and international IP systems, Overview of IP laws in India, Role of IP in innovation and economic development	7
2	Unit II: Patents and Patent Protection: Fundamentals of patents, Patentability criteria: Novelty, Inventive Step, Industrial Applicability, Patentable and non-patentable inventions, Patent specification and claims, Patent filing and examination process, Patent rights and infringement	8
3	Unit III: Copyrights, Trademarks, and Industrial Designs : Copyright: Concepts, ownership, and protection, Trademark: Registration and protection, Service marks and trade dress, Industrial designs and geographical indications, Protection of digital and creative works, Case studies on IP disputes	8
4	Unit IV: Patent Search, Drafting, and Technology TransferPatent: :databases and search techniques, Prior-art search and analysis Basics of patent drafting, Technology transfer and licensing, Commercialization of intellectual property, Startups and innovation ecosystems	9
5	Unit V: Emerging Trends and Legal Aspects of IPR : IP management in academia and industry, IP in software, AI, biotechnology, and electronics, International treaties and agreements (TRIPS, WIPO, PCT), Patent infringement and litigation, Ethical issues in IP, Recent case studies and contemporary developments	10

Text Books

Sr. No	Title
1	Intellectual Property Rights, N. K. Acharya, Asia Law House, Hyderabad.
2	Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, Deborah E. Bouchoux, Cengage Learning.
3	Intellectual Property Rights: Unleashing the Knowledge Economy, Prabuddha Ganguli, Tata McGraw-Hill.

Reference Books

Sr. No	Title
1	Law Relating to Patents, Trademarks, Copyright, Designs and Geographical Indications, B. L. Wadhera, Universal Law Publishing.
2	Intellectual Property in the New Technological Age, Robert P. Merges, Peter S. Menell, and Mark A. Lemley
3	Fundamentals of IPR for Engineers, Kompal Bansal and Parishit Bansal
4	Patent, Copyright & Trademark: An Intellectual Property Desk Reference, Richard Stim, Nolo Publications.

Title of the Course: Universal Human Values	L	T	P	Credit
Course Code: 25CSE2407	1	--	--	1

COURSE PRE-REQUISITE: Students are not required to have prior academic background in this subject, but must possess a willingness to actively engage in self-reflection and experience-based learning.

COURSE DESCRIPTION: The Universal Human Values course is designed to foster holistic personal development and interpersonal skills through active, experience-based learning. The curriculum guides students in mastering self-management techniques, including time management, stress reduction, and SWOT analysis, equipping them to handle real-world challenges like peer pressure and anger effectively. Furthermore, by emphasizing priority management and dedication, the course empowers students to formulate clear academic and career goals while thoughtfully balancing the expectations of their family, peers, society, and the nation.

COURSE OBJECTIVE:

- To introduce students to fundamental self-management skills, including SWOT analysis and time management, equipping them to effectively cope with stress, anger, and peer pressure.
- To foster an understanding of healthy interpersonal dynamics by teaching students how to navigate competition, express gratitude, and constructively resolve conflicts in their relationships.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to :-
CO1	describe self-management techniques, including time management and SWOT analysis, to foster personality development and effectively handle stress, anger, and peer pressure.
CO2	demonstrate effective interpersonal skills by navigating competition and cooperation, expressing gratitude, and resolving various types of conflicts in personal and academic relationships.
CO3	Formulate clear academic and career goals by effectively managing priorities and aligning personal dedication with the expectations of family, peers, society, and the nation.
CO4	assess personal well-being through continuous feedback and self-evaluation techniques to maintain a healthy lifestyle, implement a balanced diet, and cultivate a caring attitude towards nature.

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	0	0	0	0	0	1	0	2	2	1	1
CO2	0	0	0	0	0	2	0	3	3	3	0
CO3	0	0	0	0	0	3	0	2	2	1	2
CO4	0	0	0	0	0	2	3	2	1	0	0

ASSESSMENT SCHEME:

Two components of Continuous Assessment CA1 & CA2

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

ASSESSMENT DETAILS:

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

COURSE CONTENTS:

Unit No.	Unit Title and Contents	Hours
1	Self-Management: Self-confidence, peer pressure, time management, anger, Stress, Personality Development, Self-improvement, SWOT analysis	05
2	Relationships: Home sickness, gratitude towards parents, teachers and others Ragging and interaction Competition and cooperation, Types of conflicts and conflict resolution.	05
3	Individual academic : career Expectations of family, peers, society, nation, fixing the goals. Time management, priority management, Dedication, devotion.	05
4	Self-evaluation and Healthy life: Sharing and feedback Health issues, healthy diet, healthy lifestyle. Caring the nature, Self-evaluation techniques.	05

TEXT BOOKS:

Sr. No	Title	Author	Publisher
1	A Foundation Course in Human Values and Professional Ethics.	R R Gaur, R Asthana, G P Bagaria	ISBN 978-93-87034-47-1, Excel Books, New Delhi.
2	Professional Ethics and Human Values	Premvir Kapoor	Khanna Book Publishing, New Delhi,

REFERENCE BOOKS:

Sr. No	Title	Author	Publisher
1	Fundamentals of Ethics for Scientists & Engineers,		Oxford University Press
2	Human Values	A N Tripathy	New Age International Publishers.
3	Foundations of Ethics and Management	B P Banerjee	Excel Books

Title of the Course: Full Stack Web Development Lab	L	T	P	Credit
Course Code: 25CSE2409L	–	--	2	1

COURSE PRE-REQUISITE:

Object Oriented Programming using Java
Python Programming

COURSE DESCRIPTION: This comprehensive, hands-on course equips students with practical full-stack web development skills, transitioning from foundational HTML5, CSS3, and JavaScript to the advanced MERN stack. Learners will design responsive interfaces, manage databases with MongoDB, develop robust RESTful APIs using Node.js and Express.js, and build dynamic frontend applications utilizing React components, Hooks, and React Router.

COURSE OBJECTIVES:

- To introduce students to the fundamentals of web development using HTML, CSS, and Bootstrap.
- To develop programming skills using JavaScript and client-side scripting techniques for interactive web applications.
- To provide knowledge of MongoDB and Node.js for database management and server-side development.
- To enable students to design RESTful APIs and backend applications using Express.js.
- To develop modern single-page web applications using React.js and MERN stack architecture.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Demonstrate the use of HTML5 and CSS3 to structure personal portfolio websites, and implement JavaScript for client-side form validation.
CO2	Outline the setup process for a MERN stack development environment, and execute REST API creation and testing using Express.js and Postman.
CO3	Apply basic CRUD operations within a MongoDB schema, and configure simple Node.js server environment.
CO4	Organize basic routing in an Express.js application, and employ React components to display dynamic content.
CO5	Examine the integration of a React frontend with an Express backend, and use React Router and Hooks within a frontend application.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1	3	2	3	1	3	0	0	0	1	1	0
CO2	3	2	3	2	3	0	0	0	1	1	0
CO3	3	2	3	2	3	0	0	0	1	0	0
CO4	3	3	3	2	3	0	0	0	1	0	0
CO5	3	3	3	2	3	0	0	0	1	1	1

ASSESSMENT SCHEME:

Two components of Continuous Assessment (CA1 & CA2), Practical Examination (POE) having 25%, 25% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
CA2	25
POE	50

ASSESSMENT DETAILS:

- **CA1** and **CA2** are based on Assignment/Surprise test/Quiz/Seminar/Group discussions/presentation, etc.
- **POE** is based on 100% course content.

COURSE CONTENTS:

Expt. No	Experiment Name	Hrs
1	Create a Personal Portfolio Website using HTML5 and CSS3 with sections such as About, Skills, Projects, and Contact.	2
2	Create a Student Information Form with fields such as name, email, course, and mobile number and perform validation using JavaScript.	2
3	Setup development environment for MERN stack	2
4	Develop REST APIs with Express.js and test with Postman	2
5	Design a MongoDB schema and perform basic CRUD operations	2
6	Install and configure Node.js environment and create a simple Node.js server.	2
7	Create a simple Express.js application and define basic routes.	2
8	Create a simple React application using components and display dynamic content.	2
9	Integrate React frontend with Express backend	2
10	Build a frontend app using React Router and Hooks	2

TEXT BOOKS

Sr. No	Title	Author	Publisher
1	HTML & CSS: Design and Build Web Sites	Jon Duckett	First Edition, 2011, Wiley.
2	Node.js, MongoDB and Angular Web Development	Brad Dayley, Brendan Dayley, and Caleb Dayley	Addison-Wesley.
3	Learning React: Functional Web Development with React and Redux	Alex Banks and Eve Porcello	O'Reilly Media.
4	Mastering Node.js: Build robust and scalable real-time server-side web applications efficiently	Sandro Pasquali Kevin Faaborg	© Pearson Education Limited, 2021

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1	Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node	Adam Freeman	A press.
2	JavaScript & jQuery: Interactive Front-End Development	Jon Duckett	First edition, 2014, Wiley

Title of the Course: Object Oriented Programming Laboratory using JAVA Course Code: 25CSE2303L	L	T	P	Credit
	--	--	2	1

COURSE PRE-REQUISITE: This course requires that the students are familiar with programming language such as C.

COURSE DESCRIPTION:

Fundamental OOP & Lifecycle: Students master the creation of classes and objects, exploring how various constructors manage object initialization. Polymorphism & Code Reusability: The lab emphasizes compile-time flexibility through method and constructor overloading, alongside runtime polymorphism via method overriding. A significant portion of the curriculum is dedicated to inheritance models—single, multilevel, and hierarchical—to promote code efficiency and reusability. Abstraction & Interfaces: Students learn advanced design techniques by implementing abstract classes and interfaces to achieve abstraction and support multiple inheritance.

COURSE OBJECTIVES:

- To introduce the fundamental concepts of Object-Oriented Programming including class, object creation, and constructors.
- To develop understanding of compile-time polymorphism through constructor and method overloading.
- To enable students to implement inheritance concepts such as single, multilevel, and hierarchical inheritance for code reusability.
- To provide knowledge of advanced OOP features including runtime polymorphism, abstraction using abstract classes, and interfaces for multiple inheritance.
- To equip students with practical skills in performing string operations and handling runtime errors using exception handling mechanisms.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to										
CO1	Construct basic Java programs by defining classes and implementing various constructor types to manage object initialization and lifecycle.										
CO2	Apply compile-time polymorphism through method overloading and implement fundamental inheritance structures to facilitate code reusability.										
CO3	Organize complex class hierarchies using hierarchical inheritance and demonstrate runtime polymorphism by overriding methods in derived classes.										
CO4	Design modular software components by integrating abstract classes and interfaces to achieve abstraction and support multiple inheritance.										
CO5	Develop functional and resilient applications by executing string manipulation techniques and implementing structured exception handling to manage										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1	3	2	2	1	2	0	0	0	1	1	-
CO2	3	3	2	1	1	0	0	0	1	1	-
CO3	2	3	3	2	1	0	0	0	1	1	-
CO4	2	2	3	2	2	0	0	0	1	1	-
CO5	3	2	2	2	1	0	0	0	1	1	

**CO
-
PO
MA
PPI
NG
:**

ASSESSMENT SCHEME:

Two components of Continuous Assessment (CA-1, CA-2), having 25%, 25% and POE 50%

weightage respectively.

Assessment Component	Marks
CA1	25
CA2	25
POE	50

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

COURSE CONTENTS:

Exp. No.	Unit Title and Contents	Hours
1	Implement a program to demonstrate class and object creation.	2
2	Write a program to demonstrate constructor overloading.	2
3.	Implement method overloading with different parameter types	2
4	Write a program to demonstrate inheritance (single, multilevel).	2
5	Implement hierarchical inheritance using a real-world example	2
6	Demonstrate polymorphism (method overriding).	2
7	Write a program to demonstrate abstraction using abstract class.	2
8	Implement interfaces and multiple inheritance.	2
9	Write a program to perform string operations (concatenation, comparison, substring).	2
10	Write a program to handle arithmetic and array exceptions using try-catch.	2

TEXT BOOKS:

Sr. No.	Title	Author	Publisher
1	JAVA Complete Referenc	Herbert Schildt	Tata McGraw Hill, (12th Edition)
2	Thinking in Java	Eckel B.	Pearson Education, (4th Edition)
3	Java: An Introduction to Problem Solving and Programming	Walter Savitch	Pearson Education.

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1	Headfirst Java	Kathy Sierra & Bert Bates	O'reilly publication, (2nd Edition) (2009)
2	Beginning Programming with Java for Dummies	Barry Burd	O'reilly publication, (5th Edition) (2017)
3	Java How to program	Paul Deital and Harvey Deital	Prentice Hall Publication, (11th Edition)
4	The Complete Reference JAVA	Herbert Schildt	4th Edition, McGraw Hill

Title of the Course: Database System Laboratory	L	T	P	Credit
Course Code: 25CSE2402L	--	--	2	1

COURSE PRE-REQUISITE: A student should know basic programming (such as C programming language or Python), fundamental mathematics, and problem-solving skills before studying Data Structures.

COURSE DESCRIPTION: This course explores the fundamental concepts and practical implementation of database systems, including schema design, entity-relationship modeling, structured query language (SQL) transactions, optimization, and alternative database structures, while equipping students with the ability to build and manipulate database systems for real-world applications.

COURSE OBJECTIVES:

- To understand the fundamental concepts and practical syntax of Structured Query Language (SQL) for database operations.
- To develop the ability to design conceptual data models using Entity-Relationship diagrams and translate them into physical schemas.
- To design and implement relational databases using constraints, normalization rules, and integrity checks.
- To apply problem-solving techniques in creating complex data retrieval operations using joins, sub queries, and views.
- To understand transaction control mechanisms, programmatic structures like triggers and procedures, and modern NoSQL implementations.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to
CO1	Students will be able to implement, manage, and use relational databases and execute core structured database operations.
CO2	Students will be able to analyze user requirements, construct ER diagrams, and map them to physical relational tables.
CO3	Students will be able to select and apply normalization methodologies to resolve design redundancies and operational anomalies
CO4	Students will be able to design optimized queries, apply index optimizations, and establish programmatic routines for real-world scenarios.
CO5	Students will be able to demonstrate an understanding of transaction integrity parameters and manage alternative un-structured database architectures.

CO-PO MAPPING:

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

ASSESSMENT SCHEME:

Two components of Continuous Assessment (CA-1, CA-2),

Assessment Component	Marks
CA1	25
CA2	25

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

COURSE CONTENTS:

Exp. No.	Experiment Title	Hours
1.	DDL Statements: Design and create a student/library schema database and perform CREATE, ALTER, DROP, and RENAME operations along with structural modifications.	2
2.	Data Integrity Constraints: Implement Primary Key, Foreign Key, Unique, Not Null, and Check constraints on database tables to evaluate logical data restriction schemas.	2
3.	DML Operations: Populate the schema and perform advanced row manipulation including INSERT, UPDATE, DELETE, and SELECT queries under structural criteria.	2
4.	Built-in Functions and Operations: Construct queries demonstrating Aggregate functions, String functions, Math operations, and Date-Time calculations inside database schemas.	2
5.	Advanced SQL Data Retrieval: Compose multi-table retrieval syntax leveraging Inner Join, Left Outer Join, Right Outer Join, Full Outer Join, and Self Join conditions.	2
6	Subqueries and Views: Write nested queries (correlated and non-correlated subqueries) and create virtual structures (Views) to optimize reporting access configurations.	2
7	PL/SQL Blocks and Stored Procedures: Develop procedural code structures using conditional logic and implement reusable Stored Functions or Procedures	2
8	Database Triggers: Construct and bind automatic Row-Level and Statement-Level Triggers to execute auditing operations on targeted updates or inserts.	2
9	Indexing and Query Performance: Generate Primary, B+ Tree, and Secondary Indexes to analyze execution time differences and optimize queries.	2
10	NoSQL Data Modeling: Model unstructured or semi-structured data frameworks, performing basic CRUD configurations using MongoDB or equivalent engine suites.	2

TEXT BOOKS:

Sr. No.	Title	Author	Publisher
1.	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	McGraw-Hill Education
2.	Fundamentals of Database Systems	Ramez Elmasri, Shamkant B. Navathe	Pearson Education
3.	SQL Cookbook: Query Solutions and Techniques for Database Developers	Anthony Molinaro, Robert de Graaf	O'Reilly Media
4.	MongoDB: The Definitive Guide	Shannon Bradshaw, Kristina Chodorow	O'Reilly Media
5.	Learning SQL: Master SQL Fundamentals	Alan Beaulieu	O'Reilly Media

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1.	Database Management Systems	Raghu Ramakrishnan, Johannes Gehrke	McGraw-Hill
2.	Murach's MySQL	Joel Murach	Mike Murach & Associates
3.	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence	Pramod J. Sadalage, Martin Fowler	Addison-Wesley

Resource link like NPEL - <https://nptel.ac.in/courses/106105175>

Title of the Course: Mastering Object Oriented Programming	L	T	P	Credit
Course Code: 25MMCSE2402	2	--	-	2

COURSE PRE-REQUISITE: This course requires that the students are familiar with programming language such as C.

COURSE DESCRIPTION: This course introduces students to the paradigm of Object-Oriented Programming (OOP), shifting the focus from procedural logic to data-driven design. Using the Java programming language, students will learn to model real-world problems into modular, reusable, and maintainable software components.

The curriculum covers core OOP pillars—Encapsulation, Inheritance, Polymorphism, and Abstraction—alongside Java-specific features like the Java Virtual Machine (JVM) architecture, Exception Handling, Multithreading, and the Collection Framework. By the end of the course, students will be equipped to design robust applications used in modern software development.

COURSE OBJECTIVES:

- Analyse the differences between procedural and object-oriented programming.
- Implement robust applications using Java syntax and class hierarchies.
- Apply error-handling mechanisms using Java’s Exception Handling framework.
- Develop multi-threaded applications to handle concurrent tasks.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to	CO - PO Ma ppi ng:
CO1	Explain the fundamental principles of object-oriented programming, including encapsulation and abstraction, as well as basic Java elements and the Java Virtual Machine (JVM) environment.	
CO2	Apply inheritance, polymorphism, and method overloading or overriding, along with arrays and strings, to write reusable Java code.	
CO3	Design modular applications by integrating abstract classes, interfaces, user-defined packages, and Java Collection Framework elements like ArrayList and HashSet.	
CO4	Develop robust programs by implementing effective error-handling mechanisms using try, catch, throw, throws, and finally keywords.	
CO5	Construct multithreaded applications to execute concurrent tasks by managing thread creation, thread management, and thread life cycles.	

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	0	2	0	0	0	0	0	0
CO2	3	3	2	0	1	0	0	0	0	0	0
CO3	2	2	3	0	2	0	0	0	0	0	0
CO4	2	2	3	1	1	0	0	0	0	0	0
CO5	2	2	3	2	1	0	0	0	0	0	0

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	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 Object Oriented Programming: class, objects, Features of Java, Command line arguments. Programming Elements - Data Types, Class, Object, Constructor, Inheritance, Polymorphism, Encapsulation, Abstraction, Constructor, The Java Programming Environment- JVM	08
2.	Polymorphism and Inheritance: Static method, This Keyword, function overloading, String, Arrays in Java, Types of Inheritance, base class, derived class, access specifiers, Method Overriding.	08
3.	Abstract class Interfaces and Packages: Abstract class, interfaces, runtime polymorphism, creating and importing packages, Java collection Framework-Array List, HashSet,	08
4	Exception Handling: Errors and Exceptions, Types of Exceptions try, catch, throw, throws and finally Keyword, Building Exceptions. Handling Arithmetic Exceptions and Input Mismatch Exceptions, when to use exception handling, Java exception hierarchy, finally block. Java Iterator Methods Parametrized classes in Java.	08
5	Multithreading: Thread Creation and Management, Process vs Thread, Benefits of multithreading, Life cycle of a thread. Runnable Interface and Thread Class, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Thread States, Thread Properties, Joins, Synchronization	08

TEXT BOOKS:

Sr. No.	Title	Author	Publisher
1.	JAVA Complete Reference	Herbert Schildt	Tata McGraw Hill, (12th Edition)
2.	Thinking in Java	Eckel B.	Pearson Education, (4th Edition)
3.	Java: An Introduction to Problem Solving and Programming	Walter Savitch	Pearson Education.

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1.	Headfirst Java	Kathy Sierra & Bert Bates	O'reilly publication, (2nd Edition) (2009)
2.	Beginning Programming with Java for Dummies	Barry Burd	O'reilly publication, (5th Edition) (2017)
3.	Java How to program	Paul Deital and Harvey Deital	Prentice Hall Publication, (11th Edition)
4	The Complete Reference JAVA	Herbert Schildt	4th Edition, McGraw Hill

Title of the Course: Object Oriented Programming Laboratory using JAVA	L	T	P	Credit
Course Code: 25CSE2303L	--	--	2	1

COURSE PRE-REQUISITE: This course requires that the students are familiar with programming language such as C.

COURSE DESCRIPTION:

Fundamental OOP & Lifecycle: Students master the creation of classes and objects, exploring how various constructors manage object initialization. Polymorphism & Code Reusability: The lab emphasizes compile-time flexibility through method and constructor overloading, alongside runtime polymorphism via method overriding. A significant portion of the curriculum is dedicated to inheritance models—single, multilevel, and hierarchical—to promote code efficiency and reusability. Abstraction & Interfaces: Students learn advanced design techniques by implementing abstract classes and interfaces to achieve abstraction and support multiple inheritance.

COURSE OBJECTIVES:

- To introduce the fundamental concepts of Object-Oriented Programming including class, object creation, and constructors.
- To develop understanding of compile-time polymorphism through constructor and method overloading.
- To enable students to implement inheritance concepts such as single, multilevel, and hierarchical inheritance for code reusability.
- To provide knowledge of advanced OOP features including runtime polymorphism, abstraction using abstract classes, and interfaces for multiple inheritance.
- To equip students with practical skills in performing string operations and handling runtime errors using exception handling mechanisms.

COURSE OUTCOMES:

CO	After the completion of the course the student should be able to										
CO1	Construct basic Java programs by defining classes and implementing various constructor types to manage object initialization and lifecycle.										
CO2	Apply compile-time polymorphism through method overloading and implement fundamental inheritance structures to facilitate code reusability.										
CO3	Organize complex class hierarchies using hierarchical inheritance and demonstrate runtime polymorphism by overriding methods in derived classes.										
CO4	Design modular software components by integrating abstract classes and interfaces to achieve abstraction and support multiple inheritance.										
CO5	Develop functional and resilient applications by executing string manipulation techniques and implementing structured exception handling to manage										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011
CO1	3	2	2	1	2	0	0	0	1	1	-
CO2	3	3	2	1	1	0	0	0	1	1	-
CO3	2	3	3	2	1	0	0	0	1	1	-
CO4	2	2	3	2	2	0	0	0	1	1	-
CO5	3	2	2	2	1	0	0	0	1	1	

**CO
-
PO
MA
PPI
NG
:**

ASSESSMENT SCHEME:

Two components of Continuous Assessment (CA-1, CA-2), having 25%, 25% and POE 50% weightage respectively.

Assessment Component	Marks
----------------------	-------

CA1	25
CA2	25
POE	50

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

COURSE CONTENTS:

Exp. No.	Unit Title and Contents	Hours
1	Implement a program to demonstrate class and object creation.	2
2	Write a program to demonstrate constructor overloading.	2
3.	Implement method overloading with different parameter types	2
4	Write a program to demonstrate inheritance (single, multilevel).	2
5	Implement hierarchical inheritance using a real-world example	2
6	Demonstrate polymorphism (method overriding).	2
7	Write a program to demonstrate abstraction using abstract class.	2
8	Implement interfaces and multiple inheritance.	2
9	Write a program to perform string operations (concatenation, comparison, substring).	2
10	Write a program to handle arithmetic and array exceptions using try-catch.	2

TEXT BOOKS:

Sr.	Title	Author	Publisher
-----	-------	--------	-----------

No.			
1.	JAVA Complete Referenc	Herbert Schildt	Tata McGraw Hill, (12th Edition)
2.	Thinking in Java	Eckel B.	Pearson Education, (4th Edition)
3.	Java: An Introduction to Problem Solving and Programming	Walter Savitch	Pearson Education.

REFERENCE BOOKS:

Sr. No.	Title	Author	Publisher
1.	Headfirst Java	Kathy Sierra & Bert Bates	O'reilly publication, (2nd Edition) (2009)
2.	Beginning Programming with Java for Dummies	Barry Burd	O'reilly publication, (5th Edition) (2017)
3.	Java How to program	Paul Deital and Harvey Deital	Prentice Hall Publication, (11th Edition)
4	The Complete Reference JAVA	Herbert Schildt	4th Edition, McGraw Hill