

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)



Autonomous programme
Bachelor of Engineering



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHEME and SYLLABUS

I, II, III Semester & IV Semester

(2025-26 Admitted Batch)

VISION OF THE INSTITUTE

To be an institute of excellence in engineering education and research, producing socially responsible professionals

MISSION OF THE INSTITUTE

1. Create conducive environment for learning and research
2. Establish industry and academia collaborations
3. Ensure professional and ethical values in all institutional endeavours

VISION OF THE DEPARTMENT

To become a prominent department of Computer Science & Engineering producing competent professionals with research and innovation skills, inculcating moral values and societal concerns

MISSION OF THE DEPARTMENT

1. Impart world class engineering education to produce technically competent engineers.
2. Provide facilities and expertise in advanced computer technology to promote research.
3. Enhance Industry readiness and entrepreneurial abilities through innovative skills
4. Nurture ethical values and social responsibilities

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1: Graduates will establish successful careers by applying core knowledge of Computer Science and Engineering to perform effectively as IT professionals.

PEO 2: Graduates will engage in lifelong learning by pursuing higher education, research and professional development through effective utilization of modern computing technologies.

PEO 3: Graduates will demonstrate professional competence in industry or entrepreneurial ventures by exhibiting leadership, teamwork and managerial skills.

PEO 4: Graduates will work productively and responsibly, upholding ethical values and social responsibility for the betterment of society.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Upon graduation, students with a degree B.E. in Computer Science & Engineering will be able to:

PSO – 1: To enable students, apply modern software tools and technologies in solving real-world computing problems.

PSO – 2: To enable students, utilize theoretical knowledge, algorithmic thinking and software engineering practices to build efficient and scalable IT systems for real-world applications

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, natural science, computing, and engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, and analyses complex engineering problems, reaching substantiated conclusions with consideration for the holistic nature of the problem.
3. **Design/development of solutions:** Design creative solutions for complex engineering problems and design systems, components, or processes to meet identified needs — with consideration for public health and safety, and cultural, societal, and environmental factors. Sustainability is now intrinsic to design.
4. **Conduct investigations of complex problems:** Conduct investigations of complex engineering problems using research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
5. **Engineering Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling — recognizing their limitations — to solve complex engineering problems.
6. **The Engineer and the World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems, considering their impact on sustainability with reference to economy, health, safety, legal frameworks, culture, and the environment.
7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity, and inclusion; and adhere to relevant national and international laws.
8. **Individual and Collaborative Team Work:** Function effectively as an individual, and as a member or leader in diverse and multi-disciplinary teams.
9. **Communication:** Communicate effectively and inclusively within the engineering community and with society at large — comprehending and writing effective reports and design documentation, and making effective presentations — considering cultural, language, and learning differences.
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, to manage projects in multi-disciplinary environments.
11. **Life-Long Learning:** Recognize the need for, and have the preparation and ability for, independent and life-long learning, adaptability to new and emerging technologies, and critical thinking in the broadest context of technological change.



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PBNo.21, HASSAN-573201, Karnataka, India

CIE and SEE Assessment Structure for 2025 batch onwards

Examination	Maximum Marks	Minimum marks to qualify
CIE	50	20 (12+8)
SEE	50	20
Total	100	40

Assessment Structure for Theory Courses

Assessment	Marks
CIE 1 – conducted for 50 marks and scaled down to 15 marks	15
CIE 2 – conducted for 50 marks and scaled down to 15 marks	15
Activities as decided by course faculty	20
SEE – conducted for 100 and scaled down to 50	50
Total	100

CIE Assessment Structure

Assessment	Marks	Syllabus
CIE 1 - Conducted for 50 marks and scaled down to 15 marks	15	Module-1 and Module-2
CIE 2 - Conducted for 50 marks and scaled down to 15 marks	15	Module-3 and Module-4
Activities as decided by course faculty	20	All Modules
Total	50	



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CIE 1 Question Paper Pattern

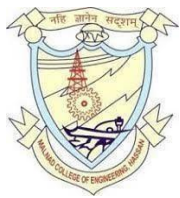
Question 1	Module-1	Mandatory	One question for 20 marks – maximum 4 sub divisions
Question 2	Module-2	Internal choice	Two questions for 20 marks each, out of which, student has to answer one question – maximum 4 sub divisions
Question 3	Module-1 and Module-2	Mandatory	One question for 10 marks – maximum 5 sub divisions – short answer types

CIE 2 Question Paper Pattern

Question 1	Module-3	Mandatory	One question for 20 marks – maximum 4 sub divisions
Question 2	Module-4	Internal choice	Two questions for 20 marks each, out of which, student has to answer one question – maximum 4 sub divisions
Question 3	Module-3 and Module-4	Mandatory	One question for 10 marks – maximum 5 sub divisions – short answer types

SEE Question Paper Pattern

Question 1	Module -1	Mandatory	One question for 20 marks – maximum 4 sub divisions
Question 2	Module -2	Internal choice	Two questions for 20 marks each, out of which, student has to answer one question - maximum 4 sub divisions
Question 3	Module -3	Internal choice	Two questions for 20 marks each, out of which, student has to answer one question - maximum 4 sub divisions
Question 4	Module -4	Internal choice	Two questions for 20 marks each, out of which, student has to answer one question - maximum 4 sub divisions
Question 5	Module – 1, 2, 3, 4	Mandatory	One question for 20 marks – maximum 5 sub divisions – short answer types



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Assessment Structure for Exclusive Laboratory Courses

Assessment	Marks	Minimum marks to qualify
Continuous Evaluation in every lab session by the Course Coordinator	30	12
Laboratory CIE - conducted for 50 marks and scaled down to 20	20	8
SEE	50	20
Total	100	40

1. The laboratory syllabus shall consist of PART-A and PART-B. PART-A has shall have minimum of 10 fixed set of experiments. PART-B shall have minimum of 10 open-ended experiments.
2. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.
3. Both PART-A and PART-B are considered for CIE and SEE.
4. Students have to answer 1(one) question from PART-A and 1(one) question from PART-B.
5. The questions for CIE and SEE shall be included from among the experiments under PART-A and shall be evaluated for 25 marks out of the maximum 50 marks.
6. The open-ended question set for CIE and SEE shall be any other open-ended question not done in regular lab sessions under PART-B and shall be evaluated for 25 marks out of the maximum 50 marks.
7. The student shall be evaluated in every lab session for 30 marks and finally the average of all evaluations shall be considered as continuous evaluation for 30 marks.



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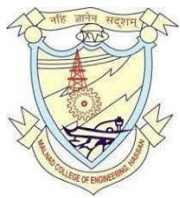
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Assessment Structure for Integrated Laboratory Courses (20 Marks)

Assessment	Marks	Minimum marks to qualify
Continuous Evaluation in every lab session by the Course Coordinator	30	12
Laboratory CIE - conducted for 50 marks and scaled down to 20	20	8
Total	50	20
*** Integrated Lab Course marks shall be scaled down to 20		

1. The laboratory syllabus shall consist of PART-A and PART-B. PART-A has shall have minimum of 10 fixed set experiments. PART-B shall have minimum of 10 open-ended experiments.
2. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.
3. Both PART-A and PART-B are considered for CIE.
4. Students have to answer 1(one) question from PART-A and 1(one) question from PART-B.
5. The questions for CIE shall be included from among the experiments under PART-A and shall be evaluated for 25 marks out of the maximum 50 marks.
6. The open-ended question set for CIE shall be any other open-ended question not done in regular lab sessions under PART-B and shall be evaluated for 25 marks out of the maximum 50 marks.
7. The student shall be evaluated in every lab session for 30 marks and finally the average of all evaluations shall be considered as continuous evaluation for 30 marks.



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Rubrics for Continuous Evaluation in Laboratory Courses **(30 marks)**

Performance Indicators	Excellent	Very Good	Good	Satisfactory
Fundamental Knowledge : Understanding the problem statement (4 Marks)	The student has in-depth knowledge of the topics related to the course (4)	Student has good knowledge of some of the topics related to course (3)	Student is capable of narrating the answer but not capable to show in depth knowledge (2)	Student has not understood the concepts clearly (1)
Design Of Experiment (5 Marks)	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable design with proper reason (5)	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best (4)	Student is capable of discussing single design with its merits and demerits (2-3)	Student is capable of explaining the design (1)
Implementation (8 Marks)	Student is capable of implementing the design with best suitable algorithm considering optimal solution. (7-8)	Student is capable of implementing the design with best suitable algorithm and should be capable of explaining it (5-6)	Student is capable of implementing the design with proper explanation. (3-4)	Student is capable of implementing the design. (1-2)
Result & Analysis (5 Marks)	Student is able to run the program on various cases and compare the result with proper analysis. (5)	Student will be able to run the program for all the cases. (4)	Student will be able to run the code for few cases and analyze the output. (2-3)	Student will be able to run the program but not able to analyze the output. (1)
Demonstration and Documentation (8 Marks)	Demonstration is very good. The lab record is well organized, with clear sections (e.g., Introduction, Method, Results, and Conclusion). Transitions	Demonstration is good. The lab record is organized, with clear sections, but some sections are not well defined. (5-6)	Demonstration is not clear. The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (3-4)	Demonstration is very poor. The lab record is poorly organized, with missing or unclear sections. (1-2)



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between sections
are smooth. (7-8)

Rubrics for CIE/SEE Test in Laboratory Courses

Performance Indicators	Superior(5)	Good(4)	Fair(3)	Needs Improvement(2)	Unacceptable(1)
Understanding of Experimental Principle	Excellent	Good	Satisfactory	Limited	Poor
Experimental Execution	Independent execution	Minor procedural errors	With guidance	Significant errors	Unable
Observation, Result & Interpretation	Accurate and scientific	Minor errors	Basic	Limited	Incorrect
Open-ended Problem Solving	Independent design	Good approach	Basic solution	Limited	Unable
Viva Voce & Scientific Communication	Excellent	Good	Satisfactory	Limited	Unable

COURSE TYPES

Basic Science Course	BSC
Applied Science Course	ASC
Engineering Science Course	ESC
Emerging Technology Course	ETC
Programming Language Course	PLC
Professional Core Course	PCC
Integrated Professional Core Course	IPCC
Professional Core Course Laboratory	PCCL
Professional Elective Course	PEC
Open Elective Course	OEC
Project/Mini Project/Internship	PI
Humanities and Social Sciences, Management Course	HSMC
Ability Enhancement Course	AEC
Skill Enhancement Course	SEC
Skill Development Course	SDC
Universal Human Value Course	UHV
Non-credit Mandatory Course	NCMC

MALNAD COLLEGE OF ENGINEERING HASSAN
First Year Scheme 2025-26

I SEMESTER: PHYSICS CYCLE STREAMS: EC/ CV/ CSE													
Sl. No	Course category	Course code	Course Title	Offering Dept	Teaching Hours					Exam Marks			Credits
					L	T	P	TW	Total	CIE	SEE	Total	
1.	BSC	MAT5C11/ MAT5S11/ MAT5E11	Mathematics-I for CV/CS/EE Stream	Mathematics	42	0	28	50	120	50	50	100	04
2.	BSC	PHY5C12 PHY5S12 PHY5E12	Physics for CV/CS/EE stream	Physics	42	0	0	48	90	50	50	100	03
3.	PSC	CIV5131 BEE5132 PPC5133	Program Specific course (Engg. Mechanics/Basic Electronics/ Principles of Programming using C) Integrated Course	CV/EC/CSE	42	0	28	50	120	50	50	100	04
4.	ESC	ESC514x	Engineering Science Course-I	Respective department	42	0	0	48	90	50	50	100	03
5.	ETC	ETC515x	Introduction to AI and its use cases (Stream wise)	Respective department	42	0	0	48	90	50	50	100	03
6.	AEC	SKS516	Soft Skills - Ability enhancement course	Humanities	14	0	0	16	30	100	--	100	00
7.	BSC	PHY5CL17 PHY5SL17 PHY5EL17	Physics lab for CV/CS/EE stream	Physics	0	0	28	02	30	50	50	100	01
8.	AEC/ SDC	IDT518	Innovation and Design Thinking	ME	0	0	28	02	30	50	50	100	01
9.	HSMC	KSK519/ KBK519	Sanskritika Kannada/ Balake Kannada	Humanities	14	0	0	16	30	50	50	100	01
TOTAL										500	400	900	20

I SEMESTER : CHEMISTRY CYCLE STREAMS: EEE/ ME/CSE/ CSBS/AIML													
Sl. No	Course category	Course code	Course Title	Offering Dept	Teaching Hours					Exam Marks			Credits
					L	T	P	TW	Total	CIE	SEE	Total	
1	BSC	MAT5E11 MAT5S11/ MAT5M11	Mathematics-I for EE/CS/ME stream	Mathematics	42	0	28	50	120	50	50	100	04
2	BSC	CHE5E12/ CHE5S12/ CHE5M12/	Chemistry for EE/CS/ME Stream	Chemistry	42	0	0	48	90	50	50	100	04
3	ESC	CED513	Computer-Aided Engineering Drawing	ME	28	0	28	34	90	50	50	100	03
4	ESC	ESC514x	Engineering Science Course-I	Respective department	42	0	0	48	90	50	50	100	03
5	PLC	PLC515	Programming Language Course– PYTHON	ME	28	0	28	34	90	50	50	100	03
6	AEC	ENG516	Communication skills	Humanities	14	0	0	16	30	50	50	100	01
7	BSC	CHE5EL17/ CHE5SL17/ CHE5ML17	Chemistry for EE/CS/ME Stream	Chemistry	0	0	28	02	30	50	50	100	01
8	AEC/ SDC	IDT518	Innovation and Design Thinking	ME	0	0	28	02	30	50	50	100	01
9	HSMC	ICO519	Indian Constitution	Humanities	14	0	0	16	30	100	--	100	00
10	HSMC	PE5110	Physical Education	Sports	0	0	28	02	30	50	50	100	01
TOTAL										550	450	1000	20

II Semester: PHYSICS CYCLE STREAMS: EEE/ ME/CSE/ CSBS/ AIML													
Sl. No	Course category	Course code	Course Title	Offering Dept	Teaching Hours					Exam Marks			Credits
					L	T	P	TW	Total	CIE	SEE	Total	
1	BSC	MAT5M21/ MAT5S21/ MAT5E21	Mathematics - II for ME/CS/EE Stream	Mathematics	42	0	28	50	120	50	50	100	04
2	BSC	PHY5S22/ PHY5E22/ PHY5M22	Physics for ME/CS/EE Stream	Physics	42	0	0	48	90	50	50	100	03
3	PSC	PPC5233/ EME5234/ EEE5235	Program Specific course (Principles of Programming Using C/Elements of Mechanical Engineering/ Elements of Electrical Engineering)	CSE/ME/ EE	42	0	28	50	120	50	50	100	04
4	ESC	ESC524x	Engineering Science Course-II	Respective department	42	0	0	48	90	50	50	100	03
5	ETC	ETC525x	Introduction to AI and its use cases (Stream wise)	Respective department	42	0	0	48	90	50	50	100	03
6	AEC	SKS526	Soft Skills - Ability enhancement course	Humanities	14	0	0	16	30	100	--	100	--
7	BSC	PHY5CL27 PHY5SL27 PHY5EL27	Physics lab for ME/CS/EE stream	Physics	0	0	28	02	30	50	50	100	01
8	AEC/SDC	PRJ528	Interdisciplinary Project- Based Learning	Multiple Dept	0	0	28	02	30	50	50	100	01
9	HSMC	KSK529/ KBK529	Samskrutika Kannada/ Balake Kannada	Humanities	14	0	0	16	30	50	50	100	01
TOTAL										500	400	900	20

II Semester: CHEMISTRY CYCLE STREAMS: EC/ CV/ CSE													
Sl. No	Course Category	Course code	Course Title	Offering Dept	Teaching Hours					Exam Marks			Credits
					L	T	P	TW	Total	CIE	SEE	Total	
1	BSC	MAT5C21/ MAT5S21/ MAT5E21	Mathematics-II for CV/CS/EE Stream	Mathematics	42	0	28	50	120	50	50	100	04
2	BSC	CHE5C22/ CHE5S22/ CHE5E22	Chemistry for CV/CS/EE Stream	Chemistry	42	0	0	48	90	50	50	100	03
3	ESC	CED523	Computer-Aided Engineering Drawing	ME	28	0	28	34	90	50	50	100	03
4	ESC	ESC524x	Engineering Science Course-II	Respective department	42	0	0	48	90	50	50	100	03
5	PLC	PLC525	Programming Language Course-PYTHON	ME	28	0	28	34	90	50	50	100	03
6	AEC	ENG526	Communication skills	Humanities	14	0	0	16	30	50	50	100	01
	BSC	CHE5CL27/ CHE5SL27/ CHE5EL27	Chemistry for CV/CS/EE Stream	Chemistry	0	0	28	02	30	50	50	100	01
7	AEC/SDC	PRJ528	Interdisciplinary Project- Based Learning	Multiple Dept	0	0	28	02	30	50	50	100	01
8	HSMC	ICO529	Indian Constitution	Humanities	14	0	0	16	30	100	--	100	00
9	HSMC	PE5210	Physical Education	Sports	0	0	28	02	30	50	50	100	01
TOTAL										550	450	1000	20

COURSE CODE LIST FOR I AND II SEMESTER-2025-26

SL NO	COURSE CODE	COURSE TITLE
1	MAT5C11	Mathematics -I for Civil Engineering
2	MAT5S11	Mathematics -I for Computer Science Engineering Stream
3	MAT5E11	Mathematics -I for Electrical & Electronics Engineering Stream
4	MAT5M11	Mathematics-I for Mechanical Engineering Stream
5	PHY5C12	Physics for Civil Engineering
6	PHY5S12	Physics for Computer Science Engineering Stream
7	PHY5E12	Physics for Electronics & Electrical Engineering Stream
8	PHY5CL17	Physics Lab For Civil Engineering
9	PHY5SL17	Physics Lab For Computer Science Engineering Stream
10	PHY5EL17	Physics Lab For Electronics & Electrical Engineering Stream
11	CHE5E12	Chemistry for Electrical & Electronics Engineering Stream
12	CHE5S12	Chemistry for Computer Science and Engineering Stream
13	CHE5M12	Chemistry for Mechanical Engineering Stream
14	CHE5EL17	Chemistry Lab for Electrical & Electronics Engineering Stream
15	CHE5SL17	Chemistry Lab for Computer Science and Engineering Stream
16	CHE5ML17	Chemistry Lab for Mechanical Engineering Stream
PROGRAM SPECIFIC COURSE		
17	CIV5131	Engineering Mechanics

18	BEE5132	Basic Electronics Engineering
19	PPC5133	Principles of Programming using C
ESC COURSES		
20	ESC514A	Introduction to Civil Engineering
21	ESC514B	Introduction to Electrical Engineering
22	ESC514C	Introduction to Electronics Engineering
23	ESC514D	Introduction to Mechanical Engineering
24	ESC514E	Essentials of Information Technology
ETC COURSES		
25	ETC515K	Introduction to AI and its use cases for Civil Engineering
26	ETC515L	Introduction to AI and its use cases for Mechanical Stream
27	ETC515M	Introduction to AI and its use cases for Electrical & Electronics Engineering
28	ETC515N	Introduction to AI and its use cases for Electronics Stream
29	ETC515O	Introduction to AI and its use cases for Computer Science Stream
30	SKS516	Soft Skills - Ability enhancement course
31	IDT518	Innovation and Design Thinking
32	KSK519	Samskrutika Kannada
33	KBK519	Balake Kannada
34	CED513	Computer-Aided Engineering Drawing(CAED)
35	PLC515	Introduction to Python Programming

36	ENG516	Communication skills
37	ICO519	Indian Constitution
38	PE5110	Physical Education

II SEMESTER

SL NO	COURSE CODE	COURSE TITLE
1	MAT5C21	Mathematics -II for Civil Engineering
2	MAT5S21	Mathematics -II for Computer Science Engineering Stream
3	MAT5E21	Mathematics -II for Electrical & Electronics Engineering Stream
4	MAT5M21	Mathematics-II for Mechanical Engineering Stream
5	PHY5S22	Physics for Computer Science Engineering Stream
6	PHY5E22	Physics for Electronics & Electrical Engineering Stream
7	PHY5M22	Physics for Mechanical Engineering Stream
8	PHY5SL27	Physics Lab for Computer Science Engineering Stream
9	PHY5EL27	Physics Lab for Electronics & Electrical Engineering Stream
10	PHY5ML27	Physics Lab for Mechanical Engineering Stream
11	CHE5C22	Chemistry for Civil Engineering
12	CHE5S22	Chemistry for Computer Science and Engineering Stream
13	CHE5E22	Chemistry for Electrical & Electronics Engineering Stream
14	CHE5CL27	Chemistry Lab for Civil Engineering Stream
15	CHE5EL27	Chemistry Lab for Electrical & Electronics Engineering Stream
16	CHE5SL27	Chemistry Lab for Computer Science and Engineering Stream
PROGRAM SPECIFIC COURSE		
17	PPC5233	Principles of Programming Using C
18	EME5234	Elements of Mechanical Engineering

19	EEE5235	Elements of Electrical Engineering
ESC COURSES		
20	ESC524A	Introduction to AI and its use cases for Civil Engineering
21	ESC524B	Introduction to AI and its use cases for Mechanical Stream
22	ESC524C	Introduction to AI and its use cases for Electrical & Electronics Engineering
23	ESC524D	Introduction to AI and its use cases for Electronics Stream
24	ESC524E	Introduction to AI and its use cases for Computer Science Stream
ETC COURSES		
25	ETC525K	Introduction to AI and its use cases for Civil Engineering
26	ETC525L	Introduction to AI and its use cases for Mechanical Stream
27	ETC525M	Introduction to AI and its use cases for Electrical & Electronics Engineering
28	ETC525N	Introduction to AI and its use cases for Electronics Stream
29	ETC525O	Introduction to AI and its use cases for Computer Science Stream
30	SKS526	Soft Skills - Ability enhancement course
31	PRJ528	Interdisciplinary Project-Based Learning
32	KSK529	Samskrutika Kannada
33	KBK529	Balake Kannada
34	CED523	Computer-Aided Engineering Drawing
35	PLC525	Introduction to Python Programming

36	ENG526	Communication skills
38	ICO529	Indian Constitution
39	PE5210	Physical Education

SCHEME OF II YEAR

THIRD SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching & Learning Scheme					Exam Marks			Credits
				L	T	P	TW & SL	TH/S	CIE	SEE	Total	
1.	ASC	25MACS301	Mathematics-III for Computer Science Engineering	42	0	0	48	90	50	50	100	3
2.	IPCC	25CS302	Digital Design and Computer Organization	42	0	28	50	120	50	50	100	4
3.	PCC	25CS303	Data Structures and its Applications	42	0	0	48	90	50	50	100	3
4.	IPCC	25CS304	Object Oriented Programming with Java	42	0	28	50	120	50	50	100	4
5.	PCCL	25CS305	Data Structures Laboratory	0	0	28	2	30	50	50	100	1
6.	PCCL	25CS306	Unix and Shell Programming Laboratory	0	0	28	2	30	50	50	100	1
7.	AEC	25CS307X	Ability Enhancement Course	0	0	28	2	30	50	50	100	1
8.	SDC	25SCR	Community Project (Project-Based Learning) /Societal Project	0	0	0	30	30	50	50	100	1
9.	AEC	25PT1	Placement Training I	14	0	0	16	30	100	-	100	AUDIT
10.	NCMC	25NYP1	NSS, YOGA, PE	0	0	0	28	28	100	-	100	AUDIT
11.	NCMC	25BCM301	Bridge Course Mathematics -I (Non-Credit Mandate Audit Course for Diploma entry students)	14	0	0	14	28	100	-	100	AUDIT
Total							290					18

Ability Enhancement Course		
AEC	25CS307A	Data Analysis using R
AEC	25CS307B	Data Analytics with Excel
AEC	25CS307C	Data Visualization with Python
AEC	25CS307D	Version Controller with GiT

FOURTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours per Semester					Exam Marks			Credits
				L	T	P	TW & SL	TH/S	CIE	SEE	Total	
1.	PCC	25CS401	Design and Analysis of Algorithms	42	0	0	48	90	50	50	100	3
2.	IPCC	25CS402	Microcontroller and Embedded Systems	42	0	28	50	120	50	50	100	4
3.	PCC	25CS403	Database Management Systems	42	0	0	48	90	50	50	100	3
4.	PCC	25CS404	Operating Systems	42	0	0	48	90	50	50	100	3
5.	PCC	25CS405	Discrete Mathematics and Combinatorics	42	0	0	48	90	50	50	100	3
6.	PCCL	25CS406	Algorithms Laboratory	0	0	28	2	30	50	50	100	1
7.	PCCL	25CS407	Database Management Systems Laboratory	0	0	28	2	30	50	50	100	1
8.	AEC	25CS408X	Ability Enhancement Course	0	0	28	2	30	50	50	100	1
9.	BSC	25CS409	Biology for Engineers	14	0	0	16	30	50	50	100	1
10.	SDC	25EVS	Environmental Science Project	0	0	0	30	30	50	50	100	1
11.	AEC	25PT2	Placement Training II	14	0	0	16	30	100	-	100	AUDIT
12.	NCMC	25NYP1	NSS, YOGA, PE	0	0	0	28	28	100	-	100	AUDIT
13.	NCMC	25BCM301	Bridge Course Mathematics -I (Non-Credit Mandate Audit Course for Diploma entry students)	14	0	0	14	28	100	-	100	AUDIT
Total							352					21

Ability Enhancement Course

1	25CS408A	Computer Assembly and Networking
2	25CS408B	Introduction to Power Bi
3	25CS408C	Technical writing using Latex
4	25CS408D	UI/UX Laboratory

**PROGRAM OUTCOME (PO) AND PROGRAM SPECIFIC OUTCOME
(PSO) MAPPING**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
25MACS301	✓	✓	✓										
25CS302	✓	✓	✓		✓							✓	
25CS303	✓	✓	✓		✓						✓	✓	✓
25CS304	✓	✓	✓		✓							✓	✓
25CS305			✓		✓				✓		✓		✓
25CS306	✓		✓									✓	
25CS307A	✓		✓		✓			✓	✓		✓	✓	✓
25CS307B	✓		✓		✓			✓	✓		✓	✓	✓
25CS307C	✓		✓		✓			✓	✓		✓	✓	✓
25CS307D	✓		✓		✓			✓	✓		✓	✓	✓
25CS401	✓	✓	✓								✓		✓
25CS402	✓	✓	✓		✓							✓	
25CS403	✓	✓	✓		✓			✓	✓			✓	
25CS404	✓	✓	✓		✓			✓	✓		✓		
25CS405	✓	✓	✓		✓			✓	✓		✓	✓	
25CS406			✓		✓				✓		✓		✓
25CS407	✓		✓									✓	
25CS408A	✓	✓										✓	
25CS408B	✓		✓		✓			✓	✓		✓	✓	✓
25CS408C	✓		✓		✓			✓	✓		✓	✓	✓
25CS408D	✓		✓		✓			✓	✓		✓	✓	✓

Course Title	PHYSICS FOR CIVIL ENGINEERING		
Course Code	PHY5C12/22	(L-T-P) C	(3-1-0)3
Exam	3 hours	Hours/Week	04
SEE	100 marks	Total Hours (L+T+P+TW+SL)	90
Course Objective: The objective of the course is to make students learn principles and theories of physics in civil engineering field and to develop effective solutions for civil engineering problems.			
Course Outcomes: Upon completion of the course, students shall be able to			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Interpret fundamental concepts of physics to analyze vibrations, rigid body dynamics, crystallography, photonics, Acoustics and shock waves.	1	-
2	Apply theoretical principles to understand and solve problems related to rigid body dynamics, crystal structures, photonic systems, lasers, and Acoustics.	1	-
3	Solve problems related to the applications of material science, crystallography, photonics, and Acoustics.	1	-
4	Discuss collaboratively in groups to conduct experiments, analyze results, and effectively communicate findings through presentations	1, 8, 9	-
MODULE-1			10Hrs.
Vibrations and Rigid Body Dynamics. Pre-requisites: Fundamentals of Newtonian Mechanics. Free vibrations. Damped vibrations-derivation of expressions for displacement of damped harmonic motion. Discussion of types of damped vibrations. Forced vibrations-derivation of expression for amplitude and phase-			

variation with frequency, Resonance. Condition for amplitude resonance. Consequences of resonance. Spring mass and its applications Rigid body. Moment of inertia. Torsional pendulum-derivation of expression for time period of oscillation. Mention its uses. Bending of beams- derivation of expression for bending moment of a beam. Cantilever-derivation for depression of loaded end of a single cantilever. Applications of cantilevers. Self-learning component: Simple Harmonic Vibrations. <i>Numerical problems on amplitude and phase of forced vibrations, time-period of oscillation, bending moment and Young's Modulus/depression of a cantilever.</i>	
MODULE-2	10Hrs.
Acoustics and Ultrasonics. Pre-requisites:Fundamentals of Sound. Acoustics; Introduction to acoustics, Types of Acoustics, reverberation and reverberation time, absorption power and absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (No derivation), Eyring's formula (No derivation). Comparison of Eyring's and Sabine's formula, measurement of absorption coefficient, factors affecting the acoustics and remedial measures, Noise and its Insulation, Ultrasonics. Non-destructive testing of materials using ultrasonics. Measurement of velocity of ultrasonic waves and elastic constants in solids and liquids. List of application of ultrasonics, detection of cracks in metal blocks, kill bacteria in liquid, medical field, Determining the depth of the sea. Self-learning; Production of Ultrasonic waves. <i>Numerical Problems on reverberation time, absorption power and absorption coefficient, Sabine's formula, Eyring's formula.</i>	
MODULE-3	10Hrs.

Photonics.

Pre-requisites: Geometrical optics, physical science of light waves

Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources. Ruby laser, CO₂ laser, Semiconductor laser. Advantages and disadvantages of above laser sources. Holography. Qualitative discussion of measurement of pollutants (LIDAR), LASER Range Finder, Speed Checker, laser cutting, laserdrilling, laser welding, List of other applications: laser-guided missiles, Bridge Deflection, Road Profiling.

Self-learning: Characteristics of Laser

Numerical problems on Boltzmann factor, Energy density, number of photons.

MODULE-4**10Hrs****Crystallography.**

Pre-requisites: States of matter, Classifications of solids

Introduction to crystalline solids. Space lattice, Bravais lattice–unit cell, primitive cell. Lattice parameters. Directions and planes, Miller indices. Expression for interplanar spacing. Coordination number. Atomic packing factors (SC, FCC, BCC). Density of a unit cell. Production of X-ray, Bragg's law and Bragg's spectrometer. XRD-application in material characterization.

Shock waves: Mach number and Mach Angle, Definition and Characteristics of Shock waves, Construction and working of Reddy Shock tube, List of applications of Shock Waves,

Self-learning: 7 basic crystal systems.

Numerical problems on Miller indices, Interplanar space. Bragg's law, Mach number

Prescribed Textbooks:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering physics	R K Gaur and S L Gupta, ISBN:	Eleventh Edition,	Dhan pat Rai Publishing Company (P) Ltd.	2011

		9788189928223			
2	Solid state physics.	S.O.Pillai, ISBN-10: 9386070928,	Eighth edition,	New Age International Pvt. Ltd,	2018

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Shock waves made simple.	Chin too S Kumar, K Takayama and K P J Reddy:	New	Willey India Pvt. Ltd, Delhi	2014
2	A Textbook of Engineering Physics	M.N. Avadhanulu and P.G. Kshirsagar,	10th revised Ed,	S. Chand. & Company Ltd, New Delhi	2018
3	Lasers and Non Linear Optics	B.B Laud	3rd Ed	New Age International Pvt. Ltd,	2011

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc23_ee84/preview
2. https://onlinecourses.nptel.ac.in/noc23_cv37/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted. <u>Details of activity 1: - Hands on model and report</u>	10+10=20

	<u>submission</u> <u>Details of activity 2: - Presentation and viva-voce</u>	
Total		50

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3										
CO2	3										
CO3	3										
CO4	3							1	1		

CourseTitle	PHYSICS LAB FOR CIVIL ENGINEERING		
CourseCode	PHY5CL17/27	(L-T-P)C	(0-0-2)1
Exam	3hours	Hours/Week	02
SEE	100 marks	Total Hours (L+T+P+TW+SL)	30
CourseObjective: To impart hands-on experience in fundamental experiments related to modern physics, material properties, mechanical systems, and optical techniques and develop skills essential for civil engineering practice.			
CourseOutcomes: Uponcompletionofthecourse,students shallbeableto			
Sl. No.	Courseoutcomes	PO	PSO
1.	Apply appropriate experimental techniques to determine material, electrical, mechanical, and optical properties.	1,8,9	-
2.	<u>Interpret experimental data to evaluate physical parameters relevant to engineering applications in a professional laboratory setting</u>	1,8,9	-

CourseContents**List of experiments**

Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.

Determination of dielectric constant by charging and discharging of a capacitor.

Determination of wavelength of LASER by diffraction technique.

Verification of Stefan's law of radiation.

Determination of Planck's constant using Light Emitting Diodes.

Estimation of frequencies of vibrating string and AC using Sonometer.

Determination of resonance frequency and inductance using LCR circuits.

Determination of Young's modulus using single cantilever.

Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.

Determination of numerical aperture and modes of transmission of optical fiber.

Determination of Fermi energy of given material.

Determination of Mach number by using Reddy shock tube.

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Engineering physics Lab Manual	Faculty of Department of Physics	1	Department of Physics, Malnad College of Engineering, Hassan	2025

Online Courses and Video Lectures:

<https://youtu.be/ASOcMmPCLhU>

https://youtu.be/pJm1B-||_OE

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Assessment	Conduction of any 10 of 12 experiments -20 marks (conduction + calculation with results) Record-10 marks	30
Test (CIE)	<u>Write up, experimental set up, conduction and calculation-80% of maximum marks</u> <u>Viva-Voce-20% of maximum marks (test will be conducted for 50 marks and reduced to 20)</u>	20
Total		50

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1
CO1	3							1	1		
CO2	3							1	1		

Course Title	PHYSICS FOR MECHANICAL ENGINEERING STREAM		
Course Code	PHY5M12/22	(L-T-P) C	(3-1-0)3
EXAM	3 Hours	Hours/Week	4
SEE	100 marks	Total Hours (L+T+P+TW+SL)	90
Course Objective: The objective of the course is to make students learn principles and theories of physics in the Mechanical engineering field and to develop effective solutions for engineering problems. Course Outcomes: Upon completion of the course, students shall be able to			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Interpret fundamental concepts of physics to analyze vibrations, rigid body dynamics, crystallography, photonics, and thermoelectric phenomena.	1	-
2	Apply theoretical principles to understand and solve problems related to rigid body dynamics, crystal structures, photonic systems, lasers, and thermoelectric materials.	1	-
3	Solve problems related to the applications of material science, crystallography, photonics, and thermoelectric devices in engineering	1	-
4	Work collaboratively in groups to conduct experiments, analyze results, and effectively communicate findings through presentations	1, 8, 9	-
MODULE-1			10 hours
Vibrations and Rigid Body Dynamics Prerequisites: Basics of Mechanics, Oscillations, and Differential equations.			

Simple harmonic vibrations. Free vibrations. Damped vibrations-derivation of expressions for displacement of damped harmonic motion. Discussion of types of damped vibrations. Forced vibrations-derivation of expression for amplitude and phase-variation with frequency. Resonance. Condition for amplitude resonance. Applications of resonance, spring mass and its applications.

Rigid body. Moment of inertia. Torsional pendulum-derivation of expression for time of oscillation. Applications in automotive engineering and robotics (moment of inertia of rotating parts like wheels, axles and design of rotating machinery and structural elements). Bending of beams- derivation of expression for bending moment of a beam. Cantilever-derivation for depression of loaded end of a single cantilever. Application: Cantilever beams in cranes and wings of airplanes.

Self-learning topics: Fundamentals of Elasticity.

Numerical problems on Amplitude and phase of forced vibrations, time-period of oscillation, bending moment and Young's Modulus/depression of a cantilever.

MODULE-2	10 hours
Crystallography Pre-requisites: Basic understanding of Atomic structure, Wave-particle duality, and Geometry Space lattice, Bravais lattice–unit cell, primitive cell. Lattice parameters. Directions and planes, Miller indices. Expression for interplanar spacing. Coordination number. Atomic packing factors (SC, FCC, BCC). Density of a unit cell. X-rays and their types. Bragg's law. Bragg's X-ray spectrometer for identification of crystal structure. Importance of X-ray diffraction in material characterisation. de Broglie's concept of matter waves. Diffraction of matter waves- Davisson-Germer experiment, application of diffraction of X-rays and electrons in advent of nanotechnology and material characterization-Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM). Self-learning topics: 7 basic crystal systems Numerical problems on de Broglie's equation Miller indices, Interplanar space, Bragg's law.	
MODULE-3	10 hours

Photonics

Pre-requisites: Fundamentals of electromagnetic waves and geometrical optics.

Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO₂ laser –construction and working. Industrial applications of laser: laser cutting, laser drilling, laser welding and laser assisted ultrasonics of finding defects in materials

Optical fibres. Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Merits and demerits of optical fibres. Applications: Optical fiber sensors and industrial endoscopy.

Self-learning topics: Identification of other applications: Bar Code scanner, Laser Printer, Laser Cooling, laser fencing, laser-guided missiles, LASER Range Finder, Road Profiling, Bridge Deflection, Speed Checker.

Numerical problems on Boltzmann factor, Numerical aperture, V-number and number of modes.

MODULE-4**10 hours****Thermoelectric materials and devices**

Pre-requisites: Fundamentals of thermodynamics.

Thermoelectric phenomena. Thermo emf and thermo current, Seebeck effect. Variation of thermo emf with temperature, Peltier effect, Seebeck, Peltier and Thomson coefficients (Mention Expression), laws of thermoelectricity. Experimental demonstration of Peltier effect. Explanation of thermo emf based on Peltier effect. Thermo-electric power. Construction and Working of Thermoelectric generators (General). Construction and working of Thermoelectric coolers (Refrigerators), Construction and working of Exhaust (Automobiles). Applications: Temperature sensors: Resistance Temperature Detector (RTD), Thermistor, Thermocouple, waste heat recovery.

Self-learning topics: Renewable energy sources from heat

Numerical Problems on thermoelectric coefficients.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering physics	R K Gaur and S L Gupta, ISBN: <u>9788189928223</u> , Dhanpat Rai	second	(P) Ltd. Edition	2011
2	Solid state physics	S O Pillai, physics ISBN-10: 9386070928	Eighth edition	New Age International Pvt. Ltd,	9 January 2018.

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Fiber Optics	: A K Ghatak and K Thyagarajan ISBN-13: 978-0521577854	2	Cambridge University Press India Pvt. Limited	1998
2	NPTEL courses on Engineering physics	E-resources			
3	Heat, Thermodynamics and Statistical Physics	Singal, Agarwal and Prakash ISBN-13- 9789350065235	New	Pragati Prakashan, India	2017
4	Heat and thermodynamics	Brijlal N Subramanyam ISBN: 81-219-2813-3 S.	new	Chand and Co. Ltd. New Delhi,	2007

E Books and online course materials:

https://onlinecourses.nptel.ac.in/noc23_ee84/preview

https://onlinecourses.nptel.ac.in/noc23_cy37/preview

Online Courses and Video Lectures:

<https://youtu.be/ASOcMmPCLhU>

https://youtu.be/pJm1B-||_OE

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs Conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted <u>Group Activity - Execution and Report: 10 marks</u> <u>Presentation and Viva-Voce: 10 marks</u>	20
Total		50

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3										
CO2	3										
CO3	3										
CO4	3							1	1		

CourseTitle	PHYSICS LAB FOR MECHANICAL ENGINEERING STREAM		
CourseCode	PHY5ML17/27	(L-T-P) C	(0-0-2)1
Exam	3hour	Hours/Week	02
SEE	100 marks	Total Hours (L+T+P+TW+SL)	90
CourseObjective: To provide hands-on experience in experiments that strengthen concepts in modern physics, materials, mechanics, and optics, enhancing practical engineering skills.			
Course Outcomes: Uponcompletionofthecourse,students shallbeableto			
Sl. No.	Courseoutcomes	PO	PSO
1.	Conduct experiments to determine various physical properties such as resistivity, energy gap, dielectric constant, Young's modulus, and Fermi energy using standard techniques.	1,8,9	-
2.	<u>Analyze experimental data and effectively present results relevant to engineering applications.</u>	1,8,9	-
CourseContents List of experiments 1. <u>.Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.</u> 2. <u>Determination of dielectric constant by charging and discharging of a capacitor.</u> 3. <u>Determination of wavelength of LASER by diffraction technique.</u> 4. <u>Verification of Stefan's law of radiation.</u> 5. <u>Determination of Planck's constant using Light Emitting Diodes.</u>			

6. Estimation of frequencies of vibrating string and AC using Sonometer.
7. Determination of resonance frequency and inductance using LCR circuits.
8. Determination of Young's modulus using single cantilever.
9. Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
10. Determination of numerical aperture and modes of transmission of optical fiber.
11. Spring constant
12. Fermi energy of copper
13. Measurement of Mach number using Reddy Shock tube

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering physics Lab Manual	Faculty of Department of Physics	1	Department of Physics, MCE, Hassan	2025

Online Courses and Video Lectures:

<https://youtu.be/ASOcMmPCLhU>

https://youtu.be/pJm1B-||_OE

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Assessment	Conduction of any 10 of 13 experiments -20 marks (conduction + calculation with results) Record-10 marks	30
Test (CIE)	Write up, experimental set up, conduction and calculation-80% of	20

	<u>maximum marks</u> <u>Viva-Voce-20% of maximum marks (test will be conducted for 50 marks and reduced to 20)</u>										
Total											50

Course Articulation Matrix											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3							1	1		
CO2	3							1	1		

Course Title	PHYSICS FOR ELECTRONICS AND ELECTRICAL ENGINEERING STREAM																						
Course Code	PHY5E12/22	(L-T-P) C	(3-1-0)4																				
Exam	3hour	Hours/Week	04																				
SEE	100 marks	Total Hours (L+T+P+TW+SL)	90																				
Course Objective: Objective of the course is to make students learn principles and theories of physics in electronics and electrical engineering fields and to develop effective solutions for engineering problems. Course Outcomes: Upon completion of the course students shall be able to: <table> <tr> <th>#</th><th>Course Outcomes</th><th>Mapping to PO's</th><th>Mapping to PSO's</th></tr> <tr> <td>1</td><td>Interpret theories of materials science, photonics and quantum mechanics</td><td>1</td><td>-</td></tr> <tr> <td>2</td><td>Identify applications of materials science, photonics and quantum mechanics.</td><td>1</td><td>-</td></tr> <tr> <td>3</td><td>Solve problems on materials science, lasers, optical fibers and quantum mechanics.</td><td>1</td><td>-</td></tr> <tr> <td>4</td><td>Realise the concepts, laws and properties of materials, photonics and quantum behaviour of matter through activities.</td><td>1,8,9</td><td></td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1	Interpret theories of materials science, photonics and quantum mechanics	1	-	2	Identify applications of materials science, photonics and quantum mechanics.	1	-	3	Solve problems on materials science, lasers, optical fibers and quantum mechanics.	1	-	4	Realise the concepts, laws and properties of materials, photonics and quantum behaviour of matter through activities.	1,8,9	
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1	Interpret theories of materials science, photonics and quantum mechanics	1	-																				
2	Identify applications of materials science, photonics and quantum mechanics.	1	-																				
3	Solve problems on materials science, lasers, optical fibers and quantum mechanics.	1	-																				
4	Realise the concepts, laws and properties of materials, photonics and quantum behaviour of matter through activities.	1,8,9																					
MODULE-1			10Hrs.																				
Electrical Properties of Solids Pre-requisites: States of Matter and their properties																							

Free electron theories:Free electrons in metals. Drift velocity, Mean free path, Mean collision time, Relaxation time. Classical free electron theory-assumptions. Expression for electrical conductivity in metals. Failures of classical free electron theory. Quantum free electron theory–assumptions. Fermi energy. Fermi-Dirac distribution function (Fermi factor). Merits of quantum free electron theory. Effects of impurity and temperature on electrical resistivity of metals. Applications(Qualitative discussion); Designing electrical interconnects, PCBs, conductor materials, optoelectronic components-photodetectors, thermal solutions for electronics-heat sinks.

Semiconductors:Effects of impurity and temperature on electrical resistivity of semiconductors. Electrical conductivity of a semiconductor (derivation). List of Applications: Diodes, Transistors, Integrated Circuits (ICs), Sensors, and in Electric Motor Control, Smart Grids and Power Monitoring, Electric Vehicles (EVs).

Self-learning topics: Band theory of solids and classification of semiconductors.

Numerical problems on electron concentration, electrical conductivity, resistivity, Fermi factor, Fermi energy.

MODULE-2

10Hrs.

Dielectrics and Superconductors

Pre-requisites: Distinction between different types of materials.

Dielectric materials:Classification: polar and nonpolar dielectrics. Relative permittivity (dielectric constant), Polarization and its types. Frequency dependence of polarizability and permittivity. Expression for internal field. Clausius-Mossotti equation. Dielectric loss and loss tangent, Dielectric strength and breakdown. Ferroelectric and Piezoelectric Materials. Applications(Qualitative); Energy storage devices, transformers, PCBs, RF and Microwave Components.

Superconductors:Temperature dependence of electrical resistivity in superconductors. Meissner effect. Critical magnetic field.Critical current. Type I and Type II superconductors. BCS Theory. High temperature superconductors. Applications; Discussion of superconducting magnets, MRI and SQUID, Identification of other applications; LosslessPower Transmission and Distribution, Superconducting Filters and Amplifiers, Quantum Technology, Generators and Maglev Vehicle.

Self-learning topics: Types of Dielectric Materials-Solid, Liquid, and Gaseous Dielectrics. <i>Numerical problems on dielectric constant, internal field, Clausius-Mossotti equation, critical current and critical magnetic field.</i>	
MODULE-3	10Hrs.
Photonics Pre-requisites: Fundamentals of Geometrical optics LASER: Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO₂ laser –construction and working, Applications: LIDAR-Measurement of pollutants (qualitative), Identification of other applications: laser cutting, laser drilling, laser welding, Mention of Communication Systems, Measurements and Instrumentation, Testing and Inspection, Power Systems, Consumer Electronics Devices, Remote Sensing. Optical fibers: Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Attenuation. Applications: Discussion of Fiber Optic Communication, identification of other applications-Electrical Power Systems, Measurement and Instrumentation. Lighting and Displays, Embedded Sensing in Smart Systems, Electromagnetic Isolation. Merits and demerits of optical fibers. Self-learning topics: Analog vs Digital Transmission. <i>Numerical problems on energy, Boltzmann factor, V-number, Numerical aperture, and attenuation.</i>	
MODULE-4	10Hrs
Quantum Communication Pre-requisites: Modes of transfer of thermal energy Black body. Black body radiation spectrum, Wien's law and Rayleigh Jeans law. Planck's law. Dual nature of	

matter-Louis de Broglie hypothesis of matter waves. Group velocity, phase velocity, particle velocity and their relation with velocity of light (no derivations). Expression for de Broglie wavelength of electron. Characteristics of matter waves. Schrodinger wave equation. Max Born's interpretation of wave function. Application of Schrodinger wave equation to find eigen values and eigen functions for a trapped particle. Discussion of probability density for different quantum states and advent to quantum computing and communication.

Classical bits and Qubits; Definitions of their types; SQUID, Photonic, NMR, Ion trap. Heisenberg's uncertainty principle. Quantum tunneling, Quantum superposition, Quantum entanglement. Quantum Communication- Quantum Teleportation. Features, Challenges, and Future Prospects of quantum communication: Quantum key distribution. Quantum repeater. Quantum internet. Quantum Satellite Communication (Qualitative).

Self-learning Topics: Application of Schrodinger wave equation to find eigen values and eigen functions for a free particle.

Numerical problems on Louis de Broglie equations, group velocity, phase velocity and Eigenvalue equation.

Prescribed Textbooks:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering physics	R K Gaur and S L Gupta ISBN: 9788189928223	2022	Dhanpat Rai Publishing Company	2022
2	Solid state physics	S O Pillai ISBN-10: 9386070928	Eighth edition	New Age International Pvt. Ltd	2018

3	Quantum Computation and Quantum Information	Michael A. Nielsen & Isaac L. Chuang	10 th Anniversary Edition	Cambridge University Press	2012
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Reference Books:

Sl. No	BookTitle	Authors	Edition	Publisher	Year
1	Modern Physics	Kenneth S. Krane, ISBN-13: 9781118061145,	3	John Wiley & Sons	2012
2	Lasers and non-linear optics	B.B. Laud, ISBN: 9788122430561	3	New Age International Private Limited	2015
3	Fiber Optics	A K Ghatak and K Thyagarajan, <i>ISBN-13: 978-1-4039-3011-8, ISBN: 1-4039-3011-2</i>	2	Macmillan/Laxmi Publications (P) Ltd., New Delhi	2006

E Books and online course materials:

1. https://onlinecourses.nptel.ac.in/noc23_ee84/preview
2. https://onlinecourses.nptel.ac.in/noc23_ph36/preview

Online Courses and Video Lectures:

[https://www.coursera.org/search?query=engineering%20physics&topic=Physical%20Science%](https://www.coursera.org/search?query=engineering%20physics&topic=Physical%20Science%20)

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	ThreeCIEsconductedfor20markseach and reduced to 10 marks	30
Activity Details	Details of activities to be conducted <u>Group activity-execution and report-10 marks</u> <u>Presentation, Viva-Voce – 10 marks</u>	20
Total		50

Course Articulation Matrix

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

Course Title	PHYSICS LAB FOR ELECTRONICS AND ELECTRICAL ENGINEERING STREAM		
Course Code	PHY5EL17/27	(L-T-P) C	(0-0-2)1
Exam	3hour	Hours/Week	02
SEE	100 marks	Total Hours (L+T+P+TW+SL)	30

Course Objective:

Objective of the course is to make students realize principles of physics by conducting experiments towards developing effective solutions for engineering problems.

Course Outcomes: Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Identify the physical properties of materials, lasers, optical fibers and black body through practical experience.	1,8,9	-
2	Interpret physical parameters of materials properties, lasers, optical fibers and quantum mechanics.	1,8,9	-

SN	Experiments
1	Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique
2	To determine the resistivity (ρ) and conductivity (σ) of a given metallic wire using its resistance, length, and cross-sectional area.
3	Determination of dielectric constant by charging and discharging of a capacitor.
4	Determination of wavelength of LASER by diffraction technique

5	Verification of Stefan's law of radiation
6	Determination of Planck's constant using Light Emitting Diodes
7	Estimation of frequencies of vibrating string and AC using Sonometer
8	Determination of resonance frequency and inductance using LCR circuits.
9	Determination of Young's modulus using single cantilever
10	Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
11	Determination of numerical aperture and modes of transmission of optical fiber
12	Determination of quantum circuit under black box using the output (only 5 circuits).
13	I-V Characteristics of zener diode

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering physics Lab Manual	Faculty of Department of Physics	1	Department of Physics, Malnad College of Engineering, Hassan	2025

Online Courses and Video Lectures:

https://onlinecourses.nptel.ac.in/noc24_ph06/preview

<https://archive.nptel.ac.in/courses/115/105/115105110/>

https://www.youtube.com/watch?v=pJm1B-II_0E

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Assessment	Conduction of any 10 of 13 experiments, computation -20 marks Reports -10 marks	30
Test (CIE)	<u>Write up, experimental set up, conduction and calculation-80% of max. Marks.</u> <u>Viva-Voce – 20% of max. Marks (test will be conducted for 50 marks and reduced to 20 marks)</u>	20
Total		50

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3							1	1		
CO2	3							1	1		

Course Title	PHYSICS FOR COMPUTER ENGINEERING STREAM																						
Course Code	PHY5S12/22	(L-T-P) C	(3-1-0) 3																				
Exam	3hour	Hours/Week	04																				
SEE	100 marks	Total Hours (L+T+P+TW+SL)	90																				
Course Objective:The objective of the course is to enable students to learn the principles and theories of physics relevant to computer science and allied engineering fields, forming a foundation towards developing effective engineering solutions. Course Outcomes: Upon completion of the course the students will be able to <table> <tr> <th>#</th><th>Course Outcomes</th><th>Mapping to PO's</th><th>Mapping to PSO's</th></tr> <tr> <td>1</td><td>Discuss the working principles of quantum and classical physics, LASERs, optical fibers, and their applications in photonic systems.</td><td>1</td><td>-</td></tr> <tr> <td>2</td><td>Apply principles of photonics, classical and quantum mechanics in deriving relations between physical quantities and properties.</td><td>1</td><td>-</td></tr> <tr> <td>3</td><td>Solve the problems pertaining to photonics, classical and quantum properties of materials.</td><td>1</td><td>-</td></tr> <tr> <td>4</td><td>Analyze principles of classical and quantum physics through activities.</td><td>1,8,9</td><td>-</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1	Discuss the working principles of quantum and classical physics, LASERs, optical fibers, and their applications in photonic systems.	1	-	2	Apply principles of photonics, classical and quantum mechanics in deriving relations between physical quantities and properties.	1	-	3	Solve the problems pertaining to photonics, classical and quantum properties of materials.	1	-	4	Analyze principles of classical and quantum physics through activities.	1,8,9	-
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1	Discuss the working principles of quantum and classical physics, LASERs, optical fibers, and their applications in photonic systems.	1	-																				
2	Apply principles of photonics, classical and quantum mechanics in deriving relations between physical quantities and properties.	1	-																				
3	Solve the problems pertaining to photonics, classical and quantum properties of materials.	1	-																				
4	Analyze principles of classical and quantum physics through activities.	1,8,9	-																				
MODULE-1			10 Hrs.																				

Photonics

Pre-requisites: Fundamentals of geometrical optics.

LASER: Characteristic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's A and B Coefficients and Expression for Energy Density (Derivation), Laser Action, Population Inversion, Metastable State, Requisites of a laser system, Semiconductor Diode Laser, Applications: LIDAR, Bar code scanner, Laser Printer (Qualitative).

Optical Fiber: Principle and Structure, Propagation of Light, Acceptance angle and Numerical Aperture (NA), Derivation of Expression for NA, V-number, Modes of Propagation, fractional refractive index, Classification of Optical Fibers, Attenuation and their types, Applications: Fiber Optic Communication and networking, broadband communication and speed of internet.

Self-learning: Acceptance angle and Total Internal Reflection.

Numerical problems on Boltzmann factor, V-number, Numerical aperture, and attenuation.

MODULE-2

10 Hrs.

Free Electron Theory and Superconductivity

Pre-requisites: Basics of current electricity.

Free Electron Theory

Free electron concept in metals. Classical free electron theory-assumptions. Drift velocity, mean free path, Mean collision time, Relaxation time. Expression for electrical conductivity in metals, Failures of Classical Free Electron Theory, Assumptions of Quantum Free Electron Theory, Fermi Energy, Fermi Factor, Variation of Fermi Factor with Temperature and Energy. Merits of Quantum Free Electron Theory. Matthiessen's rule and temperature dependent electrical conductivity.

Superconductivity

Introduction to Superconductors, Temperature dependence of resistivity, Meissner's Effect and its experimental demonstration, Critical Field, Temperature dependence of Critical field, Critical Current, Types of Superconductors.

BCS theory, High Temperature superconductivity, Josephson Junctions, superconducting magnets, SQUID(Qualitative), Applications in Quantum Computing and magnetic sensors for brain computer interface. Self-learning: Resistivity and Mobility <i>Numerical problems on electrical conductivity, Fermi energy, and critical magnetic field.</i>	
MODULE-3	10 Hrs.
Quantum mechanics for computation Pre-requisites: Wave–Particle dualism Black body radiation spectrum, Wien’s law and Rayleigh Jeans law, assumptions of quantum theory of radiation, Planck’s law. Explanation of dual nature of matter. de Broglie Hypothesis of Matter Waves, de Broglie wavelength and derivation of its expression for electrons, Phase Velocity and Group Velocity, and their relationship with speed of light (no derivation). Wave Function, Time independent Schrödinger wave equation, Physical Significance of a wave function and Born Interpretation, Expectation value, Eigen functions and Eigen Values, Particle inside one dimensional infinite potential well, Quantization of Energy States, Waveforms and Probabilities. The application of quantum mechanics in quantum technology - quantum computation, quantum communication, quantum sensors, quantum materials and devices. Self-learning: Photoelectric Effect and Compton Effect (qualitative) <i>Numerical problems on de Broglie equations, group velocity, phase velocity and Eigenvalue equation.</i>	
MODULE-4	10 Hrs.
Elements of Quantum Computing Pre-requisites: Fundamentals of binary systems, thermodynamics and statistics. Introduction to quantum computers, difference between classical and quantum computers, features of quantum computers; exponential speedup, parallel computation, reversible computation. Principles of quantum computation; Heisenberg’s uncertainty principle, Quantum tunnelling, Quantum entanglement, quantum superposition. Qubits and	

working principle of their different types; SQUID, Photonic, NMR, Ion trap. Notations of representing states and operations of quantum computation; Dirac bracket notation, Bloch sphere and matrix. Basics of quantum logic gates; single qubit logic gates (X, Y, Z and Hadamard) and multi-qubit logic gates (Controlled X).

Physics-Inspired Machine Learning Systems

Energy minimization principle in physical systems and its application to neural networks; Hopfield network structure, energy function, attractor states, and Hebbian learning rule. Boltzmann distribution and its role in determining state probabilities in neural systems; influence of temperature on energy-based learning. Simulated annealing technique for global optimization, temperature scheduling and acceptance probability. Ising model analogy for binary neurons; local interactions and global stability.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering physics	R K Gaur and S L Gupta	1	<i>Dhanpat Rai Publishing Company</i> (P) Ltd.	2011
2	Solid state physics	S O Pillai	1	New Age International Pvt. Ltd	2018

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Modern Physics: Kenneth S. Krane	Kenneth S. Krane	3	John Wiley & Sons, Inc.,	2012
2	Fiber Optics	A K Ghatak and K Thyagarajan	1	Cambridge University Press India Pvt. Limited	1998

	3	Quantum Computation and Quantum Information	Michael A. Nielsen & Isaac L. Chuang	10th Anniversary Edition	Cambridge University Press	2012	
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E Books and online course materials:

https://onlinecourses.nptel.ac.in/noc23_ph29/preview

Online Courses and Video Lectures:

<https://youtu.be/lZ3bPUKo5zc?si=xH1W4tBalCExwzEw>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Group activity-execution and report-10 marks 2) Presentation, Viva-Voce – 10 marks	20
Total		50

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11

	C01	3										
	C02	3										
	C03	3										
	C04	3						1	1			

Course Title	PHYSICS LAB FOR COMPUTER ENGINEERING STREAM		
Course Code	PHY5SL17/27	(L-T-P) C	(0-0-2)1
Exam	3 hr	Hours/Week	02
SEE	100 marks	Total Hours (L+T+P+TW+SL)	30
Course Objective:			
To enable students to explore and apply fundamental concepts of physics through hands-on experiments, fostering analytical thinking and practical skills essential for solving real-world engineering challenges.			
Course Outcomes: Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply practical knowledge of fundamental physics principles through experimental techniques involving semiconductors, lasers, optics, thermal radiation, and mechanical systems.	1,8,9	-
2	Develop students' ability to perform and analyze experiments for evaluating Physical parameters of materials relevant to engineering applications.	1,8,9	-
SN	Experiments		
1	Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique		
2	Determination of quantum circuit under black box using the output (only 5 circuits).		
3	Determination of dielectric constant by charging and discharging of a capacitor.		
4	Determination of wavelength of LASER by diffraction technique		

5	Verification of Stefan’s law of radiation
6	Determination of Planck’s constant using Light Emitting Diodes
7	Estimation of frequencies of vibrating string and AC using Sonometer
8	Determination of resonance frequency and inductance using LCR circuits.
9	Determination of Young’s modulus using single cantilever
10	Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
11	Determination of numerical aperture and modes of transmission of optical fiber
12	I-V Characteristics of zener diode

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering physics Lab Manual	Faculty of Department of Physics	1	Department of Physics, Malnad College of Engineering, Hassan	2025

Online Courses and Video Lectures:

https://onlinecourses.nptel.ac.in/noc24_ph06/preview

https://www.youtube.com/watch?v=pJm1B-II_0E

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous	Conduction of any 10 of 12experiments, computation -20 marks	30

Assessment	Reports -10 marks	
Test (CIE)	<u>Write up, experimental set up, conduction and calculation-80% of max. Marks</u> <u>Presentation</u> <u>Viva-Voce – 20% of max. Marks (CIE will be conducted for 50 marks and reduced to 20 marks)</u>	20
Total		50

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3							1	1		
CO2	3							1	1		

Course Title	QUANTUM COMPUTATION AND QUANTUM COMMUNICATION		
Course Code	23OEPH61/71	(L-T-P) C	(3-0-0)3
Exam	3hour	Hours/Week	03
SEE	100 marks	Total Hours (L+T+P+TW+SL)	90
Course Objective:			
The course introduces foundational quantum mechanics concepts applied in computation and communication, focusing on differences from classical systems, basic circuits, and simple algorithms and protocols.			
Course Outcomes: Upon completion of the course, students shall be able to:			
#	Course Outcomes		Mapping to PO's
1	Understand the differences between classical and quantum computation models.		1
2	Apply quantum gate operations and circuit models to simulate quantum systems.		1,5
3	Analyze the behavior of multi-qubit systems and quantum algorithm structures using IBM-Qiskit.		1,5,9
4	Evaluate quantum key distribution protocols and interpret entangled states.		1
MODULE-1			8 Hrs.
Foundations of Quantum Theory			
Pre-requisites: Complex Numbers, Linear Algebra, Probability, Classical Bits			
Quantum computing v/s classical computing. Concept of a qubit: representation on Bloch sphere, computational basis states $ 0\rangle$ and $ 1\rangle$, and superposition principle. Quantum postulates: state vectors, observables, unitary evolution, and measurement. Concept of quantum measurement and collapse of state. Differences between			

probabilistic classical bit and quantum state. Linear algebra tools used in quantum computing: vector spaces, inner and outer products, orthonormality. Introduction to Dirac notation. Introduction to quantum states of multi-qubit systems using tensor products. Applications (Qualitative discussion): Role of qubits in other applications - quantum sensors, quantum-enhanced memory, and quantum biology. Self-learning topics: Bra-ket notation and inner product interpretations. <i>Numerical problems on: Representing a qubit on Bloch sphere Calculating measurement probabilities</i> <i>Using vector algebra to define multi-qubit states</i>	
MODULE-2	8 Hrs.
Quantum Gates and Circuits Pre-requisites: Matrix operations, Boolean logic gates Basic quantum gates and their matrix representations: Pauli-X, Y, Z; Hadamard (H); Phase (S, T) gates. Identity and Unitary property of gates. Two-qubit gates: CNOT, SWAP, and their circuit symbols. Construction of quantum circuits using gate sequences. Evolution of quantum states through unitary transformations. Quantum entanglement: definition, Bell states, and importance in quantum information. Basics of quantum teleportation and superdense coding (qualitative). Quantum parallelism and quantum interference. Experiments who proved quantum principles are correct; Davisson and Germer (1927), Bell Inequality Violations experiments (Nobel prize 2022 winning experiments by Anton Zeilinger, Alain Aspect, and John F. Clauser) Applications (Qualitative discussion): Quantum processors, superconducting qubits, trapped ions, photonic systems, IBM-Q and Rigetti simulators. Self-learning topics: Representation of gates in matrix and circuit form, multi-qubit state transformations. <i>Numerical problems on: Applying gate matrices to qubit states, Constructing Bell states using gates, Evolution of entangled states</i>	
MODULE-3	8 Hrs.

Elements of Quantum algorithm

Pre-requisites: Basics of quantum gates and circuits

Introduction to the Deutsch–Jozsa Algorithm: constant vs balanced functions. Bernstein–Vazirani Algorithm: finding hidden strings. Simon’s algorithm and periodicity. Grover's search algorithm: unstructured database search (qualitative explanation). Basics of Quantum Fourier Transform (QFT) and its importance in period finding (no derivation). Shor’s Algorithm: factorization function. Simulation of simple algorithms using quantum circuits. Introduction to quantum speedup and complexity classes.

Applications (Qualitative discussion): Search problems, cryptanalysis, AI, and optimization using quantum algorithms. Mention Quantum Safety and post quantum cryptography.

Self-learning topics: Quantum circuit construction using Qiskit, difference between classical and quantum search techniques.

Numerical problems on: Deutsch algorithm execution, QFT output state calculation for given 2-qubit input, Periodicity detection through simplified circuits

MODULE-4

8 Hrs

Quantum Communication and Cryptography

Pre-requisites: Basics of classical communication and logic operations

Quantum entanglement and EPR paradox (conceptual). Quantum Teleportation Protocol (1993, Bennett et al.), BB84 Protocol (1984, Charles Bennett and Gilles Brassard), E91 Protocol (1991, Artur Ekert), Superdense Coding (1992, Bennett and Wiesner) for Quantum Key Distribution (QKD): state preparation, transmission, measurement, and key sifting and Quantum Secret Sharing (QSS) (1999, Hillery, Bužek, Berthiaume). Role of measurement bases and error checking. Quantum vs classical communication channels. Quantum cryptographic security and its resistance to classical attacks. Role of QKD in secure communication for critical infrastructure. Optical fibre and free space (Satellite) communication. Quantum repeaters and Quantum internet (qualitative). Applications (Qualitative discussion): Banking, defence communication, secure cloud services, quantum internet prototypes.

Self-learning topics: Classical symmetric/asymmetric cryptography, RSA overview.

Numerical problems on: Simulating BB84 key exchange, Entanglement correlations, Calculation of quantum bit error rate (QBER)

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Quantum Computation and Quantum Information	Michael A. Nielsen & Isaac L. Chuang	10 th Anniversary Edition	Cambridge University Press	2012
2	Quantum Computing: A Gentle Introduction	Eleanor G. Rieffel, Wolfgang H. Polak	1st Edition	MIT Press	2011
3	Quantum Mechanics for Engineers	S. Das, A. Chakrabarti	1st Edition	Springer	2012

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Quantum Computing for Computer Scientists	Noson S. Yanofsky, Mirco A. Mannucci	1st Edition	Cambridge University Press	2008
2	Quantum Mechanics: The Theoretical Minimum	Leonard Susskind, Art Friedman	1st Edition	Basic Books	2014
3	An Introduction to Quantum Computing	Phillip Kaye, Raymond Laflamme, Michele Mosca	1st Edition	Oxford University Press	2007

E Books and online course materials:
<https://s3.amazonaws.com/arena-attachments/1000401/c8d3f8742d163b7ffd6ae3e4e4e07bf3.pdf>

<https://s3.amazonaws.com/arena-attachments/1000401/c8d3f8742d163b7ffd6ae3e4e07bf3.pdf>

Online Courses and Video Lectures:
https://onlinecourses.nptel.ac.in/noc21_cs103/preview

https://onlinecourses.nptel.ac.in/noc21_cs103/preview

<https://youtu.be/R0SOqLwLOR0?si=8DRsS2nUM1NJbZtf>

Proposed Assessment Plan (for 50 marks of CIE):		
Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted <u>Activity-execution and report-10 marks</u> <u>Presentation, Viva-Voce – 10 marks</u>	20
Total		50

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted <u>Activity-execution and report-10 marks</u> <u>Presentation, Viva-Voce – 10 marks</u>	20
Total		50

[illegible][illegible]

Teaching -Learning– Evaluation Scheme:

Sl.No	TeachingandLearningMethod	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	ClassRoomTeaching&Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
3	Activity Based Learning(ABL1&ABL2)	-	-	14
4	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				90

Proposed Assessment Plan(for50marksofCIE):

Tool	Remarks	Marks
CIE	ThreeCIEsconductedfor20 marks each and reduced to 10 marks	30
Activity Details	Detailsof activities to be conducted Detailsofactivity1 Detailsofactivity2	20
Total		50

Activity Based Learning(27Hours)

ABL1(6Hours) :Activity1details	
	1) Group activity-execution and report- 10 marks

ABL2(7Hours):Activity2 details	
	Presentation , Viva-Voce – 10 marks

EvaluationofLearningProcess(7Hours)

Type of Evaluation	Hours
Test CIE 1, CIE2and CIE3	3
Quiz(1and2)(optional)	1
Semester End Exam	3
Total	7

1) Sample Activity Based Learning (ABL) Details

Sl. No	Teaching and Learning Methods	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	ClassRoom Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours – Self Learning	1	14	14
4	Evaluation of Learning Process	-	-	07
5	Activity Based Learning (ABL)	-	-	18+9=27
ABL1: Case study with SRS document preparation: Prepare the document/software project report software engineering methodology for the following scenarios or the applications. 1. Problem Analysis and Project Planning – Thorough study of the problem – Identify Project scope, Objectives and Infrastructure. 2. Software Requirement Analysis – Describe the individual Phases/modules of the project and Identify deliverables. 3. Identification of the functional and non-functional requirements from the detailed problem statement. 4. Software Modelling: Analysis and Designing – Develop the following UML diagram for the SRS document prepared for the applications. Use case diagrams Activity Diagrams DFD-0 diagrams DFD-1 diagrams Sequenced diagrams				

5. Thereportincludingthedetailedproblemstatement,SRSreport,and requirements analysis and modeling report needs to be submitted for evaluation. VariousrealtimeApplicationcanbeallottedtoateamof twomembers. EvaluationofABL1(18Hours) 1. IdentifyingareasforwhichyouwanttopreparetheSRSdocumentby literature review - 3 Hours. 2. Meetinganddiscussing(onlineoroffline)withthefacultyandfixingthe problem statement - 2 Hours. DesignandcreationofvariousUML diagrams-12Hours Presentationandsubmittingthefinalreport-1 Hours. ABL2: Writing AssignmentwithProblemsonSoftwareengineeringandcost estimation concepts. (9 Hours) Submissionofthefinalassignmentreportandevaluation.(Questionsof BloomslevelL3andHigher)	
TotalLearningHours/Semester	90

2) **Sample Activity Based Learning(ABL)Details**

Sl. No	TeachingandLearningMethod	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	ClassRoomTeaching&Learning	3	14	42
2	StudentStudyHours–SelfLearning	1	14	14
3	EvaluationofLearningProcess	-	-	07
4	ActivityBasedLearning(ABL)	-	-	14+13=27
ABL1:SimulationbasedAssignment(14Hrs)				
SimulationbasedAssignment		Toolselection		1
		Designof solution		4
		Implementingthesolution		4
		Testingtheresult		2
		Reportwriting		2
		Demonstration		1
ABL2:ProblemSolving Assignment(13 Hrs)				
ProblemSolvingAssignment		Understandtheinputdata requirements		1
		Formulatethe methodology		4
		Designthesolution		4
		Solvingtheproblemand submission		4
Total Learning Hours/Semester				90

3) SampleActivityBasedLearning(ABL)Details

Sl. No	TeachingandLearningMethod	No. of Hours/W eek	No.ofWeeks	Hours/ Semester
1	ClassRoomTeaching&Learning	3	14	42
2	StudentStudyHours–SelfLearning	-	-	-
3	EvaluationofLearningProcess	-	-	07
4	ActivityBasedLearning(ABL)	-	-	26+15=41
ABL1:Labbasedlearning(26 Hrs)				
ImplementationonMATLAB		1.Verificationwhethera given polynomial is primitive or not	2	
		2.GeneratingGallois Field	2	
		3.GeneratingLinearblock codes	2	
		4.Decodingoflinear block codes	2	
		5.Determiningthe syndrome	2	
		6.Computingtheminimum distance of a linear block code	2	
		7. Generation of a parity checkmatrixandgenerator matrixfor	4	
		8.Hammingcodes	4	
		9.Determiningthe	4	

	generator polynomial of (n,k) code.generator polynomial of (n,k) code.	
	10. Generation of cyclic codes	2
ABL2: Seminar(15 Hrs)		
Subject seminar on latest trends	Literature review	7
	Preparation of report	4
	Preparation of slides and presentation	4
Total Learning Hours/Semester		90

4) **Sample Activity Based Learning (ABL) Details**

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab component	2	14	28
2	Student Study Hours – Self Learning	1	14	14
3	Evaluation of Learning Process	-	-	07
4	Activity Based Learning (ABL)	-	-	20+9=29
ABL1: Implementing Real time Projects using AI and ML (20Hrs)				
1. Identifying areas in which students want to carry out the project by literature survey				3
2. Meeting and discussing (online or offline) with the faculty and fixing the				2

Problemstatement		
3.Designingandimplementingthe project		14
4.Presentationandsubmittingthefinalreport		1
ABL2:SolvingAssignmentProblemsbasedondifferentMLalgorithms(9Hours)		
Submissionofthefinalassignmentreport.		9
TotalLearningHours/Semester		120

Course Title	Mathematics-I for Computer Science Engineering stream		
Course Code	MAT5S11	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective: To help students understand and apply numerical methods, calculus, and Laplace transforms to solve engineering problems and real-life applications.

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

COs	Outcomes	POs	PSOs
CO1	Compute solutions for Algebraic and transcendental equations and Interpolation using Numerical methods	PO1	-
CO2	Apply the knowledge of calculus to solve problems related to polar curves and also its applications in Engineering problems	PO1, PO2	-
CO3	Approximate functions of one or two variables to polynomials using concepts of Taylor and Maclaurin series, partial differentiation and Jacobians.	PO1, PO2	
CO4	Evaluate engineering problems using concept of Laplace transform. And to solve the problems in transforming the continuous signals.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential calculus, numerical methods, and linear algebra, execute the same and provide correct output.	PO1, PO2, PO5	-

MODULE - 1	10 Hrs.
Numerical Methods: Numerical Solution of algebraic & transcendental equations by Gradient descent method, Newton Raphson method. Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae. Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule. Illustrative examples from engineering field. Applications- Estimating vehicles passing through a Toll Booth, Energy consumption in a smart home, Estimating Rain water Collected. Self Study: Bisection method, Inverse Lagrange's interpolation formula. Approximate solutions of ODE related to Computer Science Engineering.	
MODULE - 2	10 Hrs.

Polar coordinates : Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations, Curvature and Radius of curvature-cartesian, polar and pedal form. Applications: Angle Between Curves – Collision Detection in Computer Vision, Curvature – Path Smoothing in AI/ML, Curvature and Radius of Curvature -Pedal Applications in Robotics. Self Study: Brief introduction to evolutes and involutes, Radius of curvature-Parametric form. Derivative of arc-length.	
MODULE - 3	10 Hrs.
Introduction to series expansion: Definition of differentiability, Statement of Taylor's theorem, Taylor's series and Maclaurin's series expansion for function of one variable. Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples.. Evaluation of Jacobians. Extreme values for a functions of two variables. Applications -Minimizing the Canvas Area for a Fixed Volume. Self Study: Differentiation of composite function, Propertis of Jacobians, Lagrange's method of undermined multipliers.	
MODULE - 4	12 Hrs.
Laplace Transforms: Introduction, Definition and standard functions (statement only), Properties of Laplace transform. Laplace transform of $e^{at}f(t)$, $t^n f(t)$, $\frac{f(t)}{t}$. Laplace transform of derivatives and integrals, Laplace transform of periodic functions, unit-step functions. Applications: Network packet transmission with delayed start, Dual-phase CPU cooling system with delayed control response. Self-Study: Unit-impulse function, Transform of derivatives and Integrals.	
Lab Components: 1. Basic Python. 2. Computation of roots using - bisection method, Newton Raphson method. 3. Lagrange's interpolation formula. 4. Numerical integration- line integral (Trapezoidal rule) . 5. Numerical integration- line integral (Simpson's 1/3rd rule , Simpson's 3/8th rule). 6. Finding angle between polar curves & computing the curvature of a given curve. 7. Finding angle between radius vector and the tangent. 8. Finding partial derivatives, Jacobians. 9. Expressing the function of one variable using Taylor's & Maclaurin's series. 10. Standard Laplace Transforms $e^{at}f(t)$, $\frac{f(t)}{t}$.	

NOTE

- 1.Proofs are not required for any theorems and properties.
- 2.There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
01	Higher Engineering Mathematics	Dr. B. S. Grewal	44 th	Khanna	2016
02	Advanced Engineering Mathematics	Erwin Kreyszig	8 th	Wiley India Pvt. Ltd	2004
03	Calculus	Thomas Finney	9 th	Thomas Finney	2002

Reference Books:

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1.	Numerical methods,	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar,	6th edition	New age International p.v.t. Publishers,	2014
2.	A textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	Reprint	Laxmi Publications	2010

EBooks and online course materials:

- <http://nptel.ac.in/courses.phd?disciplineID=111>
- [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
- <http://academicrath.org/>

Online Courses and Video Lectures:

- <https://www.courseera.org/>_____
- <https://nptel.ac.in/courses/>_____

Teaching - Learning - Evaluation Scheme :

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				120

ABL 1 : Lab based learning (14 Hrs)		
Designing and implementation of Python programming	Manual solving	4
	Writing program	5
	Execution	3
	Required output	1
	conclusion	1
ABL 2 : Problem Solving Assignment (15 Hrs)		
Problem Solving Assignment	Problem selection	1
	Formulate the methodology	3
	Solving the problem	4
	Report writing and submission	3
	Preparation of slide and presentation	4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Lab based learning 2) Problem Solving Assignment	20
Total		50

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-			-								
CO2	3	2			-								
CO3	3	2			-								
CO4	3	2			-								
CO5	3	2			1								

Course Title	Mathematics-I for Electrical and Electronics Engineering stream		
Course Code	MAT5E11	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective: To train the students to acquire knowledge in calculus and numerical methods so as to solve basic engineering application problems.

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

COs	Outcomes	POs	PSOs
CO1	Use numerical methods to solve algebraic and transcendental equations, apply interpolation and finite difference techniques, and compute line integrals using different integration rules. Real-life and engineering application problems.	PO1	-
CO2	Understand and apply concepts related to the polar curves, including angles, and radius of curvature using different coordinate systems. Real-life and engineering application problems.	PO1, PO2	-
CO3	Evaluate derivatives, series expansions of single variable, extreme values for functions of two variables and apply these concepts to solve relevant mathematical problems. Real-life and engineering application problems.	PO1	
CO4	Analyze and apply suitable methods to compute probability in statistics.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with calculus, numerical methods and statistics. execute the same and provide correct output.	PO1, PO2, PO5	-

MODULE - 1	10 Hrs.
Numerical Methods: Numerical Solution of algebraic & transcendental equations by Gradient descent method, Newton Raphson method, Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae. Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule. Illustrative examples from engineering field. Applications-Application of root finding- ion concentration. Self Study: Bisection method, Inverse Lagrange's interpolation formula. Approximate solutions of ODE related to Electrical Engineering.	

MODULE - 2	10 Hrs.
Polar coordinates: Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations, Curvature and Radius of curvature (Cartesian, polar and pedal form). Applications : Extreme values of a single variable- to find the peak current in an circuit. Self Study: Brief introduction to evolutes and involutes. Radius of curvature-Parametric form. Derivative of arc-length. Extreme values of a single variable.	
MODULE - 3	10 Hrs.
Introduction to series expansion: Definition of differentiability, Statement of Taylor's theorem, Taylor's series and Maclaurin's series expansion for function of one variable. Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples. Differentiation of composite function. Evaluation of Jacobians. Extreme values for a functions of two variables. Applications: Application of total derivative- controlling sag in an uniformly loaded beam. Self Study: Differentiation of composite function , Properties of Jacobians, Lagrange's method of undermined multifliers.	
MODULE - 4	10 Hrs.
Statistics: Curve fitting- Linear, Quadratic. Probability Theory: Mean, Standard deviation of the experimental data, Introduction to Random variables, Discrete random variables, binomial distribution , Poisson distribution. Application - Experimental data for applications of probability in Electrical & Electronics Engineering. Self Study: Contionous random variable. Computation of pdf,cdf,Mean and Standard Deviation.	
Lab Components: 1. Basic Python. 2. Computation of roots using - bisection method, Newton Raphson method. 3. Lagrange's interpolation formula. 4. Numerical integration- line integral (Trapezoidal rule) . 5. Numerical integration- line integral (Simpson's 1/3rd rule , Simpson's 3/8th rule). 6. Finding angle between polar curves & computing the curvature of a given curve. 7. Finding angle between radius vector and the tangent. 8. Finding partial derivatives, Jacobians. 9. Expressing the function of one variable using Taylor's & Maclaurin's series. 10. To fit a curve for the data Linear/ Quadratic.	

NOTE

- 1.Proofs are not required for any theorems and properties.
- 2.There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
01	Higher Engineering Mathematics	Dr. B. S. Grewal	44th	Khanna	2016
02	Advanced Engineering Mathematics	Erwin Kreyszig	8th	Wiley India Pvt. Ltd	2004
03	Calculus	Thomas Finney	9th	Thomas Finney	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
11.	Numerical methods,	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar,	6th edition,	New age International p.v.t. Publishers,	2014
12.	A textbook of Engineering Mathematics, ,	N.P. Bali and Manish Goyal	Reprint,	Laxmi Publications	2010

EBooks and online course materials:

- <http://nptel.ac.in/courses.phd?disciplineID=111>
- [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
- <http://academicrath.org/>

Online Courses and Video Lectures:

- <https://www.courseera.org/>
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Teaching - Learning - Evaluation Scheme :

Sl. No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				120

ABL 1 : Lab based learning (14 Hrs)		
Designing and implementation of Python programming	Manual solving	4
	Writing program	5
	Execution	3
	Required output	1
	conclusion	1
ABL 2 : Problem Solving Assignment (15 Hrs)		
Problem Solving Assignment	Problem selection	1
	Formulate the methodology	3
	Solving the problem	4
	Report writing and submission	3
	Preparation of slide and presentation	4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 3) Lab based learning 4) Problem Solving Assignment	20
Total		50

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2	3	2											
CO3	3	-											
CO4	3	2											
CO5	3	2			1								

Course Title	Mathematics-I for Mechanical Engineering stream		
Course Code	MAT5M11	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120
Course Objective: Enable students to apply numerical methods to solve mathematical and engineering problems, analyze linear systems, and model real-life situations using appropriate mathematical techniques.			
Course Outcomes (COs): At the end of course, student will be able to:			
COs	Outcomes	POs	PSOs
CO1	Use numerical methods to solve algebraic and transcendental equations, apply interpolation and finite difference techniques, and compute line integrals using different integration rules. Real-life and engineering application problems.	PO1, PO2	-
CO2	Demonstrate the ability to analyze and solve systems of linear equations using direct and iterative methods, to compute Eigen value and Eigen vectors. Real-life and engineering application problems.	PO1, PO2	-
CO3	Understand and apply concepts related to the polar curves, including angles, and radius of curvature using different coordinate systems. Real-life and engineering application problems.	PO1, PO2	
CO4	Evaluate derivatives, series expansions of single variable, extreme values for functions of two variables and apply these concepts to solve relevant mathematical problems. Real-life and engineering application problems.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential calculus, numerical methods, and linear algebra, execute the same and provide correct output.	PO1, PO2, PO5	-
MODULE - 1			10 Hrs.
Numerical Methods: Numerical Solution of algebraic & transcendental equations by Newton Raphson method, Gradient in decant method, Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae. Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule, Weddle's rule. Illustrative examples from engineering field. Applications - discharge of the Stream, Pressure Distribution on a Curved Turbine Blade Self Study: Bisection method, Inverse Lagrange's interpolation formula. Approximate solutions of ODE related to Mechanical Engineering.			

MODULE - 2	10 Hrs.
Linear Algebra: Elementary row transformation of a matrix, Rank of the matrix, Consistency and solution of system of linear equations - Gauss elimination method, Gauss seidel method, Eigen values and Eigen vectors. Application - Application of solution of system of equations to balance the chemical equations. Traffic flow problem. Self Study: Solution of system of equations by Gauss-Jacobi iterative method. Stretching of an elastic membrane.	
MODULE - 3	10 Hrs.
Polar coordinates: Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations, Curvature and Radius of curvature in cartesian, polar and pedal form. Applications: Vehicle Dynamics on a Superelevated Curved Road, Stiffness of a beam Self Study: Radius of curvature in parametric form, Derivative of arc length, Brief introduction to evolutes and involutes	
MODULE - 4	10 Hrs.
Introduction to series expansion: Definition of differentiability, Statement of Taylor's theorem, Taylor's series and Maclaurin's series expansion for function of one variable. Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples. Evaluation of Jacobians. Extreme values for a functions of two variables. Applications - Applications of Optimization (extreme values of a single variable) Self Study: Lagrange's method of undetermined multipliers, composite function, properties on Jacobians.	
Lab Components: (Integrated course) 1. Basic Python Programs 2. Computation of roots using Newton Raphson method. 3. Lagrange's interpolation formula. 4. Numerical integration- line integral (Trapezoidal rule , Weddle's rule) 5. Numerical integration- line integral (Simpson's $1/3^{\text{rd}}$ rule, Simpson's $3/8^{\text{th}}$ rule) 6. Compute Rank, Eigen value and Eigen vectors of the matrix. 7. Solve the system of equations by Gauss seidal method. 8. Find angle between radius vector and tangent 9. Find angle of intersection of polar curves and the radius of curvature of a given curve. 10. Express the function of one variable using Taylor's & Maclaurin's series. 11. Find partial derivatives - Jacobians	

Note:

1. Proofs are not required for any theorems and properties.
2. There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
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2	A textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	-	Laxmi Publications	2010

EBooks and online course materials:

1. https://www.geneseo.edu/~aguilar/public/assets/courses/233/main_notes.pdf
2. <https://ocw.mit.edu/courses/res-18-001-calculus-fall-2023/pages/textbook/>

Online Courses and Video Lectures:

1. <https://www.coursera.org/learn/introduction-to-linear-algebra>
2. <https://www.coursera.org/learn/introduction-to-calculus>
3. <https://nptel.ac.in/courses/111104092>

Teaching - Learning - Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours / Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				120

ABL 1 : Lab based learning (14 Hrs)		
Designing and implementation of Python programming	Manual solving	4
	Writing program	5
	Execution	3
	Required output	1
	conclusion	1
ABL 2 : Problem Solving Assignment (15 Hrs)		
Problem Solving Assignment	Problem selection	1
	Formulate the methodology	3
	Solving the problem	4
	Report writing and submission	3
	Preparation of slide and presentation	4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 5) Lab based learning 6) Problem Solving Assignment	20
Total		50

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2	3	2											
CO3	3	-											
CO4	3	2											
CO5	3	2			1								

Course Title	Mathematics-I for Civil Engineering stream		
Course Code	MAT5C11	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective: Enable students to apply numerical methods to solve mathematical and engineering problems, analyze linear systems, and model real-life situations using appropriate mathematical techniques.

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

COs	Outcomes	POs	PSOs
CO1	Use numerical methods to solve algebraic and transcendental equations, apply interpolation and finite difference techniques, and compute line integrals using different integration rules. Real-life and engineering application problems.	PO1, PO2	-
CO2	Demonstrate the ability to analyze and solve systems of linear equations using direct and iterative methods, to compute Eigen value and Eigen vectors. Real-life and engineering application problems.	PO1, PO2	-
CO3	Understand and apply concepts related to the polar curves, including angles, and radius of curvature using different coordinate systems. Real-life and engineering application problems.	PO1, PO2	
CO4	Evaluate derivatives, series expansions of single variable, extreme values for functions of two variables and apply these concepts to solve relevant mathematical problems. Real-life and engineering application problems.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential calculus, numerical methods, and linear algebra, execute the same and provide correct output.	PO1, PO2, PO5	-

MODULE - 1	10 Hrs.
Numerical Methods: Numerical Solution of algebraic & transcendental equations by Newton Raphson method, Gradient in decant method, Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae. Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule. Illustrative examples from engineering field. Applications - - discharge of the Stream, Rocket Launch Optimization Self Study: Bisection method, Inverse Lagrange's interpolation formula. Approximate solutions of ODE related to Civil Engineering.	

MODULE - 2	10 Hrs.
Linear Algebra: Elementary row transformation of a matrix, Rank of the matrix, Consistency and solution of system of linear equations - Gauss elimination method, Gauss seidel method, Eigen values and Eigen vectors. Application - Traffic flow problems, Stretching of an elastic membrane, to determine the growth of a population model. Self Study: Solution of system of equations by Gauss-Jacobi iterative method. Stretching of an elastic membrane.	
MODULE - 3	10 Hrs.
Polar coordinates: Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations, Curvature and Radius of curvature in cartesian, polar and pedal form. Applications: Vehicle Dynamics on a Superelevated Curved Road, Stiffness of a beam Self Study: Radius of curvature in parametric form, Derivative of arc length, Brief introduction to evolutes and involutes.	
MODULE - 4	10 Hrs.
Introduction to series expansion: Definition of differentiability, Statement of Taylor's theorem, Taylor's series and Maclaurin's series expansion for function of one variable. Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples. Evaluation of Jacobians. Extreme values for a functions of two variables. Applications: Soil Settlement Under a Foundation-Foundation Differential Settlement Analysis Self Study: Lagrange's method of undetermined multipliers, composite function, properties on Jacobians.	
Lab Components: (Integrated course) 1. Basic Python Programs 2. Computation of roots using Newton Raphson method. 3. Lagrange's interpolation formula. 4. Numerical integration- line integral (Trapezoidal rule , Weddle's rule) 5. Numerical integration- line integral (Simpson's 1/3rd rule , Simpson's 3/8th rule) 6. Compute Rank, Eigen value and Eigen vectors of the matrix. 7. Solve the system of equations by Gauss seidel method. 8. Find angle between radius vector and tangent 9. Find angle of intersection of polar curves and the radius of curvature of a given curve. 10. Express the function of one variable using Taylor's & Maclaurin's series. 11. Find partial derivatives - Jacobians	

Note:

1. Proofs are not required for any theorems and properties.
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Teaching - Learning - Evaluation Scheme :

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
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3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				120

ABL 1 : Lab based learning (14 Hrs)		
Designing and implementation of Python programming	Manual solving	4
	Writing program	5
	Execution	3
	Required output	1
	conclusion	1
ABL 2 : Problem Solving Assignment (15 Hrs)		
Problem Solving Assignment	Problem selection	1
	Formulate the methodology	3
	Solving the problem	4
	Report writing and submission	3
	Preparation of slide and presentation	4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 7) Lab based learning 8) Problem Solving Assignment	20
Total		50

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2	3	2											
CO3	3	-											
CO4	3	2											
CO5	3	2			1								

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

Hassan – 573202, Karnataka, India



Autonomous Programmes

BACHELOR OF ENGINEERING

DEPARTMENT OF CHEMISTRY

**SYLLABUS
I AND II SEMESTERS
FIRST YEAR**

Academic year 2025-26

Course Title	CHEMISTRY FOR CIVIL ENGINEERING STREAM		
Course Code	CHE5C12/22	(L-T-P)C	(3-1-0)3
SEE duration	3 hour	Hours / Week	04
SEE marks	100	Total contact hours	90
Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.			
Course Outcomes:			
After the completion of the course, students shall be able to:-			
Sl. No.	Course outcomes		Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.		PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.		PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.		PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.		PO1, PO2
Course Contents:			
MODULE –1			10 Hrs.
Water and its Treatment			
Introduction, sources of water, impurities in water, standards of water for industrial supply. Hardness of water, types of hardness determination of total hardness by EDTA method.			
Boiler feed water and boiler problems, Boiler scales and sludge’s- meaning, formation, disadvantages and prevention, priming and foaming.			
External treatment of boiler feed water- Hot Lime -Soda process and Ion exchange method.			
Internal treatment of water- phosphate conditioning &calgon treatment.			
Desalination- Meaning,purification of water by reverse osmosis.			
Potable water- Meaning, Standards of potable water, treatment of water for town supply. BOD and COD- definition, experimental determination of COD of the industrial waste water sample.			

MODULE –2	10 Hrs.
Chemical Energy Sources and Engineering Materials Fuels- Definition with examples. Characteristics of an ideal fuel. Calorific value- definition, types - Gross and Net calorific values, units in S.I system. Experimental determination of calorific value of a solid fuel using Bomb Calorimeter. Numerical problems on GCV and NCV. Chemical processing of Petroleum: Cracking- Definition. Types of cracking- thermal and catalytic cracking. Fluidized catalytic cracking. Reforming of petrol with reactions (Isomerization, cyclisation, aromatization and dehydrogenation). Octane number & Cetane number. Knocking in IC engine. Prevention of knocking - Anti knocking agents (TEL & MTBE). Green fuels: Power alcohol- introduction, advantages and disadvantages. Biodiesel- introduction, synthesis, advantages, and disadvantages. Cement: Introduction, composition, properties, classification, manufacturing process of cement, process of setting and hardening of cement, additives for cement and testing of cement.	
MODULE –3	10 Hrs.
Electrochemistry and Battery Technology Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst's equation. Concentration cell- Definition with example, derivation of EMF of concentration cells. Electrodes - Types of electrodes- Metal-metal ion electrode, Metal- metal salt ion electrode, gas-electrode and ion selective electrode. Secondary reference electrodes – Calomel electrode- construction, working and applications. Ion selective electrode- construction and working of glass electrode. Determination of pH of a solution using glass electrode. Numerical problems on E , E^0 , E_{cell} , E^0_{cell} and concentration cells. Potentiometric estimation of FAS using $\text{K}_2\text{Cr}_2\text{O}_7$ solution. Battery technology Batteries- Definition, classification of batteries- primary & secondary batteries. Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.	

MODULE – 4					10 hrs.
Macromolecules for Engineering Applications					
Introduction , definition with examples. Glass transition temperature (T_g) - definition, factors affecting T _g and significances of T _g .					
Plastics – Compounding of resins in to plastics.					
Synthesis, properties and Industrial applications of PMMA and Polyurethane.					
Polymer composites - introduction, fibers - meaning, synthesis, properties and industrial applications of Kevlar and Polyester.					
Adhesives –Meaning, preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.					
Bio-degradable polymers - Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).					
Corrosion chemistry					
Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion.					
Corrosion control -galvanization, anodization and sacrificial anode method.					
Prescribed Text Books:					
Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Chemistry	M.M. Uppal	11th Edition	Khanna Publishers	2011
2	A text Book of Engineering Chemistry	P C Jain and Monica Jain	16th Edition	Dhanapatrai Publications	2015
3	A Text Book of Engineering Chemistry	R.V. Gadag and Nitthyananda Shetty	2 nd Edition	I.K. International Publishing house	2016
4	Chemistry for Engineering Students	S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar	5 th Edition	Subash Publications	2014

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Industrial Chemistry	B.K.Sharma	34th Edition	GOEL Publishing House	2014
2	Industrial Electrochemistry	Derek Pletcher & Frank C	2 nd Edition	Walsh publisher	1993
3	Corrosion Engineering	M.G. Fontana, N.D. Greene	3 rd Edition	McGraw Hill Publications	1996
4	Instrumental Methods of Analysis	Dr. K. R. Mahadik and Dr. L. Sathiyarayanan	1st Edition	Nirali Prakashan	2003
5	Text Book of Polymer Science	F.W. Billmeyer, John Wiley & Sons	4 th Edition	John Wiley & Sons	1999
6	Vogels text book of quantitative inorganic analysis	J. Bassett, R.C. Denny, G.H. Jeffery	4 th Edition	ELBS/Longman	1980

E Books and online course materials:

1. <https://nptel.ac.in/courses/105105110> (*Water and Waste Water Engineering - NPTEL*)
2. https://onlinecourses.nptel.ac.in/noc23_ce42/preview (*Water Chemistry - NPTEL*)
3. <https://www.kopykitab.com/Engineering-Chemistry> (*Kopykitab - Various authors, eBook access*)
4. <https://ndl.iitkgp.ac.in/result?q=engineering%20chemistry> (*National Digital Library of India - Free access to Engineering Chemistry books*)
5. <https://www.pdfdrive.com/engineering-chemistry-books.html> (*PDFDrive - Free Engineering Chemistry PDFs*)

Online Courses and Video Lectures:

1. <https://www.edx.org/course/chemistry> (*Introductory Chemistry - edX platform*)
2. https://www.youtube.com/playlist?list=PLLy_2iUCG87CQhELCytYLzKfBkzU8ovN9

Proposed Assessment Plan (for 50 marks of CIE):		
Tool	Remarks	Marks
CIE	ThreeCIEsconductedfor20markseach and reduced to 10 marks	30
Activity Details	Activities to be conducted.	20
Total		50

Course Articulation Matrix

[illegible]

Course Title	CHEMISTRY LAB FOR CIVIL ENGINEERING STREAM		
Course Code	CHE5CL17	(L-T-P) C	(0-0-2)1
Exam	3 hr	Hours/Week	02
SEE	50	Total Hours	24

Course Objective:

To provide students with practical knowledge of quantitative analysis of materials by volumetric and instrumental methods for the determination of constituents present in a sample.

Course Outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Conducting the experiments with suitable volumetric and instrumental procedures.	PO1	-
2	Analysis and estimation of materials using volumetric and instrumental methods.	PO2	-

SL. NO	Experiments
1	Estimation of total hardness of water by EDTA method.
2	Estimation of CaO in Portland cement.
3	Estimation of iron in TMT bar by biphenyl amine/external indicator method.
4	Estimation of Copper present in electroplating effluent by optical sensor.
5	Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.
6	Determination of p^{K_a} of vinegar using p^H sensor.
7	Potentiometric estimation of FAS using $K_2Cr_2O_7$
8	Estimation of Copper present in electroplating effluent by optical sensor
9	Conductometric estimation of acid mixture
10	Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
	Demonstration (any two) offline/virtual:
11	Synthesis of polymer
12	Synthesis of iron oxide nanoparticles

Course Title	CHEMISTRY FOR COMPUTER SCIENCE AND ENGINEERING STREAM		
Course Code	CHE5S12/22	(L-T-P)C	(3-1-0)3
SEE duration	3 hour	Hours / Week	04
SEE marks	100	Total contact hours	90
Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.			
Course Outcomes: After the completion of the course, students shall be able to:-			
Sl. No.	Course outcomes	Mapping to POs	
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2	
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2	
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2	
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2	
Course Contents:			
MODULE –1			10 Hrs.

Macromolecules for Engineering Applications Introduction, definition with examples. Glass transition temperature (T_g) - definition, factors affecting T_g and significances of T_g. Plastics – Compounding of resins into plastics. Synthesis, properties and industrial applications of PMMA, Polyurethane & PTFE. Polymer composites - introduction. Fibers- meaning, synthesis, properties and industrial applications of Kevlar and Polyester. Adhesives –Meaning, preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins. Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).	
Elastomers- Definition, types-natural and synthetic rubber. Preparation of natural rubber from latex, deficiencies of natural rubber, vulcanization of natural rubber. Synthetic rubbers- Preparation, properties and industrial applications of SBR rubber, Thiokol, and Silicon rubber.	
MODULE –2	10 Hrs.
Electrochemistry and Sensors Electrochemistry Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst's equation. Concentration cell- Definition with example, derivation of E.M.F of concentration cells. Electrodes -Types of electrodes-Metal-metal ion electrode, Metal- metal salt ion electrode, gas electrode and ion selective electrode. Secondary reference electrodes – Calomel electrode- construction, working and applications. Ion selective electrode- construction and working of the glass electrode. Determination of p^H of a solution using glass electrode. Numerical problems on E, E⁰, E_{cell}, E⁰_{cell} and concentration cells. Potentiometric estimation of FAS using K₂Cr₂O₇ solution. Sensors: Introduction, working principle and applications of electrochemical sensors - Potentiometric sensors, Amperometric sensors, and Conductometric sensors. Optical sensors.	
MODULE –3	10 Hrs.

Energy, Storage and Conversion

Batteries- Definition, difference between battery and cell. Classification of batteries- primary & secondary batteries. Battery characteristics.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.

Modern batteries: Construction, working and industrial applications of Li-ion battery.

Fuel Cells- Introduction, definition, construction, working and industrial applications of H₂-O₂ fuel cell & methanol-oxygen fuel cell. Differences between battery and fuel cell.

Green fuels:Power alcohol-introduction, advantages and disadvantages.

Biodiesel- Introduction, synthesis, advantages, and disadvantages.

E-waste management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling, extraction of copper and gold from e-waste.

MODULE – 4

10 hrs.

Surface Finishing (PCB preparation)

Introduction, technological importance of metal finishing. Factors affecting the nature of electro deposit - metal ion concentration, current density, complexing agents, organic additives, p^H, temperature & throwing power.

Electroplating – Definition, electroplating process. Methods of cleaning the metal surfaces to be coated. Electroplating of Copper by cyanide bath method and electroplating of gold.

Electroless plating - Definition, distinction between electroplating and electroless plating, advantages of electroless plating. Electroless plating of Nickel and electroless plating of Copper in the manufacture of double-sided PCB.

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

Prescribed Text Books:					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Chemistry	M.M. Uppal	11th Edition	Khanna Publishers	
2	A text Book of Engineering Chemistry	P C Jain and Monica Jain	16th Edition	Dhanapatrai Publications	2015
3	A Text Book of Engineering Chemistry	R.V. Gadag and Nitthyananda Shetty	2 nd Edition	I.K. International Publishing house	2016
4	Chemistry for Engineering Students	S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar	5 th Edition	Subash Publications	2014

Reference Books:					
Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Industrial Chemistry	B.K.Sharma	34th Edition	GOEL Publishing House	2014
2	Industrial Electrochemistry	Derek Pletcher & Frank C	2 nd Edition	Walsh publisher	1993
3	Corrosion Engineering	M.G. Fontana, N.D. Greene	3 rd Edition	McGraw Hill Publications	1996
4	Instrumental Methods of Analysis	Dr. K. R. Mahadik and Dr. L. Sathiyarayanan	1st Edition	Nirali Prakashan	2003
5	Text Book of Polymer Science	F.W. Billmeyer, John Wiley & Sons	4 th Edition	John Wiley & Sons	1999
6	Vogels text book of quantitative inorganic analysis	J. Bassett, R.C. Denny, G.H. Jeffery	4 th Edition	ELBS/Longman	1980
E Books and online course materials: 1. https://www.kopykitab.com/Engineering-Chemistry (<i>Kopykitab - Various authors, eBook access</i>) 2. https://ndl.iitkgp.ac.in/result?q=engineering%20chemistry (<i>National Digital Library of India - Free access to Engineering Chemistry books</i>) 3. https://www.pdfdrive.com/engineering-chemistry-books.html (<i>PDFDrive - Free Engineering Chemistry PDFs</i>)					

Online Courses and Video Lectures:

1. **Online Courses and Video Lectures:**
2. <https://www.edx.org/course/chemistry> (*Introductory Chemistry - edX platform*)
3. https://www.youtube.com/playlist?list=PLLy_2iUCG87CQhELCytYLzKfBkzU8ovN9 (*NPTEL Engineering Chemistry Video Lectures - YouTube*)

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Activities to be conducted.	20
Total		50

Course Articulation Matrix									
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[illegible]

Course Title	CHEMISTRY LAB FOR COMPUTER SCIENCE ENGINEERING STREAM		
Course Code	CHE5SL17	(L-T-P) C	(0-0-2)1
Exam	3 hr	Hours/Week	02
SEE	50	Total Hours	24

Course Objective:

To provide students with practical knowledge of quantitative analysis of materials by volumetric and instrumental methods for the determination of constituents present in a sample.

Course Outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Conducting the experiments with suitable volumetric and instrumental procedures.	PO1	-
2	Analysis and Estimation of materials using volumetric and instrumental methods.	PO2	-

SL. NO	Experiments
1	Estimation of total hardness of water by EDTA method.
2	Estimation of CaO in Portland cement.
3	Estimation of iron in TMT bar by biphenyl amine/external indicator method.
4	Estimation of Copper present in electroplating effluent by optical sensor.
5	Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.
6	Determination of p^{K_a} of vinegar using p^H sensor.
7	Potentiometric estimation of FAS using $K_2Cr_2O_7$
8	Estimation of Copper present in electroplating effluent by optical sensor
9	Conductometric estimation of acid mixture
10	Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
	Demonstration (any two) offline/virtual:
11	Synthesis of polymer

Course Title	CHEMISTRY FOR ELECTRICAL AND ELECTRONICS ENGINEERING STREAM		
Course Code	CHE5E12/22	(L-T-P)C	(3-1-0)4
SEE duration	3 hour	Hours / Week	06
SEE marks	100	Total contact hours	90

Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.

Course Outcomes:

After the completion of the course, students shall be able to:-

Sl. No.	Course outcomes	Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2

Course Contents:

MODULE –1	10 Hrs.
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Electrochemistry and Analytical Techniques

Electrochemistry- Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst's equation.

Concentration cell- Definition with example, derivation of EMF of concentration cells.

Electrodes - Types of electrodes-Metal-metal ion electrode, Metal-metal salt ion electrode, gas- electrode and ion selective electrode.

Secondary reference electrode – Calomel electrode - construction, working and applications.

Ion selective electrode- construction and working of the glass electrode. Determination of p^H of a solution using glass electrode. Numerical problems on E , E^0 , E_{cell} , E^0_{cell} and concentration cells.

Analytical techniques: Introduction, principle and instrumentation: Colorimetric sensors – estimation of copper, Potentiometric sensors – estimation of iron and Conductometric sensors – estimation of weak acid.

MODULE –2

10 Hrs.

Energy, Storage and Conversion

Batteries- Definition, difference between battery and cell. Classification of batteries – primary & secondary batteries. Battery characteristics.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.

Modern batteries: Construction, working and industrial applications of Li-ion battery.

Fuel Cells- Introduction, definition, construction, working and industrial applications of H_2 - O_2 fuel cell & methanol-oxygen fuel cell. Differences between battery and fuel cells.

Green fuels:Power alcohol-Introduction, advantages and disadvantages. **Biodiesel-** Introduction, synthesis, advantages, and disadvantages.

E-waste management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling, extraction of copper and gold from e-waste.

MODULE –3

10 Hrs.

Macromolecules for Engineering Applications

Introduction, definition with examples. **Glass transition temperature (Tg)** - definition, factors affecting Tg and significances of Tg.

Plastics – Compounding of resins into plastics. Synthesis, properties and industrial applications of PMMA, Polyurethane & PTFE.

Polymer composites- introduction, **Fibers-** meaning, synthesis, properties and industrial applications of Kevlar and Polyester.

Adhesives –Meaning, Preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Elastomers- Definition, types-natural and synthetic rubber. Preparation of natural rubber from latex, deficiencies of natural rubber, vulcanization of natural rubber.

Synthetic rubbers- Preparation, properties and industrial applications of SBR rubber, Thiokol, and Silicon rubber.

MODULE – 4					10 hrs.
Surface Finishing Introduction, technological importance of metal finishing. Factors affecting the nature of electro deposit - metal ion concentration, current density, complexing agents, organic additives, p^H , temperature & throwing power. Electroplating – Definition, electroplating process. Methods of cleaning the metal surfaces to be coated. Electroplating of Copper by cyanide bath method and electroplating of Gold. Electroless plating - Definition, distinction between electroplating and electroless plating. Advantages of electroless plating. Electroless plating of Nickel. Corrosion chemistry Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion. Corrosion control -galvanization, anodization and sacrificial anode method. Prescribed Text Books:					
Sl. No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering Chemistry	M.M. Uppal	11th Edition	Khanna Publishers	
2	A text Book of Engineering Chemistry	P C Jain and Monica Jain	16th Edition	Dhanapatrai Publications	2015
3	A Text Book of Engineering Chemistry	R.V. Gadag and Nitthyananda Shetty	2 nd Edition	I.K. International Publishing house	2016
4	Chemistry for Engineering Students	S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar	5 th Edition	Subash Publications	2014

Reference Books:					
Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Industrial Chemistry	B.K.Sharma	34 Edition	GOEL Publishing House	2014
2	Industrial Electrochemistry	Derek Pletcher & Frank C	2 nd Edition	Walsh publisher	1993
3	Corrosion Engineering	M.G. Fontana, N.D. Greene	3 rd Edition	McGraw Hill Publications	1996
4	Instrumental Methods of Analysis	Dr. K. R. Mahadik and Dr. L. Sathiyarayanan	1st Edition	Nirali Prakashan	2003
5	Text Book of Polymer Science	F.W. Billmeyer, John Wiley & Sons	4 th Edition	John Wiley & Sons	1999
6	Vogels text book of quantitative inorganic analysis	J. Bassett, R.C. Denny, G.H. Jeffery	4 th Edition	ELBS/Longman	1980

E Books and online course materials:

1. <https://www.kopykitab.com/Engineering-Chemistry> (*Kopykitab - Various authors, eBook access*)
2. <https://ndl.iitkgp.ac.in/result?q=engineering%20chemistry> (*National Digital Library of India - Free access to Engineering Chemistry books*)
3. <https://www.pdfdrive.com/engineering-chemistry-books.html> (*PDFDrive - Free Engineering Chemistry PDFs*)

Online Courses and Video Lectures:

1. <https://www.edx.org/course/chemistry> (*Introductory Chemistry - edX platform*)
2. https://www.youtube.com/playlist?list=PLLy_2iUCG87CQhELCytYLzKfBkzU8ovN9 (*NPTEL Engineering Chemistry Video Lectures - YouTube*)

Proposed Assessment Plan (for 50 marks of CIE):		
Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Activities to be conducted.	20
Total		50

Course Articulation Matrix	
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[illegible]

Course Title	CHEMISTRY LAB FOR ELECTRICAL AND ELECTRONICS ENGINEERING STREAM		
Course Code	CHE5EL17	(L-T-P) C	(0-0-2)1
Exam	3 hr	Hours/Week	02
SEE	50	Total Hours	24

Course Objective:

To provide students with practical knowledge of quantitative analysis of materials by volumetric and instrumental methods for the determination of constituents present in a sample.

Course Outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Conducting the experiments with suitable volumetric and instrumental procedures.	PO1	-
2	Analysis and Estimation of materials using volumetric and instrumental methods.	PO2	-

SL. NO	Experiments
1	Estimation of total hardness of water by EDTA method.
2	Estimation of CaO in Portland cement.
3	Estimation of iron in TMT bar by biphenyl amine/external indicator method.
4	Estimation of Copper present in electroplating effluent by optical sensor.
5	Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.
6	Determination of p^{K_a} of vinegar using p^H sensor.
7	Potentiometric estimation of FAS using $K_2Cr_2O_7$
8	Estimation of Copper present in electroplating effluent by optical sensor
9	Conductometric estimation of acid mixture
10	Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
	Demonstration (any two) offline/virtual:
11	Synthesis of polymer

12	Synthesis of iron oxide nanoparticles
13	Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch
14	Determination of chloride content in the given water sample by Argentometric method
	Open Ended Experiments:
15	Evaluation of acid content in beverages by using p ^H sensors and simulation
16	Searching suitable PDB file and target for molecular docking

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Vogel's Textbook of Quantitative Inorganic Analysis	J. Bassett, R.C. Denny, G.H. Jeffery (Revised)	4th Edition	ELBS / Longman Group	1985
2	Applied Chemistry: Theory and Practice	O. P. Vermani, A. K. Narula	2nd Edition	New Age International	1992

Online Courses and Video Lectures:

<https://nptel.ac.in/courses/104101090>

https://youtu.be/gDsGHYUHeBE?si=JcAAIt_Am4-LVIIQ

<https://youtu.be/gDsGHYUHeBE?si=wx17CP-q-28kzuyk>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Assessment	Conduction of experiments(continuous evaluation) -20 marks Reports -10 marks	30
Test (CIE)	Lab CIE	20
Total		50

Course Title	CHEMISTRY FOR MECHANICAL ENGINEERING STREAM		
Course Code	CHE5M12/22	(L-T-P)C	(3-1-0)4
SEE duration	3 hour	Hours / Week	04
SEE marks	100	Total contact hours	90
Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.			
Course Outcomes: After the completion of the course, students shall be able to:-			
Sl. No.	Course outcomes	Mapping to POs	
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2	
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2	
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2	
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2	
Course Contents:			
MODULE –1			10 Hrs.

Chemical Energy Sources and Engineering materials	
Fuels- Definition with examples. Characteristics of an ideal fuel. Calorific value- definition, types - Gross and Net calorific values, units in S.I system. Experimental determination of calorific value of a solid fuel using Bomb Calorimeter. Numerical problems on GCV and NCV.	
Chemical processing of Petroleum: Cracking- Definition. Types of cracking- thermal and catalytic cracking. Fluidized catalytic cracking. Reforming of petrol with reactions (Isomerisation, cyclisation, aromatisation and dehydrogenation). Octane number & Cetane number. Knocking in IC engine.	
Prevention of knocking - anti knocking agents (TEL & MTBE).	
Green fuels: Power alcohol- introduction, advantages and disadvantages. Biodiesel- introduction, synthesis, advantages and disadvantages.	
Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Solders, Brass and Alnico.	
MODULE –2	10 Hrs.
Water and its Treatment	
Introduction, sources of water, impurities in water, standards of water for industrial supply. Hardness of water, types of hardness determination of total hardness by EDTA method.	
Boiler feed water and boiler problems, Boiler scales and sludges- meaning, formation, disadvantages and prevention, priming and foaming.	
External treatment of boiler feed water- Hot Lime -Soda process and Ion exchange method.	
Internal treatment of water- phosphate conditioning & Calgon treatment.	
Desalination- Meaning, purification of water by reverse osmosis.	
Potable water- Meaning, Standards of potable water, treatment of water for town supply.	
BOD and COD- definition, experimental determination of COD of the industrial waste water sample.	
MODULE –3	10 Hrs.

Electrochemistry and Battery Technology

Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst equation.

Concentration cell- Definition with example, derivation of EMF of concentration cells.

Electrodes - Types of electrodes-Metal-metal ion electrode, Metal- metal salt ion electrode, gas-electrode and ion selective electrode.

Secondary reference electrodes – calomel electrode-construction, working and applications.

Ion-selective electrode- construction and working of glass electrode. Determination of pH of a solution using glass electrode. Numerical problems on E , E^0 , E_{cell} , E^0_{cell} and concentration cells.

Potentiometric estimation of FAS using $\text{K}_2\text{Cr}_2\text{O}_7$ solution.

Battery technology

Batteries- Definition, Classification of batteries- primary & secondary batteries.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.

Modern battery- construction, working and industrial applications of Li-ion batteries.

Fuel Cells- Introduction, definition, construction, working and industrial applications of $\text{H}_2\text{-O}_2$ fuel cell & Methanol- O_2 fuel cell.

MODULE –4**10 Hrs**

Macromolecules for Engineering applications

Introduction, definition with examples. **Glass transition temperature (T_g)** - definition, factors affecting T_g and significances of T_g.

Plastics – Compounding of resins in to plastics.

Synthesis, properties and Industrial applications of PMMA and Polyurethane.

Polymer composites- introduction, **fibers**- meaning, synthesis, properties and industrial applications of Kevlar and polyester.

Adhesives –Meaning, Preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration(water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering Chemistry	M.M. Uppal	11th Edition	Khanna Publishers	
2	A text Book of Engineering Chemistry	P C Jain and Monica Jain	16th Edition	Dhanapatrai Publications	2015
3	A Text Book of Engineering Chemistry	R.V. Gadag and Nitthyananda Shetty	2 nd Edition	I.K. International Publishing house	2016
4	Chemistry for Engineering Students	S. Jai Prakash, R. Venugopal, Sivakumaraiah& Pushpa Iyengar	5 th Edition	Subash Publications	2014

Reference Books:					
Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Industrial Chemistry	B.K.Sharma	34 Edition	GOEL Publishing House	2014
2	Industrial Electrochemistry	Derek Pletcher & Frank C	2 nd Edition	Walsh publisher	1993
3	Corrosion Engineering	M.G. Fontana, N.D. Greene	3 rd Edition	McGraw Hill Publications	1996
4	Instrumental Methods of Analysis	Dr. K. R. Mahadik and Dr. L. Sathiyarayanan	1st Edition	Nirali Prakashan	2003
5	Text Book of Polymer Science	F.W. Billmeyer, John Wiley & Sons	4 th Edition	John Wiley & Sons	1999
6	Vogels text book of quantitative inorganic analysis	J. Bassett, R.C. Denny, G.H. Jeffery	4 th Edition	ELBS/Longman	1980

E Books and online course materials:

1. [https://_ https://nptel.ac.in/courses/105105110](https://nptel.ac.in/courses/105105110) (*Water and Waste Water Engineering - NPTEL*)
2. https://onlinecourses.nptel.ac.in/noc23_ce42/preview (*Water Chemistry - NPTEL*)
3. <https://www.kopykitab.com/Engineering-Chemistry> (*Kopykitab - Various authors, eBook access*)
4. <https://ndl.iitkgp.ac.in/result?q=engineering%20chemistry> (*National Digital Library of India - Free access to Engineering Chemistry books*)
5. <https://www.pdfdrive.com/engineering-chemistry-books.html> (*PDFDrive - Free Engineering Chemistry PDFs*)

Online Courses and Video Lectures:

1. <https://www.edx.org/course/chemistry> (*Introductory Chemistry - edX platform*)
2. https://www.youtube.com/playlist?list=PLLy_2iUCG87CQhELCytYLzKfBkzU8ovN9 (*NPTEL Engineering Chemistry Video Lectures - YouTube*)

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Activities to be conducted.	20
Total		50

Course Articulation Matrix

[illegible]

Course Title	CHEMISTRY LAB FOR MECHANICAL ENGINEERING STREAM		
Course Code	CHE5ML17	(L-T-P) C	(0-0-2)1
Exam	3 hr	Hours/Week	02
SEE	50	Total Hours	24

Course Objective:

To provide students with practical knowledge of quantitative analysis of materials by volumetric and instrumental methods for the determination of constituents present in a sample.

Course Outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Conducting the experiments with suitable volumetric and instrumental procedures.	PO1	-
2	Analysis and Estimation of materials using volumetric and instrumental methods.	PO2	-

SL. NO	Experiments
1	Estimation of total hardness of water by EDTA method.
2	Estimation of CaO in Portland cement.
3	Estimation of iron in TMT bar by biphenyl amine/external indicator method.
4	Estimation of Copper present in electroplating effluent by optical sensor.
5	Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.
6	Determination of p^{K_a} of vinegar using p^H sensor.
7	Potentiometric estimation of FAS using $K_2Cr_2O_7$
8	Estimation of Copper present in electroplating effluent by optical sensor
9	Conductometric estimation of acid mixture
10	Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
	Demonstration (any two) offline/virtual:
11	Synthesis of polymer
12	Synthesis of iron oxide nanoparticles

PROGRAM SPECIFIC COURSES

1. ENGINEERING MECHANICS
2. BASIC ELECTRONICS ENGINEERING
3. PRINCIPLES OF PROGRAMMING USING C
4. ELEMENTS Of MECHANICAL ENGINEERING
5. ELEMENTS Of ELECTRICAL ENGINEERING

Course Title	ENGINEERING MECHANICS		
Course Code	CIV5131	(L-T-P) C	(3-0-2) 4
CIE	30+20	Hours/Week	05
SEE	50	Total Hours	(42L+28P+43ABL+7EVL)=120

Course Objective:

- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To make students to learn the effect of friction on different planes
- To develop the student's ability to find out the Centre of gravity and moment of inertia and their applications.

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Compute the resultant of coplanar concurrent and non-concurrent force system	1,2	-
2	Comprehend the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces	1,2	-
3	Analyze the frictional resistance offered by different planes and locate the centroid.	1,2	-
4	Compute the moment of inertia of sections and analyze the bodies in motion	1,2	-

MODULE-1

11Hrs.

Resultant of coplanar force system:

Basic dimensions and units, Idealizations, Classification of force system, principle of transmissibility of a force, composition of forces, resolution of a force, Free body diagrams, moment, Principle of moments, couple, Resultant of coplanar concurrent force system, Resultant of coplanar non-concurrent force system, Numerical examples.

MODULE-2

10 Hrs.

Equilibrium of coplanar force system:

Equilibrium of coplanar concurrent force system, Lami's theorem, Equilibrium of coplanar parallel force system, types of beams, types of loadings, types of supports, Equilibrium of coplanar non-concurrent force system, support reactions of statically determinate beams subjected to various types of loads, Numerical examples.

MODULE-3

11 Hrs.

Friction:

Introduction, laws of Coulomb friction, equilibrium of blocks on horizontal plane, equilibrium of blocks on inclined plane, ladder friction, wedge friction Numerical examples.

Centroid of Plane areas:

Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, centroid of composite areas and simple built-up sections, Numerical examples.

MODULE-4

10 Hrs.

Moment of inertia of plane areas:

Introduction, moment of inertia of plane lamina, polar moment of inertia, product of inertia, radius of gyration, parallel axes theorem, perpendicular axis theorem, moment of inertia of rectangular, triangular and circular areas from the method of integration, moment of inertia of composite areas and simple built-up sections, Numerical examples.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	A Textbook of Applied Mechanics Dynamics and Statics	I B Prasad	19 th Edition,	Khanna Publishers. New Delhi. ISBN No. 978-81-7409-068-1	2016.
2	Basic Civil Engineering and Engineering Mechanics,	Bansal R. K., RakeshRanjanBeoharand Ahmad Ali Khan	-	LaxmiPublications	2015

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering Mechanics	Bhavikatti SS	7 th Edition	New Age International	2019
2	Basic Civil Engineering and Engineering Mechanics	Bansal R. K., RakeshRanjanBeohar and Ahmad Ali Khan		Laxmi Publications	2017

E Books and online course materials:

1. [Mechanics of Materials - Engineer4Free: The #1 Source for Free Engineering Tutorials](#)
2. [Engineering Mechanics: Download Subject Notes & Free PDF for AE/JE Exam](#)

Online Courses and Video Lectures:

1. [Introduction to Engineering Mechanics | Coursera](#)
2. [NPTEL :: Mechanical Engineering - NOC:Engineering Mechanics](#)

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Activity Based Learning (ABL1&ABL2)	-	-	43
4	Evaluation of Learning Process	-	-	7

Total Learning Hours/Semester	120
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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Laboratory component	Details of activities to be conducted 1) Laboratory record 2) Laboratory CIE	20
Total		50

Laboratory Plan (integrated course 28 hours):

Lab Program	Program Details
1	Analysis of Lami's Theorem
2	Analysis of Equilibrium of concurrent forces.
3	Analysis of Parallel force system- Simply supported beam.
4	Specific Gravity of - Fine aggregates
5	Specific Gravity of Coarse aggregates.
6	Specific Gravity of Cement
7	Specific Gravity of Soil
8	Sieve analysis of Fine aggregate
9	Graphical representation of the gradation curve of Sieve analysis of Fine aggregate
10	Visual identification of building materials: Bricks, Stones, Tiles, M-Sand, Bitumen, Fly-Ash, GGBS, Steel Bars of Various Sizes

Activity Based Learning (43 Hours)

ABL1 : Activity1		Hours
1.	Assignment	
	Quiz- Each group has to prepare 5 questions and the quiz test will be held and discussed among students	
Total		21
ABL2 : Activity2		Hours
2.	Students shall visit different construction sites and record the data for	
	Different components of the buildings • Foundation • Plinth • Masonry structure • Column, Slab and beams • Other sub-works related to site The site should cover residential buildings, commercial buildings, roads, drains and any other special structures. Minimum of 2 sites has to be covered	
Total		43

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	07

Course Articulation Matrix

[illegible]

Course Title	BASIC ELECTRONICS		
Course Code	BEE5132/BEE5232	(L-T-P) C	(3-0-2)4
Exam	3hours	Hours/Week	3hours
SEE	100	Total Hours	42L+30P+48ABL=120
Course Objective: The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems. Course Outcomes:: {with mapping shown against the Program Outcomes (POs)} Upon completion of the course, the student shall be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2	2,1
2	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 9	2,1
3	Develop competence knowledge to construct basic digital circuit by making use of basic gate and concepts of communication Systems	1, 2, 5, 9	2,1
4	Analyzing the basic analog device and its applications in electronics.	1, 2, 5, 9	2,1
MODULE-1			10 Hours
Semiconductor Diodes: Introduction, PN Junction diode, Characteristics, Diode Approximations, (Text1:2.1,2.2,2.3,2.4) Diode Applications: Introduction, Half Wave Rectifier, Full Wave Center tapped and bridge Rectifier, Full wave Capacitor Filter Circuit, (Text1:3.1,3.2,3.4,3.5) Zener Diode: Junction Breakdown, Characteristics, Zener Diode as Voltage Regulator (Numerical). (Text1:2.9, 3.7)			
MODULE-2			10 Hours
Bipolar Junction Transistors: Introduction, PNP and NPN Transistor, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, DC Loadline and Biaspoint: Self bias, fixed bias and voltage divider bias (Text1:4.2, 4.3, 4.5,4.6,4.7, 5.1, 5.2, 5.3, 5.4) Field Effect Transistor: Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs(Text1: 9.1,9.2,9.5)			
MODULE-3			11 Hours
Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, slew rate, Bandwidth, input offset voltage, Input bias Current and Input offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting &Non-Inverting Amplifier. Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator, Summer and subtractor (Text 2: 1.1,1.2,1.3,1.5,2.2,2.3,2.4,2.6,6.5.1,6.5.2,6.5.3, 6.12, 6.13).			
MODULE-4			11 Hours
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal &Hexa Decimal Numbers, Complements, Basic definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions. Digital Logic Gates (Text3: 1.2,1.3,1.4,1.5,2.1,2.2,2.3,2.4, 2.5,2.6, 2.7) 5 Combinational logic: Introduction, Design procedure, Adders-Half adder, Full adder (Text3:4.1,4.2,4.3) Communications: Introduction to Communication System, Modulation- AM and FM(Derivation and numerical)(Textbook5:1.1,1.2, 1.3, 3.1, 5.1)			

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Electronic Devices and Circuits	David. A. Bell	5 th	Oxford University Press.	2008
2.	Basic Electronics: Devices, Circuits and IT Fundamentals	Santiram Kal	1 st	PHI	2009

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Op-amps and linear integrated circuits	Ramakant A. Gayakwad	4 th	Prentice Hall	2000
2.	Electronic communication systems	George Kennedy	6 th	McGraw Hill India.	2017
3.	Basic Electronics	DP Kothari, IJ Nagrath,	2 nd	Mc Graw Hill Education (India), Private Limited	2018

Online Courses and Video Lectures:

- <https://nptel.ac.in/courses/122106025>
- <https://nptel.ac.in/courses/108105132>
- <https://nptel.ac.in/courses/117104072>

Teaching -Learning- Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Activity Based Learning (ABL1&ABL2)	-	-	38
3.	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted	10
	Activity1- Analog and digital Circuits design and simulation using open Source Simulator. Activity2- Assignment/Quiz	10
Total		50

Activity Based learning 1 (48 hours) :

Sl. No	List
1.	For a mobile charger design a zener voltage regulator that takes ripple DC voltage produced by bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor.
2.	Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system.
3.	Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitude is to be 2.5 V.
4.	A direct-coupled non inverting amplifier with a ± 25 mV input is to produce a ± 5 V

	output. Design the circuit with suitable resistance values.
5.	Design a bridge full wave rectifier circuit to produce 12 Vun regulated DC voltage using a capacitor filter used in an electric vehicle charger circuit.
6.	The difference of two input signals is to be amplified by a factor of 20. Design the circuit with suitable resistance values.
7.	Design a three-input inverting summing amplifier circuit and show how it can be converted into an averaging circuit.
8.	The basic concepts of communication System and various Modulation Techniques.
9.	Realization of Boolean expressions using basic gates.
10.	Realization of half/full adder circuit

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Lab Conduction	2	14	28
2	Evaluation	-	-	02
Total Learning Hours/Semester				30
ABL: Lab based learning 2 (28 Hrs)				

Sl. No	Experiment Title	hours
1.	Introduction to electronics components and instruments	4
2.	Half wave and Full wave rectifiers	5
3.	Voltage divider bias using BJT	4
4.	Single stage amplifier	5
5.	Inverting and Non inverting amplifiers using Op-amp	5
6.	Summer and subtractor circuits using Op-amp.	5
Total		28

Course Articulation Matrix:

Course Outcomes	Program Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PSO 1	PSO 2
CO1	3	2										2	1
CO2	3	2			2				1			2	1
CO3	3	2			2				1			2	1
CO4	3	2			2				1			2	1

CourseTitle	PRINCIPLES OF PROGRAMMING USING C				
CourseCode	PPC5133/ PPC5233	(L-T-P)C	(3-0-2)4		
Exam	03 Hours	Hours/Week	03+02		
SEE	50 Marks	TotalHours	120		
Course Objective: Toprovidefundamentalprogrammingconceptsessentialto developprogram foragiven problem.					
Course Outcomes: UponCompletionofthecourse,students shallbe ableto:					
#	Course Outcomes	Mapping to PO's	Mapping to PSO's		
1.	DescribethetheconceptsofCprogramming language	1	-		
2.	Analyzethegiven programtodeterminetheoutputand itscorrectness	1,2	-		
3.	Develop and documentprogramsto findasolutionforthegivenproblem	3, 10	-		
MODULE-1					
			10Hrs.		
Introduction:ImportanceofC,BasicstructureofCprogram,executingaCprogram,Charactersset,Ctokens,Variables, Datatypes,Operators,Expressions,Evaluationofexpressions,Operatorprecedenceandassociativity, Typeconversion, ManagingInput andOutputOperations.					
MODULE-2					
			11Hrs.		
DecisionmakingandBranching: Simpleif,if..else,nestedifandelseif...ladderstatements.Switchstatement, The?:operator.					
DecisionmakingandLooping:Loops in C, JumpsinLoops,programmingexamples,Nestedloops.					
MODULE-3					
			11Hrs.		
Arrays: One-dimensional Arrays, Two-dimensional Arrays, Character Arrays, Arithmeticoperationon characters,String handling functions.					
MODULE-4					
			10Hrs.		
User-defined Functions: Elements of User defined function, Category of functions, Parameterspassing in functions: call by value and call by reference.					
Structures: Defining a structure, Declaring a structure variable, Accessing structure members,Structureinitialization, Operationson individual members,Arrays ofstructure					
Pointers: Understanding pointers, Accessing the address of a variable, Declaring pointer variables,Initialization of pointer variables, Accessing a variable through its pointers, Pointer expressions,Pointersincrementsandscale factor,Pointersandarrays.					
Prescribed Text Books:					
Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	ProgramminginANSIC	BalagurusamyE	8 th Edition	Tata McGraw Hill	2013.

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	TheCProgrammingLang uage	BrianW.KernighanandDe nnisM.Ritchie	2ndEditi on	PHI	2012
2	ProgrammingTechnique sthroughC	M. G.Venkateshmurthy	-	PearsonEducati on	2014

E Books and online course materials:

1. C Tutorial (w3schools.com) (<https://www.w3schools.com/c/>)
2. C Programming Language Tutorial | GeeksforGeeks (<https://www.geeksforgeeks.org/c-programming-language/>)

Online Courses and Video Lectures:

1. Best C Programming Courses & Certificates [2025] | Coursera Learn Online (<https://www.coursera.org/courses?query=c%20programming>)
2. Introduction To Programming In C - Course (nptel.ac.in) (https://onlinecourses.nptel.ac.in/noc22_cs40/preview)

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks	
CIE	CIE1	Conducted for 20 marks& reduced to 10 marks	10	
	CIE2	Conducted for 20 marks & reduced to 10 marks	10	
	CIE3	Conducted for 20 marks & reduced to 10 marks	10	
Activity Details		1. Lab CIE	10	
		2. Mini project using scratch tool	10	
Total			50	
Teaching - Learning – Evaluation Scheme				
Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching	3	14	42
2	Integrated Lab component	2	14	28
3	Activity Based Learning	3	14	42
4	Evaluation of Learning Process			8
Total Learning Hours / Semester				120

Laboratory Plan (if integrated course) : 28 Hours

The necessary theory for each lab program will be taught during the lab session.

Program	ProgramDetails										
1.	Quadratic equation is given by $ax^2+bx+c=0$, where a, b and c are the coefficients provided where $a \neq 0$. The formula to find roots of quadratic equation is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. Write a C program to find all the roots and test it for all three cases (based on discriminant value).										
2.	A shop keeper requires performing simple calculations like addition, subtraction, multiplication, division and modulo division for his daily business. Write a C program to design a simple calculator for shopkeeper.										
3.	An electric power distribution company charges its domestic consumers as follows: <table> <tr> <th>Consumption Units</th><th>Rate of Charge</th></tr> <tr> <td>0-200</td><td>Rs.0.50 per unit</td></tr> <tr> <td>201-400</td><td>Rs.100 plus Rs.0.65 per unit excess of 200</td></tr> <tr> <td>401-600</td><td>Rs.230 plus Rs.0.80 per unit excess of 400</td></tr> <tr> <td>601 and above</td><td>Rs.390 plus Rs.1.00 per unit excess of 600</td></tr> </table> Write a C program to read the customer number, power consumed and display the amount to be paid by the customer.	Consumption Units	Rate of Charge	0-200	Rs.0.50 per unit	201-400	Rs.100 plus Rs.0.65 per unit excess of 200	401-600	Rs.230 plus Rs.0.80 per unit excess of 400	601 and above	Rs.390 plus Rs.1.00 per unit excess of 600
Consumption Units	Rate of Charge										
0-200	Rs.0.50 per unit										
201-400	Rs.100 plus Rs.0.65 per unit excess of 200										
401-600	Rs.230 plus Rs.0.80 per unit excess of 400										
601 and above	Rs.390 plus Rs.1.00 per unit excess of 600										
4.	Sine series is given $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$ up to n terms, where x is an angle in radian. Write a C program to find sine value for a given angle. Also verify calculated sine value using built-in function.										
5.	A person wants to register his newly purchased car. He is passionate to have a palindromic number for car registration. Write a C program to check whether the number allotted is a palindrome or not.										
6.	Given a list of n student's weight, write a C program to find a student with given weight. If found, display the position of the student in the list else display a suitable message.										
7.	Given two matrices, write a C program to check whether the matrices are multipliable, if so find the product matrix, otherwise display a suitable message.										
8.	Given a matrix, write a C program to find its transpose. Also find sum of upper triangle elements and sum of lower triangle elements of the transposed matrix.										
9.	Write a C program to read a string, find number of vowels and consonants in it.										
10.	Develop a function to find the factorial of a given number. Using the above function. Write a C program to find nCr and nPr where $nCr = \frac{n!}{r!(n-r)!}$ and $nPr = \frac{n!}{(n-r)!}$.										
11.	Develop a C function to swap two numbers using pointers. Write a C program using the above function to swap two numbers.										
12.	Define a structured data type called student containing members: name, usn, marks of CIE1, CIE2, CIE3, activity1 and activity2. Write a C program that would assign values to individual members and display them along with the total internal marks of all students where total internal marks is sum of best of two CIE marks, activity1 and activity2.										

Activity Based Learning:	Hours / Semester
Students use the Scratch platform to create animations, games, and other interactive projects.	42+8=50

Course Articulation Matrix

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

Course Title	Elements of Mechanical Engineering		
CourseCode	EME5134/ EME5234	LTPC	3-0-2-4
Exam	03 Hours	Hours / Week	3+2
SEE	50 Marks	Totalhours	42L+28P+50ABL=120

Course objectives:

To introduce fresh entrants of mechanical engineering course to the principles and fundamentals of Mechanical Engineering.

CourseOutcomes(COs){with mappings shown against the **ProgramOutcomes(POs)**}

Upon completion of the course, students shall be able to:

COs	Outcomes	POs	PSOs
1.	describe the basic concepts of thermodynamics, properties of steam, working principle of internal combustion engines and electric/hybrid vehicles.	1, 2,4,5,6,8,9	-
2.	identify various engineering materials and explain the concepts of belt and gear drives	1, 2,4,5,6,8, 9	-
3.	demonstrate the working and operations of machine tools, metal joining and angular measurement of a given specimen using appropriate device.	1, 2,4,5,6,8, 9	
4.	discuss the role of computer systems in manufacturing, their contribution to automation, and the applications of 3D printing and Outline the performance of robots in mechanical engineering.	1, 2,4,5,6,8, 9	-

COURSE CONTENTS:

Module– I	10Hrs.
Concepts of Thermodynamics: Work, Energy, Heat, Modes of Heat transfer: Conduction, Convection and Radiation. Steam: Steam formation, Types of steam, Steam properties and applications of steam, Simple numerical problems. Heat engines and Heat pumps: Introduction to Heat engines and Heat pumps. IC Engines: Components and working principles, 4-stroke petrol and diesel engines, Applications of IC Engines, (No Numerical) Electric vehicles and Hybrid vehicles: Working principles, Advantages and disadvantages, Components - Batteries, Chargers, Power devices, Drives and Transmission, Classification, Electric and Hybrid vehicle components,	
Module– II	10Hrs
Engineering Materials: Definition, Classification of Engineering Materials. Composite materials: Introduction, Constituents of a composite, Classification, Types of Matrix and Reinforcement materials, Advantages, Disadvantages and Applications of composite materials in Aerospace and Automobile industries. Power Transmission: Belt drives: Introduction, Open and Cross belt drives, Flat belts and V belts, Velocity ratio, Simple numerical problems. Gear Drives: Types of Gears- spur gears, bevel gears, helical gears, worm gear sets, and rack and pinion, Velocity ratio, Gear Trains - Simple and Compound gear trains and Simple numerical problems.	
Module– III	10Hrs.
Machine Tools: Lathe: Working principle, Specifications, Operations performed – Turning, Facing, Taper turning by swiveling the compound rest, Thread cutting and Knurling. Drilling Machine: Working principle, Specifications, Operations performed – Drilling, Reaming, Boring, Counterboring, Countersinking, and Tapping. Milling machine: Working principle, Specifications, Operations performed – Plane milling, End milling, Slot milling, Angular milling. (Sketches of machine tools not required. Sketches to be used only for explaining the operations). Joining Processes: Introduction, Temporary and Permanent joining methods: Working principle of Soldering, Brazing and Electric Arc welding, Advantages, Limitations and Applications.	

Module– IV	10Hrs.
Introduction to Advanced Manufacturing Systems: Introduction, Components of CNC, advantages and applications of CNC. Automation: Types - Fixed, programmable, and flexible automation, merits and demerits of automation, and Applications. Introduction to Robotics: Nomenclature of an Industrial Robot - Polar Cylindrical, Cartesian coordinate, and Spherical robot, Advantages, disadvantages, and applications. Additive manufacturing: Introduction, Basic principles (Steps in additive manufacturing), Additive manufacturing processes –.Classification with example	

Lab components	Hours
1. Performing facing, plain turning and step turning operations by using a lathe. 2. Performing facing, plain turning and knurling operations by using a lathe. 3. Preparation of welded joints using the arc welding process. 4. Calibration of vernier caliper and micrometer using slip gauges. 5. Determination of the angle of a specimen using a sine bar. 6. Determination of the hardness of materials using hardness testing machine.	28

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Elements of Mechanical Engineering	K R Gopala Krishna	38	Subhash Publications	2018
2	Elements of Workshop Technology (Vol. 1 and 2)	HazraChoudhry and Nirzar Roy	17	Media Promoters and Publishers Pvt. Ltd.	2015

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	An Introduction to Mechanical Engineering	Jonathan Wickert	2nd	Cengage Learning	2006
2	Elements of Mechanical Engineering	K P Roy, S K H Choudhry, A K H Choudhry, Roy	7th	Media promoters and publishers	2014
3	Electric and Hybrid vehicles Khanna Publications	A. K. Babu	2nd	Khanna Publications	2022
4	Introduction to Mechatronics	AppuuKuttan K K	1st	Oxford University Press	2007

Web links and Video Lectures (e-Resources):

<https://nptel.ac.in/courses/112104526>

- <https://nptel.ac.in/courses/112104616>
- <https://nptel.ac.in/courses/112104769>
- <https://venturebeat.com/ai/how-ai-is-impacting-the-automotive-world/>
- <https://www.vlcsolutions.com/blog/artificial-intelligence-in-manufacturing/>
- <https://skill-lync.com/blogs/technical-blogs/design-applications-of-machine-learning-and-ai-in-mechanical-engineering>
- <https://caeassistant.com/blog/ai-in-mechanical-engineering-video/>
- <https://www.neuralconcept.com/post/how-is-ai-used-in-mechanical-engineering>
- <https://www.youtube.com/watch?v=MKiiXubKaGM>
- https://www.youtube.com/watch?v=_canCYWZPsc
- <https://www.youtube.com/watch?v=lQ-MYnyxh7M>
- <https://openoregon.pressbooks.pub/manufacturingprocesses45/chapter/chapter-unit-1-the-engine-lathe/>
- <https://www.millerwelds.com/resources/article-library/the-fundamentals-of-welding-process-equipment-and-applications>
- <https://www.youtube.com/watch?v=sbbwJ5p6irc>
- <https://www.youtube.com/watch?v=TlhGTSDfQxc>

Teaching-Learning-Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	03	14	42
2	Integrated Lab Component	02	14	28
3	Evaluation of Learning Process	-	-	06
4	Activity Based Learning (ABL)	-	-	44
Total				120

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Lab	Lab Component -Simple Machining operations in Lathe, Manual metal arc welding, Measuring dimensions using vernier caliper and micrometer, Sine bar, Checking Hardness, Comparative study of properties of Fuels, Simple models using sheet metal operations, 3D printing	10
ABL	Activities based on Metal Joining, Machining, Measurements and Properties of Fuels for different given Materials/Fuels	10
Total		50

Activity Based Learning (44 Hours)

TYPICAL OPEN-ENDED EXPERIMENTS: Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning. Students to prepare the report and present the same on the activities listed below.	Hours
1. Comparative study of flash point and fire point of various fuels / oils using the open cup method 2. Comparative study of flash point and fire point of various fuels / oils using the closed cup method 3. Comparative study on viscosity of different base fuels. 4. Investigation of the effect of additives on the viscosity of base fuels. 5. Selection and justification of appropriate joining techniques for given applications 6. Fabrication of a sheet metal part with simple geometry and soldering. 7. Make the engineering parts with given specifications using 3D printing techniques. 8. Comparative study of facing, plain turning and step turning operations by using a lathe and CNC machine	44

Rubrics for Lab component and Activity Based Learning:

(Lab component and ABL -To be conducted for 50 marks and the marks obtained shall be reduced to 20)

Performance Indicators	Excellent	Good	Satisfactory	Needs Improvement	Poor
Technical Skills & Procedure (PO1 & PO5) (10)	Performs operations flawlessly, correct sequence, excellent tool use. (9-10)	Minor errors, generally correct sequence and tool use. (7-8)	Performs task with some errors; needs occasional help. (5-6)	Many errors, requires frequent guidance. (3-4)	Cannot perform task without continuous supervision. (0-2)
Safety Compliance (PO6) (5)	Strictly follows all safety protocols, proper PPE usage at all times. (5)	Follows safety rules, occasional minor lapses. (4)	Mostly safe, some reminders needed. (3)	Frequent safety violations. (2)	Unsafe behavior ignores safety rules. (0-1)
Interaction with the Group (PO8) (5)	Naturally leads, encourages, and includes all group members. Facilitates communication and ensures tasks are distributed fairly. Respects all opinions. (5)	Cooperates well with group members. Communicates clearly, shares the workload, and is a reliable and positive team member. (4)	Works alongside others but with limited communication or collaboration. Tends to work in isolation or contributes unevenly to the group effort. (3)	Fails to cooperate with the group. Is dismissive of others' ideas or causes friction and disagreement within the team. (2)	Refuses to work with the group or actively disrupts the group's ability to complete the experiment. (1)
Lab Report (PO9) (10)	Report is exceptionally well organized, detailed, and insightful. All data and analysis are accurate. Submitted on time. (9-10)	Report is complete, well organized, and accurate. All required sections are present and data is correctly reported. Submitted on time. (7-8)	Report has minor errors in data or analysis, or is missing some minor components. Organization could be clearer. (5-6)	Report is incomplete, contains significant errors, is poorly organized, or is submitted late without a valid reason. (3-4)	Fails to submit a report or the submitted work is of completely unacceptable quality and lacks critical information. (0-2)
Execution (PO3 & PO5) (10)	Executes operations accurately with correct parameters; smooth, safe handling of equipment. (9-10)	Minor execution errors; mostly correct handling of tools/ machines. (7-8)	Acceptable performance with some parameter or handling errors. (5-6)	Multiple execution errors; needs frequent correction. (3-4)	Unable to perform operation independently. (0-2)
Result and Discussion (PO4) (5)	Presents accurate results; clearly compares with standards; insightful discussion of deviations and causes. (5)	Accurate results; some useful discussion. (4)	Results mostly correct; discussion basic. (3)	Results incomplete or partially wrong; weak discussion. (2)	Presents accurate results; clearly compares with standards; insightful discussion of deviations and causes. (1)
Viva Voce (PO9) (5)	Answers all questions confidently, showing deep conceptual and practical understanding. (5) / (17-20)	Answers most correctly; minor conceptual gaps. (4)	Answers some but lacks depth. (3)	Gives vague or incomplete answers. (2)	Unable to answer. (1)

CourseArticulationMatrix

Course Outcomes	ProgramOutcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	3	2		1	1	1		1	2				
CO2	3	2		1	1	1		1	2				
CO3	3	1		1	1	1		1	2				
CO4	3	1		1	1	1		1	2				

CourseTitle	ELEMENTS OF ELECTRICAL ENGINEERING		
CourseCode	EEE5135/ EEE5235	L-T-P	(3-0-1)4
CIE	50	Hours/Week	4
SEE	50	TotalHours	40
Course Objective: The students acquire knowledge on electrical engineering.			
Course Outcomes: At the end of course, students will be able to:			
#	CourseOutcomes	Mapping to PO's	Mapping to PSO's
1	Discuss the fundamental laws of electrical engineering	1,2	1
2	Apply the concepts to find solutions of electrical circuits	1,2	1
3	Illustrate the skills and wiring adhering to safety measures	1,2	1
4	Describe operation of electrical machines and electrical tariff.	1,2	1
MODULE - 1			10 Hrs.
Electrical Energy: Importance of electrical engineering, Significance of electrical energy, sources of energy, Conventional and renewable energy sources, General structure of electrical power systems using single line diagram approach. Electromagnetism: Faraday's Laws of Electromagnetic Induction, Lenz's Law, Fleming's rules, statically and dynamically induced EMF; concepts of self and mutual inductance. Coefficient of Coupling, Energy stored in magnetic field. DC circuits: Definitions –Passive and active electrical elements, circuit, network, node, branches, mesh, loop. Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits, analysis of electrical circuits with two loops using Maxwell's loop equation. Self-learning topics: Simple applications of electromagnetic induction, self and mutual inductances.			
MODULE - 2			10 Hrs.
Single-phase AC circuits: Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form factor and peak factor of sinusoidal voltage and currents. Phase or representation of alternating quantities. Analysis of R, L, C, R-L, R-C and R-L-C circuits with phasor diagrams, Real power, reactive power, apparent power, and Power factor. Series, Parallel and Series-Parallel circuits. Self-learning topics: Measurement of Voltage, current, power and power factor in single phase AC system.			
MODULE - 3			10Hrs.
Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phase AC voltage. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits. Transformer: Types of transformer, Emf equation, working principle of ideal transformer on no load and load. DC Machines: Types of DC Machines, Emf equation, construction of DC machines, working principle of DC motor, applications. Self-learning topics: Measurement of Voltage, current, power and power factor in three phase AC Systems.			
MODULE - 4			10Hrs
Domestic Wiring: Requirements, Types of wiring, Two way and three-way control of Lamps. General types of wires and cables. Specifications of wires used for domestic wiring and their selection. Electrical Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits, Electric Shock, General concept of earthing, Types of earthing, Safety Precautions to avoid shock, Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB). General types of wires and cables and selection. Electricity bill: Power rating of household appliances like lights, fans, Air Conditioners, Personal Computers etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.			

Laboratory component

1	Verification of Ohm's law and Kirchhoff's laws.
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EMERGING SCIENCE COURSES

1. INTRODUCTION TO CIVIL ENGINEERING
2. INTRODUCTION TO ELECTRICAL ENGINEERING
3. INTRODUCTION TO ELECTRONICS ENGINEERING
4. INTRODUCTION TO MECHANICAL ENGINEERING
5. ESSENTIALS OF INFORMATION TECHNOLOGY

Course Title	INTRODUCTION TO CIVIL ENGINEERING																						
Course Code	ESC514A/ ESC524A	(L-T-P) C	(3-0-0) 3																				
CIE	30+20	Hours/Week	03																				
SEE	50	Total Hours	42L+41ABL+7ELP=90																				
Course Objective: To equip students with foundational knowledge of civil engineering by introducing key disciplines, essential construction materials, structural systems, sustainable development principles, and basic analytical methods—fostering an understanding of how civil engineering shapes resilient, efficient, and environmentally responsible infrastructure for society. Course Outcomes: <table> <tr> <th>#</th><th>Course Outcomes</th><th>Mapping to PO's</th><th>Mapping to PSO's</th></tr> <tr> <td>1</td><td>Distinguish between different civil engineering disciplines based on their scope and application.</td><td>1</td><td>-</td></tr> <tr> <td>2</td><td>Evaluate construction materials, structural components, and transportation infrastructure based on their properties and applications in building systems and road design.</td><td>1</td><td>-</td></tr> <tr> <td>3</td><td>Apply concepts of sustainability, smart infrastructure, and environmental systems in the context of green and energy-efficient construction.</td><td>1</td><td>-</td></tr> <tr> <td>4</td><td>Analyze force systems and calculate centroids for the built up lamina</td><td>1,2</td><td>-</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1	Distinguish between different civil engineering disciplines based on their scope and application.	1	-	2	Evaluate construction materials, structural components, and transportation infrastructure based on their properties and applications in building systems and road design.	1	-	3	Apply concepts of sustainability, smart infrastructure, and environmental systems in the context of green and energy-efficient construction.	1	-	4	Analyze force systems and calculate centroids for the built up lamina	1,2	-
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1	Distinguish between different civil engineering disciplines based on their scope and application.	1	-																				
2	Evaluate construction materials, structural components, and transportation infrastructure based on their properties and applications in building systems and road design.	1	-																				
3	Apply concepts of sustainability, smart infrastructure, and environmental systems in the context of green and energy-efficient construction.	1	-																				
4	Analyze force systems and calculate centroids for the built up lamina	1,2	-																				
MODULE-1			10Hrs.																				
Civil Engineering Disciplines and Building Science: Introduction to Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Environmental Engineering, Construction planning & Project management. Basic Materials and Construction: Bricks-types, properties and tests, Cement-types, properties and basic tests & mortar, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals, Precast construction. Structural elements of a building: foundation, plinth, lintel, chejja, Masonry wall, column, beam, slab and staircase.																							
MODULE-2			10 Hrs.																				
Sustainable Development and Smart Infrastructure in Civil Engineering Sustainable materials and green construction: Green Building rating systems (LEED, IGBC, GRIHA), Energy-efficient designs and materials, rainwater harvesting, green roofs. Use of sensors and smart systems in green buildings. Built-environment: Embodied energy, temperature and sound control in buildings, Security systems. Recycling. Environment: Water Supply and Sanitary systems, urban air pollution management, Solid waste management, identification of Land fill sites, urban flood control.																							
MODULE-3			11 Hrs.																				

Analysis of force systems:

Concept of idealization, system of forces, principles of super position and transmissibility, Resolution and composition of forces, Law of Parallelogram of forces, Resultant of concurrent coplanar force systems- (equilibrium of concurrent). Resultant of non-concurrent coplanar force systems, Varignon's theorem, moment of forces, couple, free body diagram, and non-concurrent coplanar force systems (beams) Numerical examples.

MODULE-4**11 Hrs.****Centroid:**

Importance of centroid and centre of gravity, determination of centroid by method of moments, axis of reference, methods of determining the centroid, Numerical examples for locating the centroid of built-up sections (Simple sections).

Transportation Engineering:

Introduction to Transportation Engineering: Definition and scope, Role in civil engineering and national development, Importance of transportation in economic growth and mobility.

Highway Engineering Basics: Types of roads (NH, SH, MDR, rural roads) Pavement types: Flexible vs. rigid
Basic road components: carriageway, shoulders, medians, footpaths, Surface Characteristics, Cross Sectional elements, Camber, Road hierarchy and layout, Common traffic signs and road markings.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	A Textbook of Applied Mechanics Dynamics and Statics	I B Prasad	19 th Edition,	Khanna Publishers. New Delhi. ISBN No. 978-81-7409-068-1	2016.
2	Basic Civil Engineering and Engineering Mechanics,	Bansal R. K., RakeshRanjanBeoharand Ahmad Ali Khan	-	Laxmi Publications	2015

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering Mechanics	Bhavikatti SS	7 th Edition	New Age International	2019
2	Basic Civil Engineering and Engineering Mechanics	Bansal R. K., RakeshRanjanBeohar and Ahmad Ali Khan		Laxmi Publications	2017

E Books and online course materials:

1. [Understanding Civil Engineering Materials: An Introduction and Overview - Smart Civil Engineers](#)
2. [Engineering Mechanics: Download Subject Notes & Free PDF for AE/JE Exam](#)

Online Courses and Video Lectures:

1. [Introduction to Engineering Mechanics | Coursera](#)
2. [NPTEL :: Civil Engineering - NOC:Introduction to Civil Engineering Profession](#)

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Activity Based Learning (ABL1&ABL2)	-	-	41
4	Evaluation of Learning Process	-	-	7
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Flipped class for module 2 2) Pragmatic theory application- module 3	20
Total		50

Activity Based Learning (41 Hours)

ABL1 : Activity1- Flipped class		Hours
Sustainable Development and Smart Infrastructure in Civil Engineering.		20
1.	Prepare the presentation for the given topic from the module and present the same	
	Report preparation for the given topic	
Total		
ABL2 : Activity2		Hours
2.	Students shall visit different construction sites and record the data for	21
	Different components of the buildings • Foundation • Plinth • Masonry structure • Column, Slab and beams • Other sub-works related to site The site should cover residential buildings, commercial buildings, roads, drains and any other special structures. Minimum of 2 sites has to be covered	

CourseTitle	INTRODUCTION TO ELECTRICAL ENGINEERING		
CourseCode	ESC514B/ESC524B	(L-T-P) C	(3-0-0)3
CIE	50	Hours/Week	3
SEE	50	TotalHours	40
Course Objective: To acquire basic knowledge of electrical engineering.			
Course Outcomes: At the end of course, student will be able to:			
#	CourseOutcomes	Mapping to PO's	Mapping to PSO's
1	Explain the basic concepts of power system and AC and DC circuit analysis and basic electrical protection devices.	1,2	1
2	Describe the operating principle of analog and digital measuring instruments.	1,2	1
3	Apply the basic concepts of AC circuits and DC circuits.	1,2	1
4	Analyze the working principle of electrical machines and transformers.	1,2	1
MODULE –1			10 Hrs.
Introduction: Conventional and Non-conventional energy resources with examples, advantages of renewable Energy Systems; General structure of electrical power systems using single line diagram approach. Domestic Wiring: Requirements, Types of wiring: casing, capping. Two way and three way control of lamps. Electricity bill: Power rating of household appliances like lights, fans, Air Conditioners, Personal Computers etc. Definition of “unit” used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. Measuring instruments: Dynamometer type Wattmeter, Energy meter, comparisons between digital and analog meters, digital multimeter.			
MODULE –2			10 Hrs.
Basics of Electromagnetic Induction: Faraday’s law of Electromagnetic Induction, Significance of Lenz’s law. Statically induced EMF and Dynamically induced EMF. DC Circuits: Ohm’s Law and its limitations,KCL & KVL, Series, and Parallel. Simple Numerical on KCL and KVL.			
MODULE –3			10Hrs.
A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, Form factor, Peak factor. Simple problems on AC fundamentals. Single phase AC circuit Analysis: Voltage and current relationship with phasor diagrams in R, L, and C circuits. Simple numerical on R, L & C circuits. Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phase AC voltage. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections.			
MODULE - 4			10Hrs
DC machines: Construction and working principle. Classification of DC machine, EMF equation, problems on EMF.Applications. Transformers: Necessity of transformer, principle of operation, Types of Transformers: Shell and Core type,			

Three-phase induction Motors: Definition of rotating magnetic field (without derivation), Principle of operation. Constructional features of squirrel cage type and wound rotor type induction motor. Slip and its significance, problems. Applications.

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Fundamentals of Electrical Engineering	Rajendra Prasad	1 st	Prentice-Hall of India Pvt. Ltd	2005

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Basic Electrical Engineering	D. C. Kulshreshtha	2 nd	McGraw Hill	2019
2	Electrical and Electronics Technology	E. Hughes	2 nd	Pearson	2010
3	Basic Electrical Engineering	D.P. Kothari, I.J. Nagrath	4 th	McGraw Hill Education	2019

1. <https://www.mheducation.co.in/basic-electrical-and-electronics-engineering-9789364441070-india>
2. https://www.pcefet.com/common/library/books/39/173_BasicElectricalEngineeringbyV.K.Mehtaan dRohitMehta.pdf

1. <https://www.youtube.com/watch?v=rLUyP6g1VNI&list=PL425060D3C78350E1>
2. https://www.youtube.com/watch?v=VXo0p_1z3Uw&list=PLp6ek2hDcoNCc3IgSGVjIsiMhM_LI9FEh

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 (Modelling of two and Three way control of lamps) 2) Details of activity 2 (Demonstration of different types of wires used)	20
Total		50

[illegible]

Course Title	INTRODUCTION TO ELECTRONICS ENGINEERING		
Course Code	ESC514C/ ESC524C	(L-T-P) C	(3-0-0) 3
Exam	3 Hours	Hours/Week	3
SEE	50 Marks	Total Hours	42L+48ABL=90
Course Objective: The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems. Course outcomes: Upon completion of the course, students shall be able to			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2	1,2
2	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 8	1,2
3	Develop competence knowledge to construct basic digital circuit by make	1, 5, 8	1,2
4	Apply the knowledge of embedded system and basic communication system.	1,2	1,2
MODULE-1			10Hrs.
Power Supplies –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, voltage Multiplier. Amplifiers – CE amplifier input and output characteristics, multi-stage amplifier; BJT as a switch: Cut-off and saturation modes, BJT Biasing: Introduction, self bias and fixed bias.			
MODULE-2			11 Hrs.
Operational amplifiers - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op- amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator. (Text 1) Oscillators – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, RC Phase Shift Oscillator, Colpitt's and Hartley oscillator, Crystal oscillator, Multivibrators, Single-stage astable multivibrator (using transistor only). (Only Concepts, working, and waveforms. No mathematical derivations).			
MODULE-3			10 Hrs.
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & HexaDecimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (Text 2: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7). Combinational logic: Introduction, Design procedure, Adders -Half adder, Full adder.			
MODULE-4			11Hrs
Embedded Systems–Definition, Embedded systems vs general computing systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller. (Text 4). Analog Communication Schemes – Modern communication system scheme, Information source,and input transducer, Transmitter, Channel – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM,FM. (Problems on AM only). Digital Modulation Schemes: Advantages of digital communication over analogcommunication, ASK, FSK, PSK.(Only concepts, no mathematical derivations) (Text 3).			

Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	‘Electronic Circuits, Fundamentals & Applications’	Mike Tooley	4 th	Elsevier	2015
2.	Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008	M. Morris Mano	1 st	Pearson education	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	‘Basic Electronics’	D P Kothari, I J Nagrath,	2 nd	McGraw Hill Education (India), Private Limited,	2018
2.	“Introduction to Embedded systems”	Shibu K V	4 th	McGraw Hill Education (India), Private Limited	2011

Online course and video lecture:

1. <https://www.youtube.com/watch?v=AUNQnmuloJI&list=PLgdFAtuRW5n7LgdFwLaGfK3cWlbNx17pA>
2. <https://www.youtube.com/watch?v=r9DU7yuWEao&list=PLu7-Sp50sShdDx6EVpK2yOYSWmqBJrfVH>
3. <https://www.youtube.com/watch?v=IoDoW5kykkw&list=PLzJaFd3A7DZsA8xZg3tgoShboIIBY98c>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
4.	Class Room Teaching & Learning	3	14	42
5.	Activity Based Learning (ABL1&ABL2)	-	-	38
6.	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Activity1- Analog Circuit design and implementation using open source Simulator (10 Marks). Activity2-Digital Circuit design and implementation using open- source Simulator (10 Marks).	20
Total		50

Activity Based Learning (38 Hours)

Activity 1 Details: Following are the experiments list of analog circuit design and implementation using open-source simulator. 1. For a mobile charger design a zener voltage regulator that takes ripple DC voltage produced by bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor. 2. Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system. 3. Construct a sinusoidal wave generator circuit using crystal oscillator to generate an audio signal frequency of 2 kHz. 4. Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitude is to be 2.5 V. 5. A direct-coupled noninverting amplifier with a ± 25 mV input is to produce a ± 5 V output. Design the circuit with suitable resistance values. 6. Design a bridge full wave rectifier circuit to produce 12 V unregulated DC voltage using a capacitor filter used in an electric vehicle charger circuit. 7. The difference of two input signals is to be amplified by a factor of 20. Design the circuit with suitable resistance values. 8. Design a three-input inverting summing amplifier circuit and show how it can be converted into an averaging circuit.	Hours
Total	25
Activity 2 Details: Following are the experiments list of circuit design and implementation using open source simulator. 1. Realization of Boolean expressions using basic gates. 2. Realization of half adder circuit. 3. Realization of full adder circuit. 4. Realization of 4-bit parallel adder. 5. Realization of Integrator. 6. Realization of Differentiator.	Hours 13
Total Learning Hours/Semester	38

Evaluation of Learning Process (10 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Demonstration of activity	4
Semester End Exam	3
Total	10

Course Articulation Matrix

Course Outcomes	Program Outcomes												Program Specific Outcomes
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PSO2
CO1	3	2										2	1
CO2	3	2			2			1				2	1
CO3	3				2			1				2	1
CO4	3	2						1				2	1

Course Title	INTRODUCTION TO MECHANICAL ENGINEERING		
Course Code	ESC514D/ESC524D	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/ Week	3
SEE	50 Marks	Total Hours	48 L + 42 ABL = 90
Course Objective: To provide students with the fundamental knowledge of mechanical engineering principles and their practical applications.			
Course Outcomes (COs):			
COs	Outcomes	POs	PSOs
1.	explain the basic principles of energy systems, flying Machines and refrigeration	1, 2	-
2.	compare engines, power transmission systems, and modern mobility solutions	1, 2, 5	-
3.	classify and identify properties and applications of engineering, composite, and lightweight materials	1, 6, 11	-
4.	describe manufacturing processes, machine tools, modern methods, and recent advances in automation and mechatronics	1, 5, 11	-
MODULE - 1			10 Hrs.
Fundamentals of Mechanical Engineering: Streams of Mechanical Engineering and their relevance to society; Role of mechanical engineers in solving real-world problems. Energy Conversion Systems: Pelton turbine and Francis turbine – basic principles, schematic representation, and applications in power generation. Flying Machines: basic drone components, and working principle with simple examples. Refrigeration & Air Conditioning: working principle of vapour compression refrigeration system,working principle of Air Conditioning and applications in domestic and industrial systems.			
MODULE - 2			10 Hrs.
Engines: Introduction to petrol and diesel engines, 4-stroke working principle (No Numerical). Comparison of petrol and diesel engines. Future Mobility: Electric & Hybrid Vehicles – major components, advantages, limitations, and role in sustainable transport. Power Transmission Systems: Classification of gears, Spur gear, Helical gear, worm wheel and rack and pinion. Gear trains- simple and compound gear trains (No Numerical).			
MODULE - 3			10 Hrs.
Engineering Materials: Classification, Ferrous metals (cast iron, mild steel) and Non-ferrous metals (aluminium, copper) – basic properties and common engineering applications.Materials behaviour-stress strain curve for ductile material. Composite Materials: Constituents, classification, matrix & reinforcement,applications. Lightweight Materials for Automotive & Aerospace: Metal matrix composites, Polymer matrix composites, Ceramic matrix composites-Advantages and applications.			
MODULE - 4			10 Hrs.
Manufacturing Processes: Welding (arc and gas welding), soldering, brazing – principles & applications. Machine Tools: Lathe (Facing& Taper turning) drilling (counter boring & reaming), milling (Up milling & down milling) – basic operations. Modern Processes: CNC – components, advantages, applications; Steps involved in Additive Manufacturing (3D printing). Advances in Manufacturing Processes: Automation –types, Mechatronics – open loop and closed loop; – working principles and applications.			

Prescribed Textbooks:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Elements of Mechanical Engineering	K R Gopalakrishna, S C Sharma	36 th	Subhas Stores	2016
2.	An Introduction to Mechanical Engineering	Jonathan Wickert and Kemper Lewis	3 rd	Cengage Learning	2012

Reference Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Manufacturing Technology- Foundry, Forming and Welding	PN Rao	3 rd	Tata McGraw Hill	2003
2.	Materials Science & Engineering, An Introduction	William D Callister		John Wiley & Sons Inc	2010
3.	Internal Combustion Engines	V Ganesan	4 th	Tata McGraw Hill Education	2017
4.	Introduction to Robotics	S K Saha	3 rd	McGraw Hill	2024
5.	Introduction to Mechatronics	K K Appukuttan	1 st	Oxford University Press	2007
6.	Automation, production systems, and computer integrated manufacturing	Groover M P	3 rd	Prentice Hall	2008

E-Books and online course materials:

1. <https://books.google.com.et/books?id=CtT0fzwkMvUC&printsec=frontcover#v=onepage&q&f=false>
2. <https://ftp.idu.ac.id/wp-content/uploads/ebook/tdg/DESIGN%20SISTEM%20DAYA%20GERAK/An%20Introduction%20to%20Mechanical%20Engineering.pdf>

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc25_me09/preview
2. https://onlinecourses.swayam2.ac.in/nou24_ec10/preview
3. <https://nptel.ac.in/courses/112105212>
4. <https://nptel.ac.in/courses/107106090>
5. <https://nptel.ac.in/courses/112104526>
6. <https://nptel.ac.in/courses/112104616>
7. <https://nptel.ac.in/courses/112104769>

Teaching -Learning- Evaluation Scheme:

Sl. No.	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Activity-Based Learning (ABL1 & ABL2)	-	-	41
3.	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1. ABL1 - Industrial/ Laboratory Visit with Reflective Report & Presentation 2. ABL2 - Poster/ Model/ Infographic Presentation with Demonstration & Peer Review	20
Total		50

Activity-Based Learning (41 Hours)

ABL1 (20 Hours): Industrial/ Laboratory Visit	Hours
Consent and preparation for visit (briefing and instruction)	1
Visit to industry/ lab	6
Interaction and observations at the industry/ lab	3
Preparation of report (formatting, content writing, editing)	6
Report presentation and discussion	4
Total	20

ABL2 (21 Hours): Poster/ Model/ Infographic Presentation	Hours
Topic selection, literature review, and material collection	4
Design and development of a poster or a working model	8
Practice and preparation for the presentation	4
Final presentation or demonstration with Q&A	3
Feedback, peer discussion, and reflection	2
Total	21

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Description	Hours
Continuous Internal Evaluation (CIE-1, CIE-2, CIE-3)	Descriptive tests (Syllabus to be decided by the course coordinators, such that all the COs shall be covered)	3 hrs
Activity Evaluation	Assessment of ABL components through demonstration, mini-reports, and participation	1 hr
Semester End Examination (SEE)	Final exam (descriptive, 3 hours)	3 hrs
Total		7 hrs

COURSE ARTICULATION MATRIX

Course Outcomes	Program Outcomes (POs)												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	2	-	-	-	-	2	-	-
CO4	3	-	-	-	3	-	-	-	-	-	2	-	-

CourseTitle	ESSENTIALS OF INFORMATION TECHNOLOGY		
CourseCode	ESC514E/ESC524E	(L-T-P)C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
SEE	50Marks	Total Hours	40
CourseObjective:To introduce the concepts of IT to all undergraduate students			
CourseOutcomes(COs):Uponcompletionofthecourse,studentsshallbe able to:			
#	CourseOutcomes	Mapping to POs	
1.	Describe various information representation and manipulation schemes	1	
2.	Make use of Information Technology (IT) infrastructure for information exchange and web pages	3	
3.	Apply basic software engineering concepts for application development.	3,5	
4.	Identify the role of cybersecurity and ethical issues in Information Technology (IT).	1	
CourseContents:			
MODULE–1			12Hrs
Data Storage: Bits and Their Storage, Main Memory, Mass Storage, Representing Information as Bit Patterns, The Binary System, Storing Integers, Storing Fractions.			
Data Manipulation: Computer Architecture, Machine Language, Program Execution, Arithmetic/Logic Instructions, Communicating with Other Devices			
Database Systems: Database Fundamentals, The Relational Model			
MODULE–2			10Hrs
Operating Systems: The History of Operating Systems, Operating System Architecture, Coordinating the Machine’s Activities, Handling Competition Among Processes, Security.			
Algorithms: The Concept of an Algorithm, Algorithm Representation, Algorithm Discovery.			
Networking and the Internet: Network Fundamentals, The Internet, The World Wide Web, Internet Protocols, Security			
MODULE–3			10Hrs
Cybersecurity: Overview—What is Cybersecurity? Brief History of Cybersecurity Events, The Basic Information Security Model, Cyber Hygiene, Teams in Cybersecurity.			
Ethical Issues in Information Technology: Overview, Ownership Rules, Ethics and Online Content			
Software Engineering: The Software Engineering Discipline, The Software Life Cycle, Software Engineering Methodologies, Modularity, Tools of the Trade.			
MODULE–4			10Hrs
Introduction to HTML and Website Development: What is HTML?, Cascading Style Sheets (CSS), WebsiteDesign and Storyboarding, Structure of a Website.			
Computer Graphics: The Scope of Computer Graphics, Overview of 3D Graphics, Modeling, Rendering.			

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Computer Science: An Overview	J. Glenn Brookshear and Dennis Brylow	Second Edition	Pearson Education	2017
2	Fundamentals of Information Technology	Roy, Shambhavi; Daniel, Clinton; and Agrawal, Manish	-	Digital Commons at The University of South Florida	2023

Textbook 1: Chapter-1 (1.1-1.7), Chapter-2 (2.1-2.5), Chapter-3, Chapter-4, Chapter-5 (5.1-5.3)
 Chapter-9 (9.1-9.2), Chapter-10 (10.1-10.4)
 Textbook 2: Chapter-12, Chapter-16, Chapter-17

Reference Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	"Introduction to Information Technology"	V. Rajaraman,	Third Edition,	PHI Learning,	2018
2	Information Technology in Theory,	Pelin Aksoy,	First Edition,	Cengage	-

EBooks and online course materials:

1. [Fundamentals of Information Technology](#)

Online Courses and Video Lectures:

1. Information Technology: https://onlinecourses.swayam2.ac.in/cec20_cs05/preview

2. Computer Organization and Architecture: <https://nptel.ac.in/courses/106103068>

3. Introduction To Internet: <https://nptel.ac.in/courses/106105084>

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks			Marks
CIE	CIE1	Conductedfor20marks&reducedto10 marks			10
	CIE2	Conductedfor20marks&reducedto10 marks			10
	CIE3	Conductedfor20marks&reducedto10 marks			10
ActivityDetails		Practical Assessment			20
Total					50
Teaching-Learning-Evaluation Scheme					
Sl. No	Teaching-LearningMethod	No.of Hours/Week	No.ofWeeks	Hours/Semester	
1	ClassRoom Teaching	3	14	42	
3	ActivityBased Learning	3	12	36	
4	Evaluation of LearningProcess			12	
TotalLearningHours/Semester					90

[illegible]

EMERGING TECHNOLOGY COURSES

1. Introduction to AI and its use cases for Civil Engineering
2. Introduction to AI and its use cases for Mechanical Stream
3. Introduction to AI and its use cases for Electrical & Electronics Engineering
4. Introduction to AI and its use cases for Electronics Stream
5. Introduction to AI and its use cases for Computer Science Stream

Course Title	Introduction to AI and its use cases for Civil Engineering		
Course Code	ETC515K/525K	(L-T-P)C	(3-0-0)3
Exam	3 Hrs	Hours/Week	3
SEE	100 Marks	Total Hours	42L+48ABL=90

Course Objective:

1. Explain AI concepts, machine learning models, and prompt engineering basics.
2. Apply AI methods (regression, classification, and clustering, neural networks) to civil engineering datasets.
3. Identify and analyze real-world AI applications in construction, transportation, water resources, and environmental engineering.
4. Discuss recent AI trends, ethical concerns, and emerging opportunities in civil infrastructure development.

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the fundamental concepts of AI, types of intelligence, search methods and knowledge representation with relevance to civil engineering systems.	PO1,PO2	
2	Demonstrate prompt engineering techniques and generative AI tools for solving and documenting civil engineering tasks such as DPRs and sustainable design brainstorming.	PO1,PO6	
3	Apply regression, classification, clustering, and advanced ML models to transportation, structural and water resource datasets in civil engineering.	PO1, PO6	
4	Apply AI-driven applications, robotics, and IoT in smart infrastructure, sustainable development, and civil project management.	PO7,PO8	

MODULE-1	11 Hrs.
Introduction on Foundations of AI for Civil Engineering: Artificial Intelligence Overview: History, advantages/disadvantages, types (Weak AI, Strong AI, Reactive, Limited Memory, Selfaware). Human vs Machine Intelligence: Defining intelligence, components, agents, and environments with traffic signal systems, water networks. Search & Knowledge Representation: Uninformed and informed search (best-first, greedy), knowledge-based systems (applications in building codes and design standards). Self-study component: Mini-report: “How AI can improve flood evacuation planning in cities.”	
MODULE-2	11 Hrs.
Introduction on Prompt Engineering and Generative AI in Civil Engineering: Prompt Engineering Basics: Evolution, types of prompts, advantages in engineering communication. Prompting Techniques: Zero-shot, one-shot, few-shot, chain-of-thought, role-based prompting. Applications: Writing technical reports, environmental impact assessments, DPRs, sustainable design brainstorming. Self-study component: Prompts for concrete mix optimization, water cycle explanation, and structural design alternatives.	
MODULE-3	10 Hrs.
Introduction on Machine Learning for Civil Data Analysis: Regression: Predicting concrete strength, traffic growth, water demand, Classification: Soil type classification, flood risk prediction, Clustering: Rainfall pattern grouping, accident hotspot identification, Advanced ML Techniques (Introduction): Naive Bayes, Neural Networks, SVM — applied to structural health monitoring, pavement distress detection. Self-study component: Collect rainfall/temperature data for your city and apply regression in Excel/Python.	
MODULE-4	12 Hrs.
Introduction on Trends, Robotics, and Applications in Civil Infrastructure: Trends in AI: Ethical concerns, AI as a Service (AIaaS), Expert systems, IoT & AIoT for smart cities, Robotics & Automation: Drones in surveying, AI robotics in construction, Applications in Civil Infrastructure: Transportation: traffic flow prediction, signal optimization, Water Resources: leakage detection, water quality forecasting, Environment: pollution monitoring, STP optimization. Self-study component: Prepare a porton “Drone-based AI applications in highway construction.”	

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence Applications in Civil Engineering	Satish Chander	–	Springer	2020
2	Neural Networks, Fuzzy Logic and Genetic Algorithms	S. Rajasekaran & G.A. Vijayalakshmi Pai	–	PHI Learning	2017
3	Artificial Intelligence: Beyond Classical AI	Reema Thareja	–	Pearson Education	2021
4	Prompt Engineering: Empowering Communication	Ajantha Devi Vairamani & Anand Nayyar	–	CRC Press, Taylor & Francis Group	2024

Reference Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence: A Modern Approach	Stuart Russell & Peter Norvig	4th Edition	Pearson	2021
2	Artificial Intelligence	Elaine Rich, Kevin Knight & Shivashankar B. Nair	3rd Edition	McGraw-Hill	2019
3	Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond	Tom Taulli	–	Apress, Springer	2023
4	Engineering Optimization:	S.S. Rao	5th	Wiley	2019

	Theory and Practice		Edition		
5	Recent Research Papers on AI in Civil Engineering Domains (Transportation, Construction, Water Resources, Environmental Engineering)	Various (IEEE/Elsevier)	–	IEEE / Elsevier	2019–2025

E-Books and online course materials:

1. NPTEL / SWAYAM: Artificial Intelligence for Engineers, Machine Learning Foundations.

2. MOOCs:

- AI for Everyone (AndrewNg).
- Machine Learning (Stanford University–AndrewNg).
- Generative AI for Everyone.

3. Data & Case Study Platforms:

- Kaggle–Civil Engineering datasets (Concrete strength, traffic, water quality).
- ASCEJournalofComputinginCivilEngineering(CasestudiesonAIininfrastructure)

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07

Total Learning Hours/Semester	90
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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1. Assignment 2. Regular short quizzes conducted for each module for understanding of the most recent concepts.	20
Total		50

Activity Based Learning (27 Hours)

ABL1 (14 Hours): Activity 1 Details		Hours
1.	Field Visit	8
2	Report	6
Total		14
ABL2 (13 Hours): Activity 2 Details		Hours
1	1.Presentation	3
	2.Assignment	10
Total		13

Evaluation of Learning Process(7 Hours)

Type of Evaluation	Hours
Test(1,2 and 3)	3
Quiz	1
Semester End Exam	3
Total	7

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

Course Title	INTRODUCTION TO AI AND ITS USE CASES FOR MECHANICAL STREAM		
Course Code	ETC515L/ETC525L	(L-T-P)C	(3-0-0)3
Exam	03 Hours	Hours/Week	03
SEE	50 Marks	Total Hours	90

Course Objective: To explore the applications of AI in real world

Course Outcomes: Upon Completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's
1.	Explain the concepts and types of artificial intelligence.	1
2.	Illustrate basic machine learning methods for regression, classification and clustering.	3
3.	Interact with generative AI tools using prompt engineering techniques	5
4.	Describe recent trends in artificial intelligence and machine learning	1

MODULE-1	10Hrs.
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Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms (only fundamentals)

MODULE-2	10Hrs.
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Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

Introduction to Prompt Engineering: Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work, Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication.

Prompt Engineering Techniques for ChatGPT: Introduction to Prompt Engineering Techniques, Instructions Prompt Technique, Zero, One, and Few Shot Prompting, Self-Consistency Prompt.

MODULE-3	10Hrs.
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Machine Learning: Introduction, Evolution, Need, Applications in Industry and Real World, Types of ML (Supervised, Unsupervised and Reinforcement), Case Studies.

MODULE-4	10Hrs.
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Trends and Applications of AI: AI and Ethical Concerns, AI as a Service (AIaaS), Internet of Things, Artificial Intelligence of Things (AIoT), Robotics using AI, Drones using AI, AI in Healthcare, AI in Finance, AI in Agriculture, AI in Transportation.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence: Beyond Classical AI	Reema Thareja		Pearson Education,	2023

2	PromptEngineering:EmpoweringCommunication	AjanthaDeviVairamani andAnandNayyar	1 st	CRC Press, Taylor & Francis Group	2024
3	AI for Everyone – A Beginner’s Handbook for Artificial Intelligence”	SaptarsiGoswami, Amit Kumar Das and Amlan Chakrabarti		Pearson	2024

Reference Books:

SN	BookTitle	Authors	Edition	Publisher	Year
1	ArtificialIntelligence:AModernApproach,	Stuart Russell and Peter Norvig	4 th	Pearson Education	2023
2	ArtificialIntelligence	Elaine Rich, Kevin Knight, and Shivashankar B. Nair		McGraw Hill Education	
3	PromptEngineeringforGenerativeAI:ChatGPT,LLMs,andBeyond,Apress,	Tom Taulli		Springer Nature	
4	Artificial Intelligence: Making A System Intelligent,	Nilakshi Jain	1 st	Wiley	

Online Courses and Video Lectures:

1. ElementsofAI–<https://www.elementsofai.com>
2. CS50’sIntroductiontoArtificialIntelligencewithPython–Harvard
<https://cs50.harvard.edu/ai/>
3. GoogleMachineLearningCrashCourse–<https://developers.google.com/machine-learning/crash-course>
4. LearnPrompting(Open-SourceGuide)–<https://learnprompting.org>
5. GoogleAI–LearnwithGoogleAI<https://ai.google/education/>
6. Coursera–MachineLearningbyAndrewNg(StanfordUniversity)
<https://www.coursera.org/learn/machine-learning>
7. OpenAIPromptEngineeringGuide(forChatGPT)
<https://platform.openai.com/docs/guides/gpt-best-practices>
8. PromptEngineeringforDevelopers–DeepLearning.AI+OpenAI
<https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/>
9. EthicsinAI–GoogleResponsibleAIPractices
<https://ai.google/responsibilities/responsible-ai-practices/>
10. GoogleTeachableMachine(TrainAImodelsvisuallywithoutcode)
<https://teachablemachine.withgoogle.com>

ProposedAssessmentPlan(for50marksof CIE):

Tool		Remarks	Marks
CIE	CIE1	Conductedfor20marks&reducedto10 marks	10
	CIE2	Conductedfor20marks&reducedto10 marks	10
	CIE3	Conductedfor20marks&reducedto10 marks	10
ActivityDetails		Practical Assessment	20
Total			50
Teaching-Learning-Evaluation Scheme			

Sl. No	Teaching-LearningMethod	No.of Hours/Week	No.ofWeeks	Hours/Semester
1	ClassRoom Teaching	3	14	42
3	ActivityBased Learning	3	12	36
4	Evaluation of LearningProcess			12
TotalLearningHours/Semester				90

Activity Based Learning:	Hours / Semester 36
1. Spam Email Detector: The Spam Email Detector is one of the earliest and most practical AI applications. This project involves training a machine learning model to classify emails as spam or legitimate. 2. Sentiment Analysis of Product Reviews: This project focuses on analyzing text data from platforms like Twitter, Facebook, or Instagram to determine the sentiment behind posts. By classifying content as positive, negative, or neutral, organizations can better understand public opinion, monitor brand health, and respond quickly to trends. 3. Chatbot for Customer Service: Chatbots are everywhere today, from e-commerce websites to banking apps. This project involves creating an AI-powered conversational agent that can answer FAQs, resolve simple queries, or even process transactions. 4. Stock Price Prediction: Financial forecasting is one of the most widely recognized applications of AI. In this project, you'll explore Stock Price Prediction by analyzing historical market data to anticipate future price movements. 5. Language Translation Model: A Language Translation Model project aims to build an AI system capable of translating text from one language to another. To tackle this challenge, beginners can explore sequence-to-sequence models and attention mechanisms, gaining exposure to natural language processing and machine translation techniques.	

Course Articulation Matrix

[illegible]

CourseTitle	Introduction to AI and its use cases for Electrical & Electronics Engineering		
CourseCode	ETC515M/ETC525M	(L-T-P) C	(3-0-0)3
CIE	50	Hours/Week	3
SEE	50	TotalHours	40

Course Objective: To understand the basics, techniques, and applications of Artificial Intelligence and its impact in electrical engineering.

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

#	CourseOutcomes	Mapping to PO's	Mapping to PSO's
1	Explain the fundamentals of artificial intelligence.	1,5,6,7	1
2	Analyse the machine learning model and its techniques.	1,5,6,7	1
3	Apply the techniques of AI to develop simple machine learning models.	1,5,6,7	1
4	Demonstrate the functionality of simple AI applications.	1,3, 9,10	1

MODULE –1

10 Hrs.

Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning.

MODULE –2

10 Hrs.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment– Rationality, Types of Agents, Types of Environments, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).

MODULE –3

10Hrs.

Machine Learning: Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Technique(K-mean's), Naïve Bayes Classification, Support Vector Machine (SVM), Neural Network (excluding deep learning).

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

MODULE - 4

10Hrs

Trends in AI: AI and Ethical Concerns, AI as a Service (AlaaS), Expert System, Internet of Things, Artificial Intelligence of Things (AIoT).

Introduction to Prompt Engineering, Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work?, Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication.

Applications of AI Techniques: Application of AI in Healthcare, Application of AI in Finance, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Artificial Intelligence: Beyond Classical AI	ReemaThareja	-	Pearson Education	2023
2	Prompt Engineering: Empowering Communication	Ajantha Devi Vairamani and AnandNayyar,	1 st	CRC Press, Taylor & Francis Group	2024
3	AI for Everyone – A Beginner's Handbook for Artificial Intelligence	SaptarsiGoswami, Amit Kumar Das and AmlanChakrabarti	-	Pearson	2024

ReferenceBooks:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
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1	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	4 th	Pearson Education	2023
2	Artificial Intelligence	Elaine Rich, Kevin Knight, and Shivashankar B. Nair	-	McGraw Hill Education	-
3	Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond	Tom Taulli	-	Apress, Springer Nature	-
4	Artificial Intelligence: Making A System Intelligent	Nilakshi Jain	1 st	Wiley	-

EBooks and online course materials:

1. https://people.engr.tamu.edu/guni/csce642/files/AI_Russell_Norvig.pdf

Online Courses and Video Lectures:

1. Elements of AI – <https://www.elementsofai.com>
2. CS50's Introduction to Artificial Intelligence with Python – Harvard <https://cs50.harvard.edu/ai/>
3. Google Machine Learning Crash Course – <https://developers.google.com/machine-learning/crash-course>
4. Learn Prompting (Open-Source Guide) – <https://learnprompting.org>
5. Google AI – Learn with Google AI <https://ai.google/education/>
6. Coursera – Machine Learning by Andrew Ng (Stanford University) <https://www.coursera.org/learn/machine-learning>
7. OpenAI Prompt Engineering Guide (for ChatGPT) <https://platform.openai.com/docs/guides/gpt-best-practices>
8. Prompt Engineering for Developers – DeepLearning.AI + OpenAI <https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/>
9. Ethics in AI – Google Responsible AI Practices <https://ai.google/responsibilities/responsible-ai-practices/>
10. Google Teachable Machine (Train AI models visually without code) <https://teachablemachine.withgoogle.com>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	1 Basic Prompt writing: Create two different prompts to ask an AI about the topic "Electricity." The first prompt should be vague, and the second prompt should be clear and specific. Compare the responses you get and describe which prompt gave a better answer and why. 2 Zero-Shot Prompting: Create a prompt that asks an AI to explain Ohm's Law without giving any example or background. Evaluate how well the AI explains the concept based on your prompt alone. 3 One-Shot and Few-Shot Prompting: Provide the AI with a single example of how to calculate the resistance in a simple circuit. Then write your own prompt asking the AI to solve a similar resistance calculation. After that, add two more examples to your prompt and observe any changes in the AI's response quality. 4 Chain-of-Thought Prompting: Develop a prompt that guides the AI step-by-step through calculating current flow in a circuit using Ohm's Law with resistors in series. Then, ask a final question for the AI to solve. Analyze how breaking down the reasoning steps impacts the accuracy of the answer. 5 Prompt Refinement: Start with an ambiguous prompt related to the "Water Cycle." Test the AI's response, note the confusion or errors, and then refine your prompt to make it clearer and more specific. Repeat this process twice and record how the AI's responses improve with each refinement. Role-Based Prompting: Create three prompts asking the AI to explain "Newton's Laws of Motion," each with a different role instruction: (a) as an expert engineer, (b) as a high school teacher, (c) as a beginner.	20

	Compare the tone, detail, and style of the responses. 6 Creative Engineering Problem Prompts: Craft a prompt that asks the AI to brainstorm ideas for designing a low-cost water purification system suitable for rural areas. Encourage creativity by adding phrases like “limited resources” and “sustainability” 7 Ethical Prompt Design Discussion: Identify a biased prompt related to job descriptions (e.g. language with respect to a gender). Rewrite the prompt to remove bias and create a neutral, inclusive version. Explain why this revision is more ethical. 8 Simulated Customer Support Chatbot: Develop a prompt that instructs the AI to play the role of a technical support agent helping a customer troubleshoot a failure in an electronic circuit. Include instructions to keep the tone friendly and professional and to ask diagnostic questions. 9 Multi-Language Prompting: Develop a prompt that asks the AI to translate a simple engineering glossary (5 technical terms) from English to your native language. Then modify the prompt to request additional explanations of these terms in the translated language. 10 Review a curated set of different prompt types (e.g., for summarization, information extraction, paraphrasing, question answering) from a “Prompt Gallery.” For each prompt type, match it with a realworld task (e.g., summarizing a lecture note, extracting names from a project report). Test at least three prompt templates on an AI tool or by role-play (students simulate being the AI), with varied wording. Record the outcomes and discuss which prompt (or template) was most effective for each task, and explain why you think it worked best. Reflect on how changing small parts of a prompt can alter model response quality, completeness, or accuracy. 11 Choose a real engineering challenge or societal problem relevant to your field (e.g., “Reducing plastic waste in campus cafeterias” or “Optimizing solar panel placement on campus rooftops”). Draft an initial prompt that asks an AI to propose practical solutions. Share the AI’s (or peer’s) answer in small groups and identify aspects that are missing, vague, or not actionable. Refine your prompt based on feedback (e.g., specify constraints, ask for step-by-step solutions, or require a list of pros and cons). Repeat the process one more time, refining again for further clarity or specificity. Document the entire prompt-refinement process and share the best solution generated, along with a brief analysis of how prompt improvements led to better responses	
Total		50

Course Articulation Matrix

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
COs														
CO1	3	-	-	-	2	2	1	-	-	-	-	-	-	1
CO2	3	-	-	-	2	2	1	-	-	-	-	-	-	2
CO3	3	-	-	-	2	2	1	-	-	-	-	-	-	2
CO4	2	-	3	-	-			-	2	2	-	-	-	2

Course Title	Introduction to AI and its use cases for Electronics Stream		
Course Code	ETC515N/ ETC525N	(L-T-P) C	(3-0-0)3
Exam	3hrs	Hours/Week	3
SEE	50	Total Hours	42L+38ABL=90
Course outcome (Course Skill Set) At the end of the course, the student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain the concepts and types of artificial intelligence.	1,2, 8, 9, 11	-
2	Illustrate basic machine learning methods for regression, classification and clustering	1,8, 11	-
3	Identify real-world applications across different disciplines.	1,3, 11	-
4	Outline recent trends in artificial intelligence and machine learning.	1,3, 7, 11	-
MODULE-1			11Hrs.
Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Machine Learning and Deep Learning. Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge. Textbook 1: Chapter 1 (1.1-1.5), Chapter 4 (4.1-4.4)			
MODULE-2			11Hrs.
Machine Learning: Techniques in AI, Machine Learning Model – Types of ML: Supervised, Unsupervised, Semi-Supervised and Reinforcement Learning with example, Comparison b/w ML & DL, Neural Network, Support Vector Machine (SVM)- Example. Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Depth-First Search Algorithm (Greedy Search). Textbook 1: Chapter 2 (2.1-2.8), Chapter 3 (3.1-3.7.2)			
MODULE-3			10Hrs.
Trends in AI: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI – Collaborative Systems, Expert System – Working of an Expert System with Examples, Characteristics & Components of an Expert Systems, Internet of Things – Examples, Sensors, Artificial Intelligence of Things (AIoT) – Applications & Examples of AIoT. Textbook 1: Chapter 8 (8.1, 8.2, 8.4.1, 8.4.2), Chapter 9 (9.1- 9.3)			
MODULE-4			10Hrs
Robotics – Artificially Intelligent Robots, Characteristics of Robots, Types of Robots, Components of Robot, Drones Using AI, No Code AI, Low Code AI. Textbook 1: Chapter 8 (8.3), Chapter 1 (1.8, 1.10, 1.11)			

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence: Beyond Classical AI	ReemaThareja	-	Pearson Education	2023
2	AI for Everyone – A Beginner's Handbook for Artificial Intelligence	SaptarsiGoswami, Amit Kumar Das and AmlanChakrabarti	-	Pearson	2024

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	4 th	Pearson Education	2023
2.	Artificial Intelligence	Elaine Rich, Kevin Knight, and Shivashankar B. Nair	-	McGraw Hill Education.	-
3.	Artificial Intelligence: Making A System Intelligent	Nilakshi Jain	1 st	Wiley	-

Web Links and Video Lectures (e-Resources):

1. Elements of AI – <https://www.elementsofai.com>
2. CS50's Introduction to Artificial Intelligence with Python – Harvard
<https://cs50.harvard.edu/ai/>
3. Google Machine Learning Crash Course – <https://developers.google.com/machine-learning/crash-course>
4. Google AI – Learn with Google AI <https://ai.google/education/>
5. Coursera – Machine Learning by Andrew Ng (Stanford University)
<https://www.coursera.org/learn/machine-learning>
6. Ethics in AI – Google Responsible AI Practices
<https://ai.google/responsibilities/responsible-ai-practices/>
7. Google Teachable Machine (Train AI models visually without code)
<https://teachablemachine.withgoogle.com>

Teaching-Learning–Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Activity Based Learning (ABL1&ABL2)	-	-	38
3.	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks	Hours
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30	2
Activity Details	Details of activities to be conducted 1) Conduction of in class Essay/Debate with topics related to AI in the fields of Ethics and Society, jobs and the economy, education and learning, creativity and Identity, rights and personhood. Proper rubrics to be set by faculty for evaluation. 2) Group activity: a) Build a simple chatbot to serve specific application using any AI tools like Dialogflow or Scratch Extension b) Development and demonstration of image classifier using google's teachable machine. c) Creating a emoji translator using any AI tool which converts text to emoji's using natural language processing.	20	38
Total		50	

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2						1	1		1			
CO2	3							1			1			
CO3	3		1								1			
CO4	3						2				1			

CourseTitle	Introduction to AI and its use cases for Computer Science Stream		
CourseCode	ETC5150/ ETC5250	(L-T-P)C	(3-0-0)3
Exam	03 Hours	Hours/Week	03
SEE	50 Marks	Total Hours	90

Course Objective: To explore the applications of AI in real world

Course Outcomes: Upon Completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's
1.	Describe the concepts of artificial intelligence.	1
2.	Elucidate recent trends in artificial intelligence and machine learning	1
3.	Illustrate basic machine learning methods for regression, classification and clustering	3
4.	Interact with generative AI tools using prompt engineering techniques	5

MODULE-1	12Hrs.
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Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

MODULE-2	10Hrs.
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Machine Learning: Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM).

Trends in AI: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI, Expert System, Internet of Things, Artificial Intelligence of Things (AIoT), Robotics, Robotics as an Application of AI, Drones Using AI, No Code AI, Low Code AI.

MODULE-3	10Hrs.
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Introduction to Prompt Engineering, Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work?, Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication

Prompt Engineering Techniques for ChatGPT, Introduction to Prompt Engineering Techniques, Instructions Prompt Technique, Zero, One, and Few Shot Prompting, Self-Consistency Prompt.

Prompts for Creative Thinking: Introduction, Unlocking Imagination and Innovation.

Prompts for Effective Writing: Introduction, Igniting the Writing Process with Prompts.

MODULE-4	10Hrs.
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Industrial Applications of AI: Application of AI in Healthcare, Application of AI in Finance, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation, AI in Experimentation and Multi-disciplinary research.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	ArtificialIntelligence:BeyondClassicalAI	ReemaThareja		PearsonEducation,	2023
2	PromptEngineering:EmpoweringCommunication	AjanthaDeviVairamani andAnandNayyar	1 st	CRC Press, Taylor & Francis Group	2024
3	AI for Everyone – A Beginner’s Handbook for Artificial Intelligence”	Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti		Pearson	2024

Textbook1:Chapter1(1.1-1.5, 1.7,1.8,1.10,1.11),Chapter2(2.1-2.8), Chapter3(3.1-3.7.2),Chapter4(4.1-4.4), Chapter8(8.1,8.2,8.3,8.4),Chapter9(9.1-9.3)

Textbook2:Chapters1 , 3,4&5

Textbook3:Chapter3,Chapter5(5.1)

Reference Books:

SN	BookTitle	Authors	Edition	Publisher	Year
1	ArtificialIntelligence:AModernApproach,	Stuart Russell and Peter Norvig	4 th	Pearson Education	2023
2	ArtificialIntelligence	Elaine Rich, Kevin Knight, and Shivashankar B. Nair		McGraw Hill Education	
3	PromptEngineeringforGenerativeAI:ChatGPT,LLMs,andBeyond,Apres,	Tom Taulli		Springer Nature	
4	Artificial Intelligence: Making A System Intelligent,	Nilakshi Jain	1 st	Wiley	

Online Courses and Video Lectures:

1. ElementsofAI–<https://www.elementsofai.com>
2. CS50’sIntroductiontoArtificialIntelligencewithPython–Harvard
<https://cs50.harvard.edu/ai/>
3. GoogleMachineLearningCrashCourse–<https://developers.google.com/machine-learning/crash-course>
4. LearnPrompting(Open-SourceGuide)–<https://learnprompting.org>
5. GoogleAI–LearnwithGoogleAI<https://ai.google/education/>
6. Coursera–MachineLearningbyAndrewNg(StanfordUniversity)
<https://www.coursera.org/learn/machine-learning>
7. OpenAIPromptEngineeringGuide(forChatGPT)
<https://platform.openai.com/docs/guides/gpt-best-practices>
8. PromptEngineeringforDevelopers–DeepLearning.AI+OpenAI
<https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/>
- 9.EthicsinAI–GoogleResponsibleAIPractices
<https://ai.google/responsibilities/responsible-ai-practices/>
10. GoogleTeachableMachine(TrainAImodelsvisuallywithoutcode)
<https://teachablemachine.withgoogle.com>

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks		Marks
CIE	CIE1	Conductedfor20marks&scaled to10 marks		10
	CIE2	Conductedfor20marks&scaledto10 marks		10
	CIE3	Conductedfor20marks&scaledto10 marks		10
ActivityDetails		Practical Assessment		20
Total				50
Teaching–Learning–Evaluation Scheme				
Sl. No	Teaching- LearningMethod	No.of Hours/ Week	No.ofWeeks	Hours/ Semester
1	ClassRoom Teaching	3	14	42
3	ActivityBased Learning	3	12	36
4	Evaluation of LearningProcess			12
TotalLearningHours/Semester				90

Activity Based Learning:

Hours / Semester
36

1 Basic Prompt writing: Create two different prompts to ask an AI about the topic "Electricity." The first prompt should be vague, and the second prompt should be clear and specific. Compare the responses you get and describe which prompt gave a better answer and why.

2 Zero-Shot Prompting: Create a prompt that asks an AI to explain Ohm's Law without giving any example or background. Evaluate how well the AI explains the concept based on your prompt alone.

3 One-Shot and Few-Shot Prompting: Provide the AI with a single example of how to calculate the resistance in a simple circuit. Then write your own prompt asking the AI to solve a similar resistance calculation. After that, add two more examples to your prompt and observe any changes in the AI's response quality.

4 Chain-of-Thought Prompting: Develop a prompt that guides the AI step-by-step through calculating current flow in a circuit using Ohm's Law with resistors in series. Then, ask a final question for the AI to solve. Analyze how breaking down the reasoning steps impacts the accuracy of the answer.

5 Prompt Refinement: Start with an ambiguous prompt related to the "Water Cycle." Test the AI's response, note the confusion or errors, and then refine your prompt to make it clearer and more specific. Repeat this process twice and record how the AI's responses improve with each refinement.
Role-Based Prompting: Create three prompts asking the AI to explain "Newton's Laws of Motion," each with a different role instruction: (a) as an expert engineer, (b) as a high school teacher, (c) as a beginner. Compare the tone, detail, and style of the responses.

6 Creative Engineering Problem Prompts: Craft a prompt that asks the AI to brainstorm ideas for designing a low-cost water purification system suitable for rural areas. Encourage creativity by adding phrases like "limited resources" and "sustainability"

7 Ethical Prompt Design Discussion: Identify a biased prompt related to job descriptions (e.g. language

with respect to a gender). Rewrite the prompt to remove bias and create a neutral, inclusive version. Explain why this revision is more ethical.

8 Simulated Customer Support Chatbot: Develop a prompt that instructs the AI to play the role of a technical support agent helping a customer troubleshoot a failure in an electronic circuit. Include instructions to keep the tone friendly and professional and to ask diagnostic questions.

9 Multi-Language Prompting: Develop a prompt that asks the AI to translate a simple engineering glossary (5 technical terms) from English to your native language. Then modify the prompt to request additional explanations of these terms in the translated language.

10 Review a curated set of different prompt types (e.g., for summarization, information extraction, paraphrasing, question answering) from a “Prompt Gallery.” For each prompt type, match it with a realworld task (e.g., summarizing a lecture note, extracting names from a project report). Test at least three prompt templates on an AI tool or by role-play (students simulate being the AI), with varied wording. Record the outcomes and discuss which prompt (or template) was most effective for each task, and explain why you think it worked best. Reflect on how changing small parts of a prompt can alter model response quality, completeness, or accuracy.

11 Choose a real engineering challenge or societal problem relevant to your field (e.g., “Reducing plastic waste in campus cafeterias” or “Optimizing solar panel placement on campus rooftops”). Draft an initial prompt that asks an AI to propose practical solutions. Share the AI’s (or peer’s) answer in small groups and identify aspects that are missing, vague, or not actionable. Refine your prompt based on feedback (e.g., specify constraints, ask for step-by-step solutions, or require a list of pros and cons). Repeat the process one more time, refining again for further clarity or specificity. Document the entire prompt-refinement process and share the best solution generated, along with a brief analysis of how prompt improvements led to better responses

Course Articulation Matrix

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

Course Title	Introduction to Python Programming		
Course Code	PLC515 / 525	L-T-P-C	(2-0-2) 4
SEE duration	3 hours	Hours / Week	4
CIE(Theory) Marks	30	CIE (Practicals) / Activity Marks	20
SEE marks	50	Total contact hours	28L+28P+64ABL=120
Course Objective: Student's will be able to write a python program to solve the given problem. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
SL. No.	Course Outcomes	Mapping to Pos	Mapping to PSOs
1.	Describe and apply python language construct for writing a program	1,3,5	-
2.	Analyze the codes snippet for its correctness	2,5	-
3.	Design a GUI/python program for the given problem	3,5	-
Course Contents:			
Module 1			10 Hours
Python Basics: The way of Programming. Variables, Expression and Entering Expressions into the Interactive Shell. The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program, Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(). Loops for iteration. Manipulating Strings: Working with Strings, Useful String Methods.			
Module 2			10 Hours
Lists: The List DataType, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List. List-like Types: Strings and Tuples. Dictionaries: The Dictionary DataType, Pretty Printing. Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Argument sandprint(). Local and Global Scope, The global Statement. Exception Handling, A Short Program: Guess the Number.			
Module 3			10 Hours
Reading and Writing Files: Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the print.format() Function. GUI Programming: Tkinter Introduction, Tkinter and Python programming, Widgets Label, Button, Entry, Scaling, Menu, Check Box, Radio button. Tkinter examples			
Module 4			10 Hours
Classes and objects: Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying. Classes and functions: Time, Pure functions, Modifiers, Prototyping versus planning Classes and methods: Object oriented features, Printing objects, Another example, A more			

complicated example, Theinit method. Thestr method. Operator overloading. Type-baseddispatch, Polymorphism.

Programming Exercises:

1. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.
2. Develop a program to generate Fibonacci sequence of length(N).Read N from the console.
3. Write a function to calculate factorial of a number. Develop a program to compute binomialcoefficient (Given N and R),
4. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.
5. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
6. Write a python program to Guess the number using randint() Functions (ask player to guess 6times).
7. Write a magic 8-ball game program in python using list.
8. Write a program to search an element using linear search.
9. Write a program to search an element using binary search.
10. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
11. Write an Object-oriented Python program to create two Time objects: current Time, which contains the current time; and bread Time, which contains the amount of time it takes for a bread maker to make bread. Then we'll use add Time to figure out when the bread will be done. Write the print Time function to display the time when the bread will be done by the bread maker.
12. Define a function that takes two objects representing complex numbers and returns new complex number with an addition of two complex numbers. Define a suitable class 'Complex to represent the complex number. Develop a program to read N (N>2) complex numbers and to compute the addition of N complex numbers.
13. Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details [Hint: Use list to store the marks in three subjects and total marks. Use init() method to initialize name, USN and the lists to store marks and total, Use the getMarks() method to read marks into the list, and display() method to display the scorecard details.]
14. Design GUI a python program to store the information about the student like first name, lastname, department (text box), gender (radio button) with login and cancel button.
15. Design a simple GUI image viewer.

Text Books :

1. Al Sweigart, "Automate the Boring Stuff with Python", 1st Edition. No Starch Press, 2015.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.
3. Wesley J Chun, "Core Python Application Programming", 3rd Edition, Pearson Publication, 2016.

Reference Books:

1. R. Nageswara Rao, "Core Python Programming", 3rd Edition, Dreamtech Press

Teaching-Learning Process

These are sample strategies, which teacher can use to accelerate the attainment of the various Course outcomes and make Teaching-Learning more effective

1. Chalk and talk, use modern tools and projector.

Course Title	Computer Aided Engineering Drawing (CAED) for CSE stream		
Code	CED513/523	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	28L+28P+34ABL=90

Course Objective: To introduce the students to “universal language of Engineers” for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

Course Outcomes:

Upon completion of the course, students shall be able to;

COs	Statement	POs
1	Apply the principles of orthographic projection and create projections of planes and basic geometric solids.	1,2, 5, 9
2	develop the lateral surfaces of geometrical solids	
3	interpret isometric views and draw orthographic views of machine components	

Course contents:

MODULE 1	14 Hours
Principles of orthographic Projections: Different planes of projection and views taking point as an example with explanation about distance of a point from planes of projections. Concept of true length and true inclination of a line (emphasis on practical problems).	
Orthographic Projection of Planes: Projection of Planes by change of position method only (no combination of planes).	
MODULE 2	18 Hours
Orthographic Projection of Solids: Front, top and profile views of geometric solids resting with their base completely on HP (no other positions).	
Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.	
MODULE 3	12 Hours
Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.	

MODULE 4	08 Hours
Multidisciplinary Applications & Practice (Self Study Component)	
2D Network drawing with wired and wireless, Network topology - wired and wireless.	
3D Modeling: Raspberry Pi / Arduino boards, Router & switches, IoT devices - Concept of converting 3D printing format (stl)	
Concept of Industrial drawing	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing	N.D.Bhatt & M.Panchal	55 th	Charotar Publishing House	2024
2.	Engineering Drawing	K.R. Gopal Krishna	30 th	Subhash Publications, Bangalore	2017

Reference Books:

	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing & Design	Cencil Jensen, Jay D. Helsel, Dennis R. Short	7 th	Tata McGraw-Hill	2007
2.	Printed Circuit Board Design using AutoCAD	Chris Schroder	-	Newness	1997
3.	Design of foundation systems	Nainan P Kurian	3 rd	Alpha Science International Ltd	2005

Teaching -Learning- Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	4	14	56
2	Integrated Lab Component	-	-	-
3	Student Study Hours - Self Learning	-	-	-
3	Activity Based Learning (ABL1)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 10 marks	20
Activity Details	Submission of printouts of computer-solved problems	30
Total		50

Activity Based Learning (27Hours)

ABL1(XX Hours) : Activity 1 details		Hours
1.	Computer-solved problems printout of Projection of Planes	5
2.	Computer-solved problems printout of Projection of Solids	5
3.	Computer-solved problems printout of Development of lateral surfaces	6
4.	Computer-solved problems printout of Isometric Projections	6
5.	Computer-solved problems printout of Basic Applications	5
Total		27

Evaluation of Learning Process(7Hours)

Type of Evaluation	Hours
Test(1 and 2)	3
Submission of printouts	1
Semester End Exam	3
Total	7

COURSE ATRICULATION MATRIX

Course Out comes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1	1	1			3				2				
CO2	1	1			3				2				
CO3	1	1			3				2				

Course Title	Computer Aided Engineering Drawing (CAED) for CV stream		
Code	CED513/523	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	28L+28P+34ABL=90

Course Objective: To introduce the students to “universal language of Engineers” for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

Course Outcomes:

Upon completion of the course, students shall be able to;

COs	Statement	POs
1	Apply the principles of orthographic projection and create projections of planes and basic geometric solids.	1,2, 5, 9
2	develop the lateral surfaces of geometrical solids	
3	interpret isometric views and draw orthographic views of machine components	

Course contents:

MODULE 1	14 Hours
Principles of orthographic Projections: Different planes of projection and views taking point as an example with explanation about distance of a point from planes of projections. Concept of true length and true inclination of a line (emphasis on practical problems).	
Orthographic Projection of Planes: Projection of Planes by change of position method only (no combination of planes).	
MODULE 2	18 Hours
Orthographic Projection of Solids: Front, top and profile views of geometric solids resting with their base completely on HP (no other positions).	
Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.	
MODULE 3	12 Hours
Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.	

MODULE 4	08 Hours
Multidisciplinary Applications & Practice (Self Study Component)	
Modeling Basic Building Components: foundations, columns, beams, slabs, walls, doors windows, staircase, assigning materials and rendering building components. Drafting a 2D floor plan for a simple single-storey residential/commercial building, Converting the floor plan into 3D model with walls, openings, and roof structure. Concept of building drawing	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing	N.D.Bhatt & M.Panchal	55 th	Charotar Publishing House	2024
2.	Engineering Drawing	K.R. Gopal Krishna	30 th	Subhash Publications, Bangalore	2017

Reference Books:

	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing & Design	Cencil Jensen, Jay D. Helsel, Dennis R. Short	7 th	Tata McGraw-Hill	2007
2.	Printed Circuit Board Design using AutoCAD	Chris Schroder	-	Newness	1997
3.	Design of foundation systems	Nainan P Kurian	3 rd	Alpha Science International Ltd	2005

Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	4	14	56
2	Integrated Lab Component	-	-	-
3	Student Study Hours - Self Learning	-	-	-
3	Activity Based Learning (ABL1)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 10 marks	20
Activity Details	Submission of printouts of computer-solved problems	30

Total	50
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Activity Based Learning (27Hours)

ABL1(XX Hours) : Activity 1 details		Hours
1.	Computer-solved problems printout of Projection of Planes	5
2.	Computer-solved problems printout of Projection of Solids	5
3.	Computer-solved problems printout of Development of lateral surfaces	6
4.	Computer-solved problems printout of Isometric Projections	6
5.	Computer-solved problems printout of Basic Applications	5
Total		27

Evaluation of Learning Process(7Hours)

Type of Evaluation	Hours
Test(1 and 2)	3
Submission of printouts	1
Semester End Exam	3
Total	7

COURSE ATRICULATION MATRIX

Course Out comes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1	1	1			3				2				
CO2	1	1			3				2				
CO3	1	1			3				2				

Course Title	Computer Aided Engineering Drawing (CAED) for ECE stream		
Code	CED513/523	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	28L+28P+34ABL=90

Course Objective: To introduce the students to “universal language of Engineers” for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

Course Outcomes:

Upon completion of the course, students shall be able to;

COs	Statement	POs
1	Apply the principles of orthographic projection and create projections of planes and basic geometric solids.	1,2, 5, 9
2	develop the lateral surfaces of geometrical solids	
3	interpret isometric views and draw orthographic views of machine components	

Course contents:

MODULE 1	14 Hours
Principles of orthographic Projections: Different planes of projection and views taking point as an example with explanation about distance of a point from planes of projections. Concept of true length and true inclination of a line (emphasis on practical problems).	
Orthographic Projection of Planes: Projection of Planes by change of position method only (no combination of planes).	
MODULE 2	18 Hours
Orthographic Projection of Solids: Front, top and profile views of geometric solids resting with their base completely on HP (no other positions).	
Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.	
MODULE 3	12 Hours
Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.	

MODULE 4	08 Hours
Multidisciplinary Applications & Practice (Self Study Component)	
3D Modelling: Optical fibre cable with core and cladding, photonic crystal fibers, Antenna: Single element patch antenna, antenna array.	
Sheet Metal & Surface Design: PCB Enclosures: Creation of different geometry with slots as Standards: NMEA-0183, applying material properties for heat sink and water/dust proofing and rendering for realistic visualization.	
Concept of Industrial drawing	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing	N.D.Bhatt & M.Panchal	55 th	Charotar Publishing House	2024
2.	Engineering Drawing	K.R. Gopal Krishna	30 th	Subhash Publications, Bangalore	2017

Reference Books:

	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing & Design	Cencil Jensen, Jay D. Helsel, Dennis R. Short	7 th	Tata McGraw-Hill	2007
2.	Printed Circuit Board Design using AutoCAD	Chris Schroder	-	Newness	1997
3.	Design of foundation systems	Nainan P Kurian	3 rd	Alpha Science International Ltd	2005

Teaching -Learning- Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	4	14	56
2	Integrated Lab Component	-	-	-
3	Student Study Hours - Self Learning	-	-	-
3	Activity Based Learning (ABL1)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 10 marks	20

Activity Details	Submission of printouts of computer-solved problems	30
Total		50

Activity Based Learning (27Hours)

ABL1(XX Hours) : Activity 1 details		Hours
1.	Computer-solved problems printout of Projection of Planes	5
2.	Computer-solved problems printout of Projection of Solids	5
3.	Computer-solved problems printout of Development of lateral surfaces	6
4.	Computer-solved problems printout of Isometric Projections	6
5.	Computer-solved problems printout of Basic Applications	5
Total		27

Evaluation of Learning Process(7Hours)

Type of Evaluation	Hours
Test(1 and 2)	3
Submission of printouts	1
Semester End Exam	3
Total	7

COURSE ATRICULATION MATRIX

Course Out comes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1			3				2				
CO2	1	1			3				2				
CO3	1	1			3				2				

Course Title	Computer Aided Engineering Drawing (CAED) for EEE stream		
Code	CED513/523	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	28L+28P+34ABL=90

Course Objective: To introduce the students to “universal language of Engineers” for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

Course Outcomes:

Upon completion of the course, students shall be able to;

COs	Statement	POs
1	Apply the principles of orthographic projection and create projections of planes and basic geometric solids.	1,2, 5, 9
2	develop the lateral surfaces of geometrical solids	
3	interpret isometric views and draw orthographic views of machine components	

Course contents:

MODULE 1	14 Hours
Principles of orthographic Projections: Different planes of projection and views taking point as an example with explanation about distance of a point from planes of projections. Concept of true length and true inclination of a line (emphasis on practical problems).	
Orthographic Projection of Planes: Projection of Planes by change of position method only (no combination of planes).	
MODULE 2	18 Hours
Orthographic Projection of Solids: Front, top and profile views of geometric solids resting with their base completely on HP (no other positions).	
Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.	
MODULE 3	12 Hours
Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.	

MODULE 4	08 Hours
Multidisciplinary Applications & Practice (Self Study Component)	
2D drawing of switches, sockets, panels, junction boxes, antenna, electric circuits. Schematic diagram Automatic fire alarm, Call bell system, UPS system, Basic power system diagram.	
Concept of Industrial drawing	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing	N.D.Bhatt & M.Panchal	55 th	Charotar Publishing House	2024
2.	Engineering Drawing	K.R. Gopal Krishna	30 th	Subhash Publications, Bangalore	2017

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Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	4	14	56
2	Integrated Lab Component	-	-	-
3	Student Study Hours - Self Learning	-	-	-
3	Activity Based Learning (ABL1)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 10 marks	20
Activity Details	Submission of printouts of computer-solved problems	30
Total		50

Activity Based Learning (27Hours)

ABL1(XX Hours) : Activity 1 details		Hours
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2.	Computer-solved problems printout of Projection of Solids	5
3.	Computer-solved problems printout of Development of lateral surfaces	6
4.	Computer-solved problems printout of Isometric Projections	6
5.	Computer-solved problems printout of Basic Applications	5
Total		27

Evaluation of Learning Process(7Hours)

Type of Evaluation	Hours
Test(1 and 2)	3
Submission of printouts	1
Semester End Exam	3
Total	7

COURSE ATRICULATION MATRIX

Course Out comes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1	1	1			3				2				
CO2	1	1			3				2				
CO3	1	1			3				2				

Course Title	Computer Aided Engineering Drawing (CAED) for ME stream		
Code	CED513/523	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	28L+28P+34ABL=90

Course Objective: To introduce the students to “universal language of Engineers” for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

Course Outcomes:

Upon completion of the course, students shall be able to;

COs	Statement	POs
1	Apply the principles of orthographic projection and create projections of planes and basic geometric solids.	1,2, 5, 9
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Course contents:

MODULE 1	14 Hours
Principles of orthographic Projections: Different planes of projection and views taking point as an example with explanation about distance of a point from planes of projections. Concept of true length and true inclination of a line (emphasis on practical problems).	
Orthographic Projection of Planes: Projection of Planes by change of position method only (no combination of planes).	
MODULE 2	18 Hours
Orthographic Projection of Solids: Front, top and profile views of geometric solids resting with their base completely on HP (no other positions).	
Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.	
MODULE 3	12 Hours
Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.	

MODULE 4	08 Hours
Multidisciplinary Applications & Practice (Self Study Component)	
3D Modeling: Simple machine parts / engineering components. (Applying material properties rendering for realistic visualization)	
Sheet Metal & Surface Design: Automotive panels, HVAC ducting Concept of Industrial drawing	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing	N.D.Bhatt & M.Panchal	55 th	Charotar Publishing House	2024
2.	Engineering Drawing	K.R. Gopal Krishna	30 th	Subhash Publications, Bangalore	2017

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3.	Design of foundation systems	Nainan P Kurian	3 rd	Alpha Science International Ltd	2005

Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	4	14	56
2	Integrated Lab Component	-	-	-
3	Student Study Hours - Self Learning	-	-	-
3	Activity Based Learning (ABL1)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 10 marks	20
Activity Details	Submission of printouts of computer-solved problems	30
Total		50

Activity Based Learning (27Hours)

ABL1(XX Hours) : Activity 1 details		Hours
1.	Computer-solved problems printout of Projection of Planes	5
2.	Computer-solved problems printout of Projection of Solids	5
3.	Computer-solved problems printout of Development of lateral surfaces	6
4.	Computer-solved problems printout of Isometric Projections	6
5.	Computer-solved problems printout of Basic Applications	5
Total		27

Evaluation of Learning Process(7Hours)

Type of Evaluation	Hours
Test(1 and 2)	3
Submission of printouts	1
Semester End Exam	3
Total	7

COURSE ATRICULATION MATRIX

Course Out comes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1	1	1			3				2				
CO2	1	1			3				2				
CO3	1	1			3				2				

MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MECHANICAL ENGINEERING

Course Title	INNOVATION & DESIGN THINKING		
Course Code	IDT518	(L-T-P) C	(1-0-0)1
SEE duration	2 hours	Hours / Week	02
CIE marks	50	Total Marks	100
SEE marks	50	Total hours	14L+14ABL+2ELP=30

Course Objective:

The objective of this course is to make students choose real life problems and generate innovative ideas to solve them through design thinking approach.

Course Outcomes (COs) {with mapping shown against the Program

Outcomes (POs)} Upon completion of the course, students shall be able to:

Sl. No.	Course outcomes	Mapping to POs
1.	explain the different stages in design thinking	1, 6, 7
2.	generate solutions to real life problems by applying the design thinking approach	1, 2, 10, 12

Course Contents:

MODULE –1	5 Hrs.
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Introduction: Innovation, Design, Early man as a designer, Design thinking levels: Component or product level, System or community level. **Morphology of Design:** Divergence or Explorative phase, Transformation or Creative phase, Convergence phase. Sustainable Development Goals.

MODULE –2	5 Hrs.
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Fundamentals of Design Thinking: Design Thinking Process: Different Phases. Empathize: Observation, Interview, Literature Survey. Define/Analyze: 5 Why's technique, Conflict Analysis.

MODULE –3	5 Hrs.
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Ideate: Eskimo nine dot problem, Theory of Inventive Problem Solving (TRIZ method), Brain storming. **Prototype:** Methods of Prototyping. **Testing:** Self-reflection, Interviewing real customer.

Activities:

1. Identifying real life problems through observation & interaction with real world
2. Literature Review
3. Brain Storming Session to generate ideas for the chosen problem
4. Skill building to prepare a prototype

TEXTBOOKS:

1. Dr. Bala Ramadurai, "*Karmin Design Thinking*", Mudranik Technology Private Ltd. ISBN 978-93-5419-010-0.
2. V. Gupta and P. Murthy, An Introduction to engineering design method, Tata McGraw Hill, 2000. ISBN-0070964416.

REFERENCES:

1. John R. Karsnitz, Stephen O'Brien and John P. Hutchinson, "*Engineering Design*", Cengage Learning (International edition) Second Edition, 2013.
2. Roger Martin, "*The Design of Business: Why Design Thinking is the Next Competitive Advantage*", Harvard Business Press, 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "*Design Thinking: Understand – Improve – Apply*", Springer, 2011
4. Idris Mootee, "*Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School*", John Wiley & Sons, 2013.

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching	1	14	14
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning(ABL1&ABL2)	1	14	14
6	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				30

List of Activities:

1. Writing observations using 4W1H method
2. Interviewing people who are experiencing the chosen problem
3. Literature Review
4. Applying Multi Why's Technique to find root cause of the problem
5. Drawing Cause and Effect Diagram
6. Brain storming to generate innovative ideas
7. Preparing a prototype (can be a poster, model, website, app etc.)
8. Writing self-evaluation report
9. Collecting feedback from people through an interview

Scheme of Evaluation (Laboratory Courses)

Level	Evaluation Type	Evaluation modules	Marks
1	Continuous internal Evaluation	Record Writing (individual project)	30
		Presentation based on individual project	20
2	Semester End Examination	Group project report	20
		Presentation based on group project	20
		Viva voce	10
Total			100

Note: The marks distribution to be made based on the rubrics.

Examination	Maximum marks	Minimum marks to qualify
CIE	50	20
SEE	50	20

Course Title	SAMSKRUTHIKA KANNADA		
Course Code	KSK519/529	(L-T-P)C	(1-0-0)1
CIE (Theory) marks	50	Class Hours/Week	01
SEE marks	50	Total class hours	30

Course Outcomes (COs):

At the end of course, student will be able to

#	Course outcomes	Mapping to PO's	Mapping to PSO's
CO1	Kannada bashe , Sahithya mathu kannadadha samskruthiya kurithu arivu mudiruthadhe.	P10	-
CO2	Kannada sahithyadha pradhana bhagavadha adhunika poorva mathu Adunika kavyagalannu sankethikavagi Kalithu hechina odhige mathu jnanakke spoorthi moodiruthadhe.	P10	-
CO3	Vidhyarthigalalli sahithya mathu samskruthiya bhagge arivu agu asakthiyannu hechaguthade.		
CO4	Thantrika vyaktigala parichaya agu avarugala sadhisidha vishayagalannu thilidhukondu nadina ennithara vyakthigala bhagge thilidhukollalu Kauthukathe hechaguthadhe.		
CO5	Samskruthika,janapadha agu oravasa kathanagala parichaya madikoduvudu.		

Course Contents:

Ghataka -1: Kannada Samkruthi mathu bhashe Kurithadha Lekhanagalu

1. Karnataka Samkruthi – Hampa Nagarajayya
2. Karnatakada yekikarana : Ondhu Apoorva Charithre – G.Venkatasubbayya
3. Adalitha Bhasheyaagi kannada – Dr. L.Thimmesha mathu, Prof.V.Keshavamurthy

Ghataka -2: Adhunika poorvadha kavya bhaga

- 4 .Vachanagalu : Basavanna , Akkamahadevi , Allamaprabhu , Aydhakki Maaraiyya , Jedaradasimaiyya , Aydhakki Lakkamma.

5. Kirthanegalu : Adharindenu pala edharindhenu pala? Purandharadhasaru Thalanisadhiru kandya thalu manave – Kanakadasaru

6. Thatvapadagalu : Saavira kodagala suttu – Shishunaala sharipha

Ghataka -3: Adhunka kavyabhaga

7. DVG ravara Mankuthimmana kaggadhindha aydhu bandha kelavu bhagagalu

8. Kurudu kachana : Da.Ra.Bhendre

9.Hosabalina geethe : Kuvempu

Ghataka -4: Thantrika Vyakthigala Parichaya

10. Dr.Sir.M.Visveshwaraiah : Vyakthi mathu Aithihasika – A.N.Murthyrao

11. Karakushala kalegalu mathu parampareya vignana – Karigowda Bichanahalli

Ghataka -5: Samkruthika , janapadha kathe mathu pravasa kathegalu

12. Ugadi – Vasudhendra

13. Meghane yembha girijana parvatha – Hi.Chi.Bhoralingaiyya

Course Title	BALAKE KANNADA (KANNADA FOR CONVERSATION)		
Course Code	KBK519/529	(L-T-P)C	(1-0-0)1
CIE (Theory) marks	100	Class Hours/Week	02
SEE marks	50	Total class hours	30

Course Learning Objectives:

At the end of course, student will be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Non kannadiga students to understand, speak, read and write kannada language	P10	-
2	Communicate (converse) in Kannada language in their daily life with kannada speakers	P10	-

Course Contents:

Part-I: Lessons to teach and learn Kannada Language

Lesson-1: Vayaktika swamyasuuchaka/ sambandhitha saarwanaamagalu mattu prashnarthaka padagalu- personal pronouns, possessive forms, interrogative words

Lesson-2: Namapadagala sambandharthaka roopagalu, sandehaspada prashnegalu mattu sambhanda vachaka namapadagalu – Possessive forms of nouns, dubitive question and relative nouns

Lesson-3: Guna parimaana mattu varnabanna visheshanagalu sankhyavachakagalu- Qualitative, Quantitative and Color Adjectives, Numerals

Lesson-4: Kaaraka roopagalu mattu vibhakti prathyayagalu- saphthami vibhakti prathyaya- (aa, adu, avu, alli) Predictive forms, locative case

Lesson-5: Chathurthi vibhakthi prathyayada balake mattu sankhyavachakagalu- Dative cases and Numerals

Lesson-6: Sankhyaagunavaachakagalu mattu bahuvaachana naamaroopagalu- Ordinal numerals and Plural markers

Lesson-7: Nyuuna / nishedhaarthaka kriyapadagalu mattu Varna gunavachakagalu- Defective / negative verbs and Color Adjectives

Lesson-8: Appane/oppige, nirdeshana, proothsaaha mattu otthaaya artharoopa padagalu mattu vaakyagalu- Permission, Commands, encouraging and Urging words (Imperative words and

sentences)

Lesson-9 : Saamanya sambhaashanegalalli dvithiya vibhakthi prathyayagalu mattu sambhavaniya prakaaragalu- Accusative Cases and Potential Forms used in General Communication

Lesson-10 : “Iru mattu Iralla” sahayaka kriyaapadagalu, sambhavyasuchaka mattu nishedhaarthaka kriyaa padagalu – Helping Verbs “Iru and Iralla” , Corresponding future and Negation Verbs

Lesson-11:Hoolike (tharathama), sambhanda suchaka mattu vastu suchaka prathyayagalu mattu nishedhaarthaka padagala balake- Comparative, Relationship, Identification and Negation Words

Lesson-12: Kaala mattu samayada haagu kriyapadagala vividha prakaragalu- Different types of forms of Tense Sentences with Verb forms

Lesson-13: Dh, -Th, -Thu, -ithu, -aagi, -alla,-gh, -kh, -ide, kriyaa prathyayagalondige bhootha, bhavishyath mattu varthamana kaala vaakya rachane- Formation of Past, Future and Present Tense Sentences with Verb forms

Lesson-14: Karnataka raajya mattu raajyada bagge kurithaada ithare maahithigalu- Karnataka State and General information about the State

Lesson-15: Kannada bhaashe mattu saahithya- Kannada Language and Literature

Lesson-16: Bhaashe kaliyalu eenannu maadabeeku mattu maadabaaradu- Do’s and Don’ts in Learning a Language

Lesson-17: Part-II

Kannada Language Script Part-1

Lesson-18 : Part-III

Kannada Vocabulary List: Sambhashaneyalli dinoopayoogi Kannada padagalu- Kannada words in Conversation.

University Guidelines for CIE Procedure:

- i) CIE Marks in Vyavaharika Kannada and Aadalita Kannada shall be the sum of marks prescribed for tests and assignments. Marks prescribed for tests shall be 75 and that for the assessments be 25.
- ii) The CIE marks awarded for the tests shall be based on three tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 25 marks and the final CIE marks shall be the sum of the marks of all the

three tests.

iii) The remaining 25 marks shall be awarded based on the evaluation of assignments/unit tests/written quizzes that supports to communication skills as per Bloom's Revised Taxonomy and Course/programme outcomes.

iv) Final marks awarded shall be the sum of (ii) and (iii) for a maximum of 100 marks.

The candidates shall write the test in Blue Books and also assignments/unit-tests/written quizzes in Blue Books/Notes which shall be preserved by the Principal/Head of the Department for at least six months after the announcement of University results and shall be made available for verification at the direction of the Registrar (Evaluation).

Course Title:	Physical Education		
Course Code:	PE5110/5210	CIE Marks	50
Course Type(Practical)	Practical	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	0:0:1:0	Exam Hours	02 hours Practical
Total Hours of Pedagogy/physical activity	30 hours	Credits	01

Course objectives:

To improve the student's physical and mental health

Course Outcome:

At the end of the course students will be able to

#	Course Outcomes	Mapping to PO's
1	Describe Health, wellness & its balance for positive mindset.	PO1
2	Adopt healthy lifestyles or good health and better future.	PO1
3	Demonstrate physical activity	PO1, PO9

Course Contents:

Module-1

(3hours of Pedagogy) :

Good Health & It's balance or positive mind set: Health-Importance of Health, Influencing factors of Health, Health beliefs, Advantages of good health, Health & Behavior, Health & Society, Health & family, Health & Personality, Psychological disorders-Method to improve good psychological health, Changing health habits for good health.

Module-2

(3hours of Pedagogy)

Building of healthy life styles for better future: Developing healthy diet for good health, Food & health, Nutritional guidelines for good health, Obesity & overweight disorders and its management, Eating disorders, Fitness components for health, Wellness and physical function, How to avoid exercise injuries.

Physical Education Practical classes(24hours of Practical)

Sl. No	Name of the Game	Name of the Skills
1.	Shuttle badminton	Service
		Smash
		Receive
		Drop Shot
		Foot work
2.	Basket ball	Dribbling
		Shooting
		Ten ley shoot
		Defensive slide
		Passing
3.	Foot Ball	Dribbling
		Chest drop
		Ball control
		Thigh drop
		Shooting
4.	Table tennis	Service
		Fore hand receive
		Back hand receive
		Smash
		Rally
5.	Volley ball	Attack
		Block
		Service
		Upper hand pass
		Under hand pass
6.	Ball badminton	Service
		Fore hand receive
		Back hand receive
		Spin Smash
		Striate Smash
7.	Throw ball	Spin Pass
		Jump Throw
		Service
		Receive
		Simple pass
8.	Kho- Kho	Giving Kho
		Single chain
		Pole dive

		Pole turning
		3 – 6 Up
9.	Kabaddi	Hand Touch
		Chain Hold
		Ankle Hold
		Thigh Hold
		Bonus
10.	Hand ball	Step with ball
		Shoot
		Pass
		Block
		Dribbling

Assessment Details (both CIE and SEE):

CIE Theory -20 Marks (Multiply Choice Questions - 20 marks)

CIE Practical -30 Marks (Physical activity, Performance and Attendance)

SEE Practical -50 Marks (Skill test-20 marks, Game performance-20 marks, and Event viva -10 marks)

Evaluation method	Assessment Tool	Maximum Marks	Minimum marks to be obtained
CIE	Multiple Choice Questions	20	8
	Performance and Attendance Criteria	30	12
SEE	Skill Examination	20	20
	Game Performance Examination	20	
	Viva -Voce	10	
Total Marks		100	40

INDIAN CONSTITUTION

Course Title:	Indian Constitution		
Course Code:	ICO519/529	CIE Marks	50
		SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	3 hours
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives:

The course **INDIAN CONSTITUTION (22ICO17 / 27)** will enable the students,

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Course outcome (Course Skill Set)

At the end of the course 22ICO17/27 the student will be able to:

CO1	Analyze the basic structure of Indian Constitution.
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	Know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching – Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

- (i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms

(High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion. (ii) Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students in theoretical applied and practical skills.	
Module-1	(04 hours)
Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the Constituent Assembly.	
Module-2	(04 hours)
Salient features of India Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations. building.	
Module-3	(04 hours)
Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation, Union Executive : Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet.	
Module-4	(04 hours)
Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism. State Executive and Governor, CM, State Cabinet, Legislature - VS & VP, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions.	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and	

earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Two Unit Tests each of 30 Marks (duration 01 hour)

- First test after the completion of 30-40 % of the syllabus.
- Second test after completion of 80-90% of the syllabus.

One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration.

Two assignments each of 20 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour**. The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:

Textbook:

1. **“Constitution of India” (for Competitive Exams)** - Published by Naidhruva Edutech Learning Solutions, Bengaluru. –2022.

2. **“Introduction to the Constitution of India”,** (Students Edition.) by Durga Das Basu (**DD Basu**): Prentice –Hall, 2008.

Reference Books:

1. **“Constitution of India, Professional Ethics and Human Rights”** by Shubham Singles, Charles E.Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
2. **“The Constitution of India”** by Merunandan K B: published by Merugu Publication, SecondEdition, Bengaluru.
3. **“SamvidhanaOdu” - for Students & Youths by Justice HN NagamohanDhas, Sahayana, kerekon.**
4. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, **“Engineering Ethics”,** Prentice – Hall,2004.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Contents related activities (Activity-based discussions)
2. For active participation of students instruct the students to prepare Flowcharts and Handouts
3. Organizing Group wise discussions Connecting to placement activities
4. Quizzes and Discussions, Seminars and assignments.

COMMUNICATION SKILLS		Semester	I / II
Course Code	ENG516/526	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0	SEE Marks	50
Total Hours of Pedagogy	15 hours +15 hours	Total Marks	100
Credits	01	Exam Hours	02
Examination type (CIE+SEE)			

COURSE OUTCOMES

- **CO1:** Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness.
- **CO2:** Use interpersonal skills in group discussions, presentations, and professional interactions.
- **CO3:** Apply formal writing, email etiquette, and creative content development for employability.
- **CO4:** Communicate effectively in digital platforms, following netiquette and academic integrity.
- **CO5:** Prepare job applications, resumes, and perform confidently in interviews.

UNIT 1 COMMUNICATION SKILLS (3 Hours)

Glimpses of Essential English for Engineers (General Overview). Communication Skills: Process, Verbal and Non-Verbal, Proxemics, Chronemics and Barriers. **Writing:** Word Classification – Parts of Speech, Sentence structures. **Speaking & Listening:** Listening to English Pronunciation – English Phonemes – Intelligible Accent – Speech Organs- Syllable Structures, Stress, Intonation, and Practice.

Teaching Methodology	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Language Lab	Quiklrn.com
Digital Tools	ALL 44 sounds of English in 75 minutes - https://www.youtube.com/watch?v=QxQUapA-2w4&t=51s . AI-based grammar and writing tools (e.g., Grammarly, ChatGPT, Quillbot) to analyze and classify parts of speech. AI-based pronunciation tools (Google Speech-to-Text) for real-time feedback
Reading Material	“ <u>The Chimney Sweeper</u> ” by William Blake <u>Martin Luther King Jr's “I Have a Dream” Speech</u>
Assessment Techniques and Tools	Role Play: Formal/informal scenarios, Group Discussion (GD) , Case Studies Analysis: Identify barriers and suggest solutions, Mini-Presentation: Focused on proxemics. Observation Rubric (for body language, tone, time cues), (Sample Rubric, please refer the annexure), Video Recording + Self-evaluation Sheet.

UNIT 2 INTERPERSONAL SKILLS (3 Hours)

Speaking: Role Play Exercises Based on Workplace Contexts, Introducing Oneself - PEP Talks- Personal Empowerment, Participating in Group Discussion and Debates, Giving Technical Presentation. **Reading:** Reading the Interview of an Achiever (Skimming and Scanning) (Case Studies). **Writing:** Writing a Short Biography of an Achiever Based on given reflections, **Grammar:** Sentence patterns. **Vocabulary Development:** Idioms and Phrases.

Teaching Methodology	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Language Lab	Quiklrn.com
Digital Tools	Google Meet / Zoom + AI Transcription- Practice group discussions with live transcription. Grammarly - Highlights grammar issues with explanations. Oxford Learner's Dictionaries (https://www.oxfordlearnersdictionaries.com/) - Includes etymology, pronunciation, synonyms/antonyms.
Assessment Techniques and Tools	Group discussion performance (listening, turn-taking, clarity) Technical presentations (confidence, structure, clarity) Role plays (relevance, tone, spontaneity) Case Studies Oral communication rubric (clarity, relevance, tone, confidence, non-verbal cues), Activity: Read a short interview of an achiever (e.g., A. P. J. Abdul Kalam, Sudha Murthy) LMS (Learning Management Systems): Moodle or Google Classroom for submissions and reflections. Video Submissions: Students submit videos of role plays or presentations for asynchronous review.

UNIT 3 ENGLISH FOR EMPLOYABILITY (3 Hours)

Writing: Formal Letter writing (Enquiry, Order, and Complaint). Tenses – Reported Speech-Voice - Email Etiquettes, Structure, Writing and Responding to Emails. Paragraph Writing (Descriptive, Argumentative, Expository, Short Story, and Narrative), Blog Writing. **Reading:** Proof Reading (Spelling, Punctuation, Grammar). Error Identification Exercises. **Speaking:** Questions & Requests (non-Wh questions and Question tags).

Pedagogy	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Language Lab	Quiklrn.com
Digital Tools	Grammarly – Check grammar, tone, spelling Canva – Free templates to create posters, ads, infographics Adobe Express – Visual storytelling and ad design
Assessment Techniques and Tools	Paragraph Writing - Descriptive, Argumentative, Expository, Short Story, Narrative - Paragraph rubric (structure, logic, vocabulary, grammar) Writing - Tool: Digital submission + rubric for content originality, reader engagement, clarity. Speaking Skills - Oral assessment rubric (intonation, clarity, accuracy) Email simulator (Google Forms/Canvas/Docs template)

UNIT 4 ENGLISH IN DIGITAL WORLD (3 Hours)

Writing: Framing of search terms / keywords in search engines/ Commands for search on open AIs - Tools to support synchronous communication such as webinar platforms, and asynchronous communication such as forums and social media - Online communication - Types – pros and cons of online communication. Acceptable online roles and behaviours – Netiquettes - Etiquettes of social media. Problems and opportunities in handling digital resources -Tools to check grammar. **Writing:** Citing information accurately from source material - Plagiarism – Infringement, Importance of academic integrity.

Pedagogy	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Language Lab	Quiklrn.com
Digital Tools	Google Meet - Integrated with Gmail, free for students Google Classroom - Forum, assignments, comments
Assessment Techniques and Tools	Write a short essay (150–200 words) on the problems and opportunities . Evaluation rubric (structure, coherence, grammar). Grammar assessment rubric (before vs after comparison, understanding of corrections).

UNIT 5 APPLYING FOR JOBS (3 Hours)

Listening: TED Talks. **Speaking:** Mock Interview, Telephone Interviews. **Reading:** Reading a Job Interview- language used in formal professional settings, formal vs. informal tone, non-verbal communication cues, Statement of Purpose, Company Profile and Completing Comprehension Exercises **Writing:** Job Applications and Resumes **Grammar:** Conditional Clauses, Modal verbs **Vocabulary Development:** Technical Vocabulary, Purpose Statement.

Pedagogy	TBTL (Task-Based Teaching Learning) & Eclectic Approach
Language Lab	Quiklrn.com
Assessment Techniques and Tools	Listening to professional talks, analyzing tone and structure - https://www.ted.com/talks Non-verbal cues in professional reading - https://www.youtube.com/c/Mindsight Grammar AI practice - https://quillbot.com/grammar-check
Assessment Techniques and Tools	TED Talk worksheet - Listening rubric (comprehension, inference, note-taking), Reading comprehension tests, Resume & Application rubric (content, layout, tone, language), Grammar MCQs / Editing worksheet, Scenario-based MCQs or roleplay, Vocabulary worksheet

Extra Reading

1. Kumar, A. R. (2008). *English for engineers and technologists*. Orient BlackSwan.

2. Raman, M., & Sharma, S. (2015). *Technical communication: Principles and practice* (3rd ed.). Oxford University Press.
3. Floyd, K., & Cardon, P. W. (2019). *Business and professional communication* (3rd ed.). Principles of Scientific and Technical Writing, 1e, By Pratap K. J. Mohapatra, Sanjib Moulick, © 2025 | Published: December 23, 2024
4. Effective Technical Communication, 3e, By Ashraf M. Rizvi, Priyadarshi Patnaik, © 2024 | Published: September 12, 2024
5. Yadav, D. P. (2022). *A course in English pronunciation*. Notion Publications.

Learning Resources:

- Oxford Advance Learners Dictionary
- Cambridge English Skills Real Listening and Speaking by Miles Craven
- Communicative English for Professionals by Nitin Bhatnagar and Mamta Bhatnagar

Other Digital Resources

- Google Docs + Voice Typing - <https://docs.google.com>
- LearnEnglish – <https://learnenglish.britishcouncil.org/>
- TakeIELTS - <https://www.britishcouncil.in/exam/ielts>
- British Council Apps - **bbcLearnEnglishonline Grammar**
LearnEnglish Podcasts
IELTS Word Power
Bbclearningenglishgrammer online
Sounds Right (Phonemic Chart)

CURRICULUM DESIGN

Pronunciation Phonology in the upper secondary English curriculum includes: diphthongs, consonants, consonant clusters, word stress, strong and weak forms of pronunciation, ellipsis, assimilation, linking, sentence stress, rhythm and intonation.

Vocabulary. The target vocabulary of around 600-800 vocabulary items at level 3. Upon completion of the unit, students must know around 2,500 vocabulary items.

Grammar Communicative competences at level 3 including relative clauses, conditional sentences (type 1 and 2), compound and complex sentences, simple present, present continuous, present perfect, past simple, past continuous, past perfect, future simple, future continuous, near future, conjunctions, modal verbs, phrasal verbs, passive voice, etc.

SPECIFIC OUTCOMES

Themes	Topics	Communicative Competences	Linguistic Knowledge
Our Academic Journey	Transition from school to engineering college Choosing an engineering discipline Student life and academic challenges	Listening Understand and identify the main points of dialogues, monologues of 330-350 words on familiar topics regularly encountered in life, work, school, etc., within the scope of the curriculum. Follow simple instructions such as recipes, how to use common utensils, etc. Listen and guess meanings (through the expressions and feelings of the speakers) in familiar monologues and conversations in everyday life	Pronunciation Diphthongs Words with stress (special cases) – Words without stress Sentence stress, assimilation, linking vowels with vowels Question intonation (consolidation and extension) Homophones
Our Technical Society	Role of engineers in society Ethics in engineering Impact of technology on social structures Interdisciplinary collaboration	Understand the main points of news programs, broadcasts, interviews, etc., on familiar topics which are clearly delivered in simple language, and with illustrative images.	Vocabulary Words related to themes and topics of higher proficiency. Grammar Present perfect (consolidation and extension) Past simple and past continuous Types of sentences: simple, compound and complex
Our Built and Natural Environment Our Future Innovations	Artificial intelligence and automation Emerging technologies in engineering Lifelong learning and professional development Entrepreneurship and start-ups in engineering The future of work in the tech-driven world		

Speaking

- Pronounce clearly and relatively accurately
- Words with or without stress, sentence stress, assimilation, and liaison.
- Speak and interact with fellow speakers about familiar topics, express personal views and exchange information about the topics covered in the curriculum.

Reading

- Read and comprehend the main points, specific contents of a text of 380-400 words on current and familiar topics.
- Read and understand the argument flow of texts, identify main conclusions in texts using clear language.
- Read to find and summarize short texts of everyday use such as simple letters, brochures, using words and structures from the original texts.

Writing

- Write simple connected and coherent texts of 280-300 words; write short reports based on suggestions, providing factual information and reasons for the recommendations made in the reports; collect short information from several sources and summarize it.
- Complete (write/fill) administrative forms such as resumes, letter of application for employment, etc.
- Write composition texts

Upon successful completion of the upper secondary English curriculum, students will be able to:

- Use English as a communication tool through the four skills of listening, speaking, reading and writing to meet basic and practical communication needs on familiar topics related to college, recreational activities, career, etc.
- Continue to formulate and develop basic knowledge of English, including pronunciation, vocabulary and grammar; and through English, have more extensive understanding of the landscape, people and culture of English-speaking countries and other countries in the world.
- Use English to improve the quality of learning other subjects in the general education curriculum.
- Use English for further education or immediate employment upon completion level 6.
- Use a variety of learning strategies to manage learning time, apply information technology in learning and self-learning, consolidate self-learning and self-assessment

methodology and take responsibility for learning outcomes, and form lifelong learning habits.

Mapping Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes*											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1									1	3		2
2										3		2
3										3		2
4									1	3		2
5									1	3		2

Course Assessment and Evaluation:

		What	To Whom	When/ Where (Frequency in the course)	Max Marks	Evidence Collected	Contributing to Course Outcomes
Indirect assessment Methods	CIE	Internal assessment tests	Students	Two Tests (Average of the two will be computed)	25	Blue books/Answer Scripts	1 to 5
		Creative writing	Students	Assignment-1 (10) Assignment-2 (15)	15+10=25	Quiz Projects Presentations Assignment Questions and Answers	1 to 5
		Case Analysis	Students	-----	-----	-----	-----
		Surprise Quiz		-----	-----	-----	-----
	SEE	Standard examination Students Feedback	Students	End of course (Answering 5 of 10 questions), 10 Case Studies 10 MCQs	30+10+10	Answer scripts Feedback Forms	1 to 5
		End of course Survey		End of course	-	Questionnaire	-

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

CIE and SEE Evaluation:

SL. No	Bloom's Category	Test 1	Test 2	Semester-End Examination
1	Remember	34%	34%	30%

2	Understand	55%	20%	30%
3	Apply	00%	23%	20%
4	Analyse	11%	00%	10%
5	Evaluate	00%	00%	00%
6	Create	00%	23%	10%

Course Assessment Methods:

- Continuous Assessment of Skills: Assignments/Quiz/Presentations/Projects
- Written Tests
- End Semester Examination

Sample Rubric for Presentation

Criteria	Excellent (2)	Good (1)	Needs Work (0)
Self-awareness	✓	✓	✓
Goal clarity	✓	✓	✓
Communication & delivery	✓	✓	✓
Insight into opportunities	✓	✓	✓
Realistic challenges	✓	✓	✓

Sample Rubric

Grammar & Writing Rubric (for Essays/Reports/Emails)

Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (1-2)
Clarity and Structure	Well-organized, coherent, clear transitions	Organized with minor lapses in clarity	Understandable but lacks coherence	Difficult to follow, lacks structure
Language Use	Professional, precise, varied vocabulary	Clear, mostly appropriate language	Some awkward phrasing or repetitive vocabulary	Frequent errors, unclear language
Grammar and Punctuation	Virtually no errors	Few minor errors	Several errors affecting readability	Multiple errors impacting readability
Relevance & Depth	Thorough, detailed analysis	Solid analysis with minor gaps	Basic analysis, lacks depth	

Model Question Paper

Course – Communication Skills

- i) Answer the 10 marks MCQ compulsory questions from Part A. Each question carries one mark.
- ii) Answer compulsory 10 marks case study questions Part B.
- iii) Answer any five questions from Part C selecting one question from each unit. 6 marks each.

Q. No.	PART-A	CO's	LO	Marks
	Multiple choice questions. (Compulsory)			
1.	Choose the correct option for the following.	CO1-5	LO1	10X1=10
	a. What is the primary purpose of communication in engineering? A) To entertain B) To inform and collaborate C) To confuse others D) To express personal opinions			
	b. Which of the following is considered a barrier to effective communication? A) Clear articulation B) Technical jargon C) Active listening D) Open-ended questions			
	c. In terms of English pronunciation, which of the following is true for engineers? A) Pronunciation is not important in technical communication. B) Clear pronunciation is essential for avoiding misunderstandings. C) Engineers should only focus on writing skills. D) Accents should be completely eliminated.			
	d. How many syllables are in the word "engineering"? A) 2 B) 3 C) 4 D) 5			
	e. Which of the following prepositions correctly completes the sentence: "The report is due _____ Friday"? A) in B) on C) at D) for.			
	f. What is the past tense of the verb "to communicate"? A) Communicate B) Communicating C) Communicated D) Communicates			
	g. Which of the following is an example of mother tongue influence in English communication? A) Using idiomatic expressions B) Mispronouncing words due to native language sounds C) Employing technical vocabulary correctly D) Using varied sentence structures			
	h. In reading comprehension, which skill is most important for engineers when reviewing technical documents? A) Skimming for general ideas B) Memorizing all details C) Scanning for specific information D) Ignoring unfamiliar technical terms			
	i. Which of the following vocabulary words is most relevant to project management? A) Ambiguous B) Deadline C) Casual D) Informal			
	j. When using tenses, which sentence is correct? A) The engineer designs the project last year. B) The engineer design the project next year. C) The engineer will design the project next year. D) The engineer designed the project next year.			

Part – B (Co1-5) L3					
Case Studies (2 × 5 = 10 Marks)					
(Answer both the questions. Each carry 5 marks.)					
Case Study 1 – Communication Barriers You are working in a multinational company where your team includes members from different cultural backgrounds. During a meeting, some members misinterpret instructions due to differences in communication styles and accents. • Identify at least three barriers to communication in this scenario. • Suggest three solutions to overcome them. Case Study 2 – Workplace Scenario In a technical presentation, a student uses too many slides filled with text, speaks in a monotonous tone, and rarely makes eye contact with the audience. • Identify the issues with the presentation delivery. • Suggest improvements for verbal and non-verbal communication.					
PART-C					
Answer ANY FIVE questions selecting ONE full question from each unit. (6X5=30)					
UNIT – I					
1.		How can engineers ensure that their communication is considerate of the diverse backgrounds of their team members? Give two strategies you would implement.	CO1	LO ₂	(6)
2.		How do interpersonal skills complement technical skills in the engineering field? Provide examples of how these skills can work together in a project.	CO1	LO ₂	(6)
UNIT – II					
3.		How does incorrect intonation impact the meaning of a sentence in technical discussions or job interviews? Illustrate with examples.	CO2	LO ₂	(6)
4.		Discuss the role of intelligible pronunciation in making communication clearer. Identify English sounds that are often mispronounced by non-native.	CO2	LO ₂	(6)
UNIT – III					
5.		Use the following idioms with their figurative meanings and construct workplace place -related sentences:	CO3	LO6	(6)
		a. Hit the nail on the head b. Back to the drawing board c. In hot water d. Think outside the box e. A blessing in disguise f. Burn the midnight oil			
6.		Complete the sentences by filling in the blanks with suitable prepositions and articles. a. The team submitted the proposal _____ manager before the end of the day. b. She placed the confidential file _____ desk in the conference room.	CO3	LO2	(6)

	c. Our office is located _____ corner of Main Street and Park Avenue. d. He arrived _____ meeting room just a few minutes late. e. We will launch the new product _____ second quarter of the financial year. f. There was an error _____ final report, which needs immediate correction.			
UNIT – IV				
7.	Complete the sentences by forming the correct word (noun, verb, adjective, or adverb) from the word given in brackets. a. The manager gave a very _____ presentation on the new project. (<i>inform</i>) b. His _____ in the final decision was minimal. (<i>involve</i>) c. The engineers worked _____ to meet the product launch deadline. (<i>efficient</i>) d. The software update led to a significant _____ in system performance. (<i>improve</i>) e. She handled the client's complaint with great _____. (<i>professional</i>) f. Innovation and creativity are key to _____ in a competitive market. (<i>succeed</i>)	CO4	LO2	(6)
8.	Fill in the blanks with the correct tense of the verb in brackets. a. By the time the meeting started, the manager _____ (prepare) all the necessary documents. b. I _____ (work) on this report since morning, and I still have two sections to complete. c. The team _____ (complete) the task before the deadline yesterday. d. While we _____ (discuss) the new project, the client walked in unexpectedly. e. She usually _____ (respond) to emails within an hour. f. If the supplier delivers on time, we _____ (be) ready for the launch next week.	CO4	LO2	(6)
UNIT – V				
9.	Identify three common challenges engineers face during oral presentations and propose practical strategies to overcome them.	CO5	LO2	(6)
10.	How can voice modulation and body language enhance the effectiveness of a public speech in a technical seminar? Give examples.	CO5	LO2	(6)

Soft Skills	Semester	I/II	
Course Code	SKS516/526	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0	SEE Marks	--
Total Hours of Pedagogy	Theory/Practical/Lab: 15 Hours	Total Marks	100
Credits	PP	Exam Hours	--

COURSE OBJECTIVES

The competencies those are important for engineering students joining the digital age workforce or looking to become entrepreneurs are listed in 5 modules:

CO1: Apply social skills for clear communication, persuasion, self-awareness, and active listening.

CO2: Use emotional skills to build confidence, manage stress, and adapt to change.

CO3: Set ambitious goals, practice empathy, and apply creativity for problem-solving.

CO4: Demonstrate discipline, time management, and structured problem-solving.

CO5: Work in teams, negotiate, resolve conflicts, and think critically.

Module I – Social Skills (3 hours)

- **Communication:** Principles of clear and effective exchange of ideas in professional and social contexts.
- **Persuasion:** Techniques to influence and convince through logical, emotional, and ethical appeals.
- **Self-Awareness:** Identifying personal strengths, weaknesses, opportunities, and challenges (SWOC analysis).
- **Active Listening:** Paraphrasing, questioning techniques, and demonstrating attentiveness.

Instructional Design	Each competency is taught and assessed through guided visualisations, reflections, explainers and hands on activities conducted during sessions build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Language Lab	Quicklrn.com
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context

	Peer discussions to gain diverse perspectives.
Assessment Methods	Formative: Role-plays, activities, group discussions, peer feedback. Summative: Presentations, written reflections, problem-solving exercises.

Module II Emotional Skills I (3 hours)

- **Emotional Intelligence (EI):** Recognizing and managing emotions, empathy, relationship management, and conflict resolution.
- **Stress Management:** Identifying stress triggers, relaxation techniques, work-life balance strategies, and mindfulness practices.
- **Time Management:** Prioritization (Eisenhower Matrix), setting SMART goals, avoiding procrastination, and effective scheduling.
- **Adaptability & Resilience:** Handling change, bouncing back from setbacks, and developing a growth mindset.

Instructional Design	Each competency is taught and assessed through guided visualisations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Language Lab	Quicklrn.com
Experiential Learning Methods	• To embed skills, participants get hands-on through: • Guided reflections and explainers to connect concepts with relatable real-life situations • Guided visualization to prompt reflection and self-discovery • Role-plays and activities to practice behaviours in context • Peer discussions to gain diverse perspectives.
Assessment Methods	Formative: Role-plays, activities, group discussions, peer feedback. Summative: Presentations, written reflections, problem-solving exercises.

Module 3 Emotional Skills II (3 hours)

- **Ambition & Goal Setting:** Defining personal and professional aspirations, creating SMART goals, and aligning actions with long-term vision.
- **Sympathy & Empathy:** Understanding emotional perspectives, differentiating between the two, and applying them in workplace and social interactions.

- **Creativity & Innovation:** Generating original ideas, problem-solving, and applying creative thinking techniques (mind-mapping, SCAMPER).

Instructional Design	Each competency is taught and assessed through guided visualisations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach
Language Lab	Quicklrn.com
Experiential Learning Methods	• To embed skills, participants get hands-on through: • Guided reflections and explainers to connect concepts with relatable real-life situations • Guided visualization to prompt reflection and self-discovery • Role-plays and activities to practice behaviours in context • Peer discussions to gain diverse perspectives.
Assessment Methods	Formative: Role-plays, activities, group discussions, peer feedback. Summative: Presentations, written reflections, problem-solving exercises.

Module 4 Professional Skills I (3 hours)

- **Problem Solving:** Identifying root causes, analysing options, and implementing solutions using methods like 5 Whys and Fishbone Diagram.
- **Discipline:** Building consistency, accountability, and professional habits.
- **Time Management:** Prioritizing tasks (Eisenhower Matrix), scheduling, avoiding procrastination.

Instructional Design	Each competency is taught and assessed through guided visualisations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, activities, peer feedback. Eclectic Approach.
Language Lab	Quicklrn.com
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context Peer discussions to gain diverse perspectives.
Assessment Methods	Formative: Role-plays, activities, group discussions, peer feedback. Summative: Presentations, written reflections, problem-solving exercises.

Module 5 Professional Skills II (3 hours)

- **Collaboration & Teamwork:** Working effectively in diverse teams, fostering trust, and achieving shared goals.

- **Negotiation & Conflict Resolution:** Strategies to resolve differences and reach win-win outcomes.
- **Critical Thinking:** The ability to analyze, evaluate, and synthesize information to make well-reasoned decisions.

Instructional Design	Each competency is taught and assessed through guided visualisations, reflections, explainers and hands on activities conducted during lab sessions those build both conceptual understanding and real-world application.
Teaching Methodology	TBTL (Task-Based Teaching Learning) – interactive workshops, simulations, peer feedback. Eclectic Approach
Language Lab	Quicklrm.com
Experiential Learning Methods	To embed skills, participants get hands-on through: Guided reflections and explainers to connect concepts with relatable real-life situations Guided visualization to prompt reflection and self-discovery Role-plays and activities to practice behaviours in context Peer discussions to gain diverse perspectives.
Assessment Methods	Formative: Role-plays, group discussions, peer feedback. Summative: Presentations, written reflections, problem-solving exercises.

Extra Reading

1. Principles of Scientific and Technical Writing, 1e, By Pratap K. J. Mohapatra, Sanjib Moulick, © 2025 | Published: December 23, 2024
2. Soft Skills, 1e, By Soma Mahesh Kumar © 2024 | Published: June 8, 2023
3. Effective Technical Communication, 3e, By Ashraf M. Rizvi, Priyadarshi Patnaik, © 2024 | Published: September 12, 2024
4. Yadav, D. P. (2022). *A course in English pronunciation*. Notion Publications.

Learning Resources:

- Oxford Advance Learners Dictionary
- Cambridge English Skills Real Listening and Speaking by Miles Craven
- Communicative English for Professionals by Nitin Bhatnagar and Mamta Bhatnagar

Digital Resources

- Google Docs + Voice Typing - <https://docs.google.com>
- LearnEnglish – <https://learnenglish.britishcouncil.org/>
- TakeIELTS - <https://www.britishcouncil.in/exam/ielts>
- British Council Apps - **bbcLearnEnglishonline Grammar**
LearnEnglish Podcasts
IELTS Word Power
Bbclearningenglishgrammar online
Sounds Right (Phonemic Chart)

Mapping Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes*											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1									1	3		2
2										3		2
3										3		2
4									1	3		2
5									1	3		2

Assessment Plan – 100 Marks

CO Mapping & Components (100 Marks)

CO	Modules	Assessment Component	Description	Marks
CO1: Apply social skills for clear communication, persuasion, self-awareness, and active listening	Module I	Role-Play & Oral Presentation	Scenario-based role-play (persuasion, active listening) + short presentation; assessed on clarity, articulation, engagement, and non-verbal cues.	20
CO2: Use emotional skills to build confidence, manage stress, and adapt to change	Module II	Stress Management Activity & Reflection Journal	Guided stress-relief simulation + reflection linking EI concepts to personal experiences.	20
CO3: Set goals, practice empathy, and apply creativity for problem-solving	Module III	Goal-Setting & Creativity Project	SMART goal plan + creative problem-solving idea using mind-mapping or SCAMPER.	20
CO4: Demonstrate discipline, time management, and structured problem-solving	Module IV	Problem-Solving Exercise (Case-Based)	Apply 5 Whys/Fishbone diagram to a business/engineering problem; structured solution submission.	20
CO5: Work in teams, negotiate, resolve conflicts, and think critically	Module V	Group Debate/Negotiation Simulation	Teams negotiate a given scenario and defend solutions in a debate; assessed on teamwork, arguments, and conflict resolution.	20

Mark Distribution by Assessment Type

- **Formative (Continuous Assessment) – 50 Marks**
- **Summative (End of Course) – 50 Marks**

Bloom's Taxonomy Weightage (100 Marks)

Sl. No	Bloom's Category	Formative (Role-play, Reflection, Creativity, Case studies)	Summative (Presentation + Problem-solving)	Overall
1	Remember	20%	10%	10%
2	Understand	25%	20%	20%
3	Apply	35%	30%	30%
4	Analyse	20%	20%	20%
5	Evaluate	10%	15%	15%
6	Create	10%	10%	10%
Total		100%	100%	100%

Assessment Rubric – 100 Marks

CO's rubric is scaled **out of 20 marks**

CO1 – Role-Play & Oral Presentation (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Clarity & Articulation	Speaks fluently, precise pronunciation	Minor lapses	Frequent lapses	Hesitant, unclear	4
Persuasion & Engagement	Strong persuasive appeal, engages fully	Reasonable persuasion	Weak persuasion	No strategy	4
Non-Verbal Communication	Confident posture, gestures, eye contact	Mostly confident	Minimal use	Poor body language	6
Active Listening	Accurately paraphrases, responds appropriately	Mostly accurate	Limited paraphrasing	Ignores cues	6

CO2 – Stress Management & Reflection Journal (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Understanding of EI Concepts	Deep insight + examples	Good understanding	Basic understanding	Misunderstands	6
Application in Activity	Fully applies techniques	Mostly effective	Few techniques	No application	6

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Reflection Quality	Highly personal, analytical	Some insights	Descriptive only	No reflection	4
Structure & Clarity	Well-organized	Mostly clear	Some disorganization	Poorly structured	4

CO3 – Goal-Setting & Creativity Project (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
SMART Goal Setting	All SMART criteria, inspiring	Most criteria	Some criteria	Vague	6
Creativity & Originality	Highly original	Some originality	Limited	None	6
Presentation & Visuals	Engaging, clear, strong visuals	Clear visuals	Basic visuals	Poor/no visuals	4
Feasibility & Relevance	Practical, relevant	Mostly practical	Partially relevant	Irrelevant	4

CO4 – Problem-Solving Exercise (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Problem Analysis	Identifies all root causes	Most causes	Few causes	No clear causes	6
Application of Tools	Fully accurate	Mostly accurate	Partial	Incorrect	4
Solution Quality	Highly logical, feasible	Mostly logical	Some gaps	Illogical	4
Structure & Clarity	Clear flow	Mostly clear	Some unclear parts	Disorganized	6

CO5 – Debate/Negotiation Simulation (20 marks)

Criteria	Excellent (8)	Good (6)	Satisfactory (4)	Needs Improvement (2)	Marks
Team Collaboration	Fully cooperative	Mostly cooperative	Limited	Uncooperative	4
Argument Quality	Strong evidence-based reasoning	Mostly sound	Weak reasoning	No reasoning	6
Conflict Resolution	Balanced, win-win focus	Mostly balanced	Minimal attempt	Aggressive/avoidant	4
Critical Thinking	Insightful, anticipates counterpoints	Thoughtful	Limited depth	None	6

*** Final Marking CO1 (Criteria + Marks)**

- Understanding of EI Concepts → **5/6**
- Application in Activity → **4/6**
- Reflection Quality → **2/4**
- Structure & Clarity → **4/4**

Final Marks = 15/20

Interdisciplinary Project Work		Semester	1/2
Course Code	PRJ258	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2	SEE Marks	50
Total Hours of Pedagogy	2 (Full day of Saturday may be allotted)	Total Marks	100
Credits	1	Exam Hours	
Examination type (SEE)	Presentation/Practical/MCQ		
Course Outcome (Course Skill Set) - On successful completion, students will be able to: 1. Identify and define problems requiring interdisciplinary knowledge. 2. Apply basic concepts of science, engineering, and technology to design simple solutions. 3. Work effectively in teams with defined roles and responsibilities. 4. Use project management, documentation, and presentation skills. 5. Develop socially relevant, sustainable, and innovative prototypes/solutions.			
Week - 1, 2 & 3: Introduction, Orientation, Team Formation and Literature Survey			
Week -1&2: Introduction to project-based learning & interdisciplinarity. Motivational talk / case studies of successful student projects. Ice-breaking and team-building activities. Formation of groups (4–6 students). Selection of broad theme areas. Brainstorming techniques {mind mapping, 5W1H (what, who, when, where, why, and how) SCAMPER}. Identifying problems. Discuss feasibility & Interdisciplinarity. Mentor approval of project problem.			
Week-3: How to search for prior work (journals, patents, research project, case studies). Understanding user needs. Role of each engineering branch in solving the problem.			
Deliverables - Team list + chosen theme area and Literature survey report.			
Week- 4, 5 and 6: Problem Statement, Multiple Solution Ideas and Selection of Best IDEA			
Week-4&5: Refining the problem statement. Identifying constraints and scope. Framing objectives & expected outcomes. Generating multiple solution ideas. Discussing feasibility (technical, economic, social). Team roles assigned (design, research, coding, documentation, testing).			
Week-6: Criteria-based selection of best idea (decision matrix). Rough sketches, block diagrams, flowcharts. Resource planning (materials, software, tools).			
Deliverables - Finalized Problem definition with objectives, List of solution concepts (sketches/flowcharts) and Design document (diagrams, flow)			
Week -7, 8 and 9: Selection of Best IDEA and Prototyping			
Week-7: Work breakdown structure (task division). Timeline for development. Safety & ethical considerations.			
Week-8&9: Development of subsystems/modules, Application of classroom knowledge (electrical circuits, coding, mechanics, CAD, etc.), Peer & mentor review sessions.			
Deliverables - Prototype development plan, Subsystem demos (partial working models).			

Week 9, 10,11&12: Prototyping stage 2 using Atal Idea Lab/Makers Space
Week-9&10: Integration of subsystems. Debugging & troubleshooting. Improvement based on test results.
Week-11&12: Testing against objectives & user requirements. Experimentation results (tables, graphs). Analysing failures/limitations.
Deliverables – Prototype/working model, Testing Results, Limitations/challenges
Week 13 & 14: Refinement & Pre-Final Review
Week-13&14: Refining prototype for efficiency, cost, sustainability. Internal review & peer feedback. Preparing visuals for final presentation (posters, PPT, demo video).
Deliverables – Final Results of Experimentation or Testing & Working/ Prototype Model
Week 15 &16: Final Demo and Social Pitch
<i>Project pitching to jury - Presentation of the project with impact with assessment, prototype, and sustainability plan</i>
Teaching-Learning Process (Innovative Delivery Methods) 1.Activity Based Learning 2.Group discussion, Presentations. 3. one faculty member shall be assigned to group of 60 students or one division. 4. Each group shall contain Min. 4 and Max. 6 students. 5. Nature of the group shall be multidisciplinary. (Group shall be formed by selecting students from all branches)
Assessment Structure: The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage. - To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks. - To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks. Notwithstanding the above, a student is considered to have passed the course, provided the combined total of CIE and SEE is at least 40 out of 100 marks.

Continuous Internal Evaluation (CIE) –

CIE Marks allocation Parameters for Interdisciplinary Project Work

CIE Parameters (50 Marks)

Stage/Activity	Weightage (%)	Marks (out of 50)	Description
Weeks 1–4: Problem Identification & Literature Survey	10%	05 marks	Focus on forming teams, identifying problems, understanding user needs, and reviewing prior work through journals, patents, etc.
Weeks 5–7: Concept Development & Design	20%	10 marks	Defining problem statements, framing objectives, generating ideas, preparing diagrams, flowcharts, and resource planning.
Weeks 8–11: Prototype Development	30%	15 marks	Creating subsystems, applying theoretical knowledge, peer and mentor review sessions, debugging, and troubleshooting.
Week 12: Testing & Validation	10%	5 marks	Evaluating the prototype's performance, user requirements, experiments, and analysis of failures.
Weeks 13–14: Documentation & Presentation	30%	15 marks	Finalizing the prototype, improving based on feedback, preparing presentations, reports, and demonstration materials.

***Minimum to Qualify for SEE: 20 out of 50 in CIE**

Semester End Examination (SEE) –

SEE to be conducted in batches where the students will exhibit their projects along with the presentation and Viva -voce. – 100 Marks

“SEE shall be conducted by one Internal and one External Examiner”

Component	Weightage (%)	Marks (out of 100)	Description
Final Presentation & Demonstration	30%	30	Clear articulation of the problem, solution approach, prototype, and team contribution. Delivery, engagement, and response to questions are evaluated.
Prototype Quality & Functionality	30%	30	Working model evaluation, application of engineering principles, problem-solving effectiveness, debugging, and system integration.
Documentation Report	20%	20	Completeness, structure, accuracy, clarity in diagrams, data analysis, testing results, and conclusions.
Social Impact & Sustainability	05%	05	Relevance to society, cost-effectiveness, ethical considerations, environmental impact, and scalability.
Innovation & Originality	10%	10	Creativity, uniqueness, feasibility, and application of interdisciplinary concepts.
Viva – voce	05%	05	Viva – voce

Submission Requirements:

- Handwritten activity book with CIE marks and Final project report (Typed or Handwritten).
- Final presentation ppt/pdf (hard and soft copy).
- Prototype or working model [physical or conceptual (shall be drawn/sketched clearly on card sheet paper)].
- Peer/team feedback and reflection entries (if applicable).

Course Title	Mathematics-II for Computer Science Engineering stream		
Course Code	MAT5S21	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120
Course Objective To train the students to acquire knowledge in differential equations, vector calculus and curve fitting, so as to solve basic engineering application problems. Course Outcomes (COs): At the end of course, student will be able to:			
COs	Outcomes	POs	PSOs
CO1	Solve and apply first order, first degree differential equations to model population growth, carbon dating, escape velocity and logistic growth problems.	PO1, PO2	-
CO2	Analyze and solve second order linear differential equations with constant coefficients for mechanical vibration problems.	PO1, PO2	-
CO3	Apply numerical techniques to solve ordinary and partial differential equations arising in heat, wave, Laplace and Poisson problems.	PO1	
CO4	Apply probability theory and discrete probability distributions to analyze and solve engineering application problems.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential equations.	PO1, PO2, PO5	-
MODULE - 1			10 Hrs.
First Order First Degree Ordinary Differential Equations -Linear differential equations, Exact differential equations. Bernoulli's differential equations. Applications: Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. carbon dating half-life period, Logistic model- Natural growth of halibut population. Self-study -Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)$, Orthogonal trajectories in Cartesian form-illustrative examples, orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body.			
MODULE - 2			10 Hrs.

Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non-homogeneous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients. Applications of second order, first degree Differential equations: Mechanical Vibrations-A Spring mass system $mu''(t) + ku'(t) + gu(t) = f(t)$, Undamped free vibrations, damped free vibrations, forced vibrations with damping, forced vibrations without damping. Self-study- Method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations. Mechanical system and transmission lines.	
MODULE - 3	10 Hrs.
Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Euler's Modified method. Partial Differential Equations: Brief introduction to classification of PDE, Solution of non-homogeneous PDE by direct integration, Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formula. Applications: To find all possible solutions of one-dimensional heat equation and one-dimensional wave equation. Self-Study- Adam-Bashforth method, Solving PDE by variable separable method, Milne's-Predictor Corrector Method.	
MODULE - 4	12 Hrs.
Probability Theory: Definition of probability, Addition law of probability, conditional probability, multiplication law of probability, Baye's theorem. Discrete Random Variable: Introduction to Random variables, Discrete random variables, Binomial distribution, Poisson distribution. Applications: Experimental data for applications of probability in Computer Science Engineering , Bayes' Theorem – E-Commerce. Self-Study- Probability and set notations, independent events.	
Lab Components: 1. Solution of first order ordinary differential equation using Taylor series method. 2. Solution of first order ordinary differential equation using Runge-kutta method. 3. Solution of first order ordinary differential equation using Euler's modified method. 4. Orthogonal trajectories in Cartesian form.	

5. Solution of First order first degree-Linear differential equations
6. Solution of Linear differential equation with constant coefficients - Solutions of homogeneous equations.
7. Particular solution of non- homogenous differential equations for the following standard forms, exponential, polynomial, trigonometric and their product.
8. Solution of 2nd order differential equations (by variation of parameter method).
9. Bayes' Theorem.
10. Binomial distribution.

Note:

1. Proofs are not required for any theorems and properties.
2. There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics	Dr. B. S. Grewal	44	Khanna Publications	2016
2	Advanced Engineering Mathematics	Erwin Kreyszig	8 (Wiley student edition)	Wiley India P.v.t. Ltd	2004
3	Calculus	Thomas Finney	9	Pearson education	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Numerical methods	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar	6	New age International p.v.t. Publishers	2014
2	A textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	-	Laxmi Publications	2010

EBooks and online course materials:

- <http://nptel.ac.in/courses.phd?disciplineID=111>
- [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
- <http://academicrath.org/>

Online Courses and Video Lectures:

- <https://www.courseera.org/>_____
- <https://nptel.ac.in/courses/>_____

Teaching - Learning - Evaluation Scheme:

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1& ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				120
ABL 1 : Lab based learning (14 Hrs)				
Designing and implementation of Pyhton programming		Manual solving		4
		Writing program		5
		Execution		3
		Required output		1
		conclusion		1
ABL 2 : Problem Solving Assignment (15 Hrs)				
Problem Solving Assignment		Problem selection		1
		Formulate the methodology		3
		Solving the problem		4
		Report writing and submission		3
		Preparation of slide and presentation		4

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Lab based learning 2) Problem Solving Assignment	20
Total		50

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes[POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-			-								
CO2	3	2			-								
CO3	3	2			-								
CO4	3	2			-								
CO5	3	2			1								

Course Title	Mathematics-II for Electrical and Electronics Engineering stream		
Course Code	MAT5E21	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus, so as to solve basic engineering application problems.

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

COs	Outcomes	POs	PSOs
CO1	Compute the analytical solution of first-order and first degree differential equations and also to determine engineering phenomena using orthogonal trajectories. Real-life and engineering application problems.	PO1	-
CO2	Apply appropriate methods to find solutions for higher order linear differential equations including both homogeneous and non-homogeneous cases. Real-life and engineering application problems.	PO1, PO2	-
CO3	Develop the ability to analyze vector fields in engineering contexts, along with vector operations and apply suitable numerical methods to compute the engineering problems.	PO1, PO2	
CO4	Evaluate the concept of Laplace transform and obtain Laplace transform of periodic functions and unit step functions to solve the problems in transforming the continuous signals.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with numerical methods, differential equations, vector calculus and laplace transforms. execute the same and provide correct output.	PO1, PO2,PO5	-

MODULE - 1	10 Hrs.
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Ordinary Differential Equations: First order first degree-Linear differential equations, Exact equations. Applications to find the orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body, Equi-potential lines in an electric field between two concentric cylinders.

Applicatons - Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. carbon dating half-life period. Application of first order differential equation Logistic model- Natural growth of halibut population .

Self-Study- Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)dx + \frac{1}{M}\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)dy$. Orthogonal trajectories in polar form, illustrative examples, Linear differential equations.	
MODULE - 2	13 Hrs.
Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non- homogeneous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients. Applications of second order, first degree Differential equations -Oscillatory Electrical circuit, LC Circuit, LCR Circuit, LC Circuit with E.M.F, LCR Circuit with E.M.F, Electro-Mechanical Analogy. Self-study- Method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations).Applications of second order, first degree Differential equations - Transmission lines, Highway engineering.	
MODULE - 3	10 Hrs.
Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Milne's predictor & corrector methods, Euler's modified method. Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems. Applications - Conservation of laws, Electrostatics, Analysis of streamlines and electric potentials. Self-Study- Vector Integration: Line integrals, Surface integrals. Applications to work done by a force and flux.	
MODULE - 4	10 Hrs.
Laplace Transforms: Introduction, Definition, Importance of Laplace transform in engineering applications. properties, Laplace transform of standard functions, Laplace transform of derivatives, Laplace transform of periodic functions, unit-step functions. Applications- Network packet transmission with delayed start, Dual-phase CPU cooling system with delayed control response. Self-Study- Inverse Laplace Transforms , Unit impulse functions (Dirac – delta function).	
Lab Components: 1. To Solve first order ODE using Taylor series method	

2. To Solve first order ODE using Runge-kutta method.
3. To Solve first order ODE using Euler's modified method
4. To compute orthogonal trajectories
5. To Solve First order first degree-Linear differential equations
6. Solution of Linear differential equation with constant coefficients - Solutions of homogeneous equations.
7. Particular solution of non- homogenous differential equations for the following standard forms, exponential, polynomial, trigonometric and their product.
8. To solve second order differential equations by variation of parameter method.
9. Finding gradient, divergence and curl.
10. Standard Laplace Transforms $e^{at}f(t)$, $\frac{f(t)}{t}$.

NOTE

1. Proofs are not required for any theorems and properties.
2. There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
01	Higher Engineering Mathematics	Dr. B. S. Grewal	44th	Khanna	2016
02	Advanced Engineering Mathematics	Erwin Kreyszig	8th	Wiley India Pvt. Ltd	2004
03	Calculus	Thomas Finney	9th	Thomas Finney	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Numerical methods,	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar,	6th edition,	New age International p.v.t. Publishers,	2014
2.	A textbook of Engineering Mathematics, ,	N.P. Bali and Manish Goyal	Reprint,	Laxmi Publications	2010

EBooks and online course materials:

- <http://nptel.ac.in/courses.phd?disciplineID=111>
- [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
- <http://academicrath.org/>

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- <https://nptel.ac.in/courses/>

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4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				120
ABL 1 : Lab based learning (14 Hrs)				
Designing and implementation of Python programming	Manual solving			4
	Writing program			5
	Execution			3
	Required output			1
	conclusion			1
ABL 2 : Problem Solving Assignment (15 Hrs)				
Problem Solving Assignment	Problem selection			1
	Formulate the methodology			3
	Solving the problem			4
	Report writing and submission			3
	Preparation of slide and presentation			4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 3) Lab based learning 4) Problem Solving Assignment	20
Total		50

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2	3	2											
CO3	3	2											
CO4	3	2											
CO5	3	2			1								

Course Title	Mathematics-II for Civil Engineering		
Course Code	MAT5C21	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120
Course Objective To train the students to acquire knowledge in differential equations, vector calculus and curve fitting, so as to solve basic engineering application problems.			
Course Outcomes (COs): At the end of course, student will be able to:			
COs	Outcomes	POs	PSOs
CO1	Solve first-order, first-degree differential equations and apply them to model real-life problems such as population growth, logistic growth, carbon dating, and escape velocity.	PO1, PO2	-
CO2	Analyze and solve linear differential equations with constant coefficients and apply second-order differential equation models to real-world engineering applications.	PO1, PO2	-
CO3	Apply numerical methods for ODEs and analytical and finite difference methods for PDEs, including Laplace, Poisson, heat, and wave equations.	PO1, PO2	
CO4	Examine and compute the vector calculus problems/applications connected with gradient, divergence and curl. Correlate the experimental data using rank correlation coefficient, fit a curve to the data-solve simple problems	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential equations, vector calculus and curve fitting, execute the same and provide correct output.	PO1, PO2, PO5	-
MODULE - 1			10 Hrs.
First order first degree ordinary Differential Equations - -Linear differential equations, Exact differential equations. Bernoulli's differential equations. Applications: Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. carbon dating half-life period, Logistic model- Natural growth of halibut population. Self-study -Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)$, Orthogonal trajectories in Cartesian form-illustrative examples, Orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body.			
MODULE - 2			10 Hrs.

Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non-homogeneous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients. Applications of second order, first degree Differential equations: - Mechanical Vibrations-A Spring mass system $mu''(t) + ku'(t) + gu(t) = f(t)$, Undamped free vibrations, damped free vibrations, forced vibrations with damping, forced vibrations without damping. Self-study- method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations. Mechanical system and transmission lines.	
MODULE - 3	10 Hrs.
Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Euler's modified method. Partial Differential Equations. Brief introduction to classification of PDE, Solution of non-homogeneous PDE by direct integration, Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formula. Applications: To find all possible solutions of one-dimensional heat equation and one-dimensional wave equation. Self-Study- Milne's Predictor-corrector method, Adam-Bashforth method, Solving PDE by variable separable method.	
MODULE - 4	10 Hrs.
Vector Calculus: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Statistics: curve fitting – Linear and quadratic equation, Rank correlation Applications: Application of Gradient in seepage analysis. Self-study: lines of regression, Vector Integration: Line integrals.	
Lab Components: 1. Solution of first order ordinary differential equation using Taylor series method 2. Solution of first order ordinary differential equation using Runge-kutta method. 3. Solution of first order ordinary differential equation using Euler's modified method. 4. Orthogonal trajectories in Cartesian form. 5. Solution of First order first degree-Linear differential equations 6. Solution of Linear differential equation with constant coefficients - Solutions of homogeneous equations.	

7. Particular solution of non- homogenous differential equations for the following standard forms, exponential, polynomial, trigonometric and their product.
8. Solution of 2nd order differential equations (by variation of parameter method).
9. Finding gradient, divergence and curl.
10. To fit a curve – Linear equation and quadratic equation.

Note:

3. Proofs are not required for any theorems and properties.
4. There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics	Dr. B. S. Grewal	44	Khanna Publications	2016
2	Advanced Engineering Mathematics	Erwin Kreyszig	8 (Wiley student edition)	Wiley India P.v.t. Ltd	2004
3	Calculus	Thomas Finney	9	Pearson education	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Numerical methods	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar	6	New age International p.v.t. Publishers	2014
2	A textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	-	Laxmi Publications	2010

EBooks and online course materials:

1. https://www.geneseo.edu/~aguilar/public/assets/courses/233/main_notes.pdf
2. <https://ocw.mit.edu/courses/res-18-001-calculus-fall-2023/pages/textbook/>

Online Courses and Video Lectures:

1. <https://www.coursera.org/learn/introduction-to-linear-algebra>
2. <https://www.coursera.org/learn/introduction-to-calculus>
3. <https://nptel.ac.in/courses/111104092>

Teaching - Learning - Evaluation Scheme:

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				120
ABL 1 : Lab based learning (14 Hrs)				
Designing and implementation of Pyhton programming		Manual solving		4
		Writing program		5
		Execution		3
		Required output		1
		conclusion		1
ABL 2 : Problem Solving Assignment (15 Hrs)				
Problem Solving Assignment		Problem selection		1
		Formulate the methodology		3
		Solving the problem		4
		Report writing and submission		3
		Preparation of slide and presentation		4

Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 5) Lab based learning 6) Problem Solving Assignment	20
Total		50

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-			-								
CO2	3	2			-								
CO3	3	2			-								
CO4	3	2			-								
CO5	3	2			1								

Course Title	Mathematics-II for Mechanical Engineering stream		
Course Code	MAT5M21	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120
Course Objective To train the students to acquire knowledge in differential equations, vector calculus and curve fitting, so as to solve basic engineering application problems.			
Course Outcomes (COs): At the end of course, student will be able to:			
COs	Outcomes	POs	PSOs
CO1	Solve first-order, first-degree differential equations and apply them to model real-life problems such as population growth, logistic growth, carbon dating, and escape velocity.	PO1, PO2	-
CO2	Analyze and solve linear differential equations with constant coefficients and apply second-order differential equation models to real-world engineering applications.	PO1, PO2	-
CO3	Apply numerical methods for ODEs and analytical and finite difference methods for PDEs, including Laplace, Poisson, heat, and wave equations.	PO1, PO2	
CO4	Examine and compute the vector calculus problems/applications connected with gradient, divergence and curl. Correlate the experimental data using rank correlation coefficient, fit a curve to the data-solve simple problems	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential equations, vector calculus and curve fitting, execute the same and provide correct output.	PO1, PO2, PO5	-
MODULE - 1			10 Hrs.
First order first degree ordinary Differential Equations - -Linear differential equations, Exact differential equations. Bernoulli's differential equations. Applications: Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. carbon dating half-life period, Logistic model- Natural growth of halibut population. Self-study -Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)$, Orthogonal trajectories in Cartesian form-illustrative examples, Orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body.			
MODULE - 2			10 Hrs.

Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non-homogeneous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients. Applications of second order, first degree Differential equations: - Mechanical Vibrations-A Spring mass system $mu''(t) + ku'(t) + gu(t) = f(t)$, Undamped free vibrations, damped free vibrations, forced vibrations with damping, forced vibrations without damping. Self-study- method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations. Mechanical system and transmission lines.	
MODULE - 3	10 Hrs.
Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Euler's modified method. Partial Differential Equations. Brief introduction to classification of PDE, Solution of non-homogeneous PDE by direct integration, Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formula. Applications: To find all possible solutions of one-dimensional heat equation and one-dimensional wave equation. Self-Study- Milne's Predictor-corrector method, Adam-Bashforth method, Solving PDE by variable separable method.	
MODULE - 4	10 Hrs.
Vector Calculus: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Statistics: curve fitting – Linear and quadratic equation, Rank correlation Applications: Application of Gradient in Heat Flow Analysis. Self-study: lines of regression, Vector Integration: Line integrals.	
Lab Components: 1. Solution of first order ordinary differential equation using Taylor series method 2. Solution of first order ordinary differential equation using Runge-kutta method. 3. Solution of first order ordinary differential equation using Euler's modified method. 4. Orthogonal trajectories in Cartesian form. 5. Solution of First order first degree-Linear differential equations 6. Solution of Linear differential equation with constant coefficients - Solutions of homogeneous equations.	

7. Particular solution of non- homogenous differential equations for the following standard forms, exponential, polynomial, trigonometric and their product.
8. Solution of 2nd order differential equations (by variation of parameter method).
9. Finding gradient, divergence and curl.
10. To fit a curve – Linear equation and quadratic equation.

Note:

1. Proofs are not required for any theorems and properties.
2. There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics	Dr. B. S. Grewal	44	Khanna Publications	2016
2	Advanced Engineering Mathematics	Erwin Kreyszig	8 (Wiley student edition)	Wiley India P.v.t. Ltd	2004
3	Calculus	Thomas Finney	9	Pearson education	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Numerical methods	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar	6	New age International p.v.t. Publishers	2014
2	A textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	-	Laxmi Publications	2010

EBooks and online course materials:

1. https://www.geneseo.edu/~aguilar/public/assets/courses/233/main_notes.pdf
2. <https://ocw.mit.edu/courses/res-18-001-calculus-fall-2023/pages/textbook/>

Online Courses and Video Lectures:

1. <https://www.coursera.org/learn/introduction-to-linear-algebra>
2. <https://www.coursera.org/learn/introduction-to-calculus>
3. <https://nptel.ac.in/courses/111104092>

Teaching - Learning - Evaluation Scheme:

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28

3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				120
ABL 1 : Lab based learning (14 Hrs)				
Designing and implementation of Pyhton programming	Manual solving			4
	Writing program			5
	Execution			3
	Required output			1
	conclusion			1
ABL 2 : Problem Solving Assignment (15 Hrs)				
Problem Solving Assignment	Problem selection			1
	Formulate the methodology			3
	Solving the problem			4
	Report writing and submission			3
	Preparation of slide and presentation			4

Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 7) Lab based learning 8) Problem Solving Assignment	20
Total		50

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-			-								
CO2	3	2			-								
CO3	3	2			-								
CO4	3	2			-								
CO5	3	2			1								

Course Title		MATHEMATICS-III FOR COMPUTER SCIENCE ENGINEERING			
Course Code		25MACS301	(L-T-P) C		(3-0-0) 3
Exam Hrs.		3	Hours/Week		3
CIE		50 Marks	Total Hours		42L+48ABL =90
SEE		50 Marks			
Course Objective: To expertise linear algebra and probability theory which can be employed as tools in solving engineering application problems.					
Course Outcomes (COs): Upon completion of the course, students shall be able to:					
#	Course Outcomes			Mapping to POs	Mapping to PSOs
1.	Apply concepts of linear algebra, probability distributions, sampling theory, and Markov chains to formulate and solve mathematical, statistical, and engineering problems.			1	-
2.	Analyze systems involving linear transformations, probability distributions, Markov chains, stochastic processes and statistical inference using appropriate mathematical techniques for data driven decision-making.			1, 2	-
3.	Develop mathematical and statistical models for real-life engineering and analytical problems.			2, 3	-
Course Contents:					
MODULE – 1					10 Hrs
Linear Algebra: Importance of Matrices. Rank of a matrix. Consistency of the system of linear equations, Solution of the system of linear equations by Gauss elimination. Linear transformation: Special matrices-matrix of rotation, reflection and translation. Eigen values and Eigen vectors Illustrative examples. Applications: transformation of 3D coordinate in Robotic arm, web-page ranking. Self-Study-- Application of Eigen value Eigen vectors in Signature testing, Jordan canonical matrices					
MODULE – 2					8 Hrs
Continuous Random Variables: Probability density function, Cumulative distribution function, Mean and Variance. Exponential distribution, Uniform distribution and Normal distribution. Applications: AI-based traffic systems, face-recognition system Self-Study: Gamma distribution					
MODULE – 3					12 Hrs
Joint probability distribution: Joint distribution of Discrete random variables- Marginal probability distribution, Independent random variable, Expectation, Covariance, Correlation coefficient. Markov chains: Introduction to stochastic process, probability vectors, stochastic matrices, regular stochastic matrices, higher transition probabilities, stationary distribution of regular Markov chains. Application: Application of Markov chain to determine the voting tendencies, Recommendation Analysis on OTT platforms Self-Study: Joint probability distribution-Continuous random variables.					
MODULE – 4					12 Hrs
Sampling Theory- Introduction to sampling distribution Confidence intervals and Hypothesis testing: Testing a hypothesis, central limit theorem, concepts of standard error and confidence interval, level of significance, type I and type II errors, one tailed and two tailed tests, Z-test: for single mean, for single proportion and for difference between means, for difference between proportion. Student's t –test: for single mean and for difference between two means, Chi-square test: for goodness of fit and for independence of attributes. Applications: Cloud server performance analysis, Cyber-security login analysis Self-Study— F-test Analysis of variance.					
Note– Theorems and properties without proof. Applicable to all the modules. Self-study is not included in SEE					
Pre-requisite: Mathematics basics					
Text Books					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Higher Engineering Mathematics	Dr. B. S. Grewa	44	Khanna Publications	2016

2.	Linear algebra and its application	David c lay	5	Pearson education	2023
Reference Books:					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Advanced Engineering Mathematics	E.Kreyszig	10	Wiley	2015
2.	Advanced engineering mathematics	R K Jain and S R K Iyengar	5	Pearson education	2019
3.	Calculus	Thomas Finney	9	Pearson education	2002
EBOOKS/MOOC:					
https://www.geneseo.edu/~aguilar/public/assets/courses/233/main_notes.pdf					
Online Courses and Video Lectures:					
1. https://www.coursera.org/learn/introduction-to-linear-algebra 2. https://www.coursera.org/learn/stanford-statistics 3. https://onlinecourses.nptel.ac.in/noc21_ma74 4. https://archive.nptel.ac.in/courses/111/106/111106135/					
Teaching -Learning– Evaluation Scheme:					
Sl. No	Teaching and Learning Method		No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning		3	14	42
2.	Integrated Lab Component		-	-	-
3.	Student Study Hours – Self Learning		1	14	14
4.	Activity Based Learning		-	-	27
5.	Evaluation of Learning Process		-	-	07
Total Learning Hours / Semester					90
Proposed Assessment Plan (for 50 marks of CIE):					
Tool	Remarks				Marks
CIE	CIE1	Conducted for 50 marks & reduced to 15 marks			15
	CIE2	Conducted for 50 marks & reduced to 15 marks			15
Activity Details		Details of activities to be conducted 1) Details of activity1 2) Details of activity2			20
Total Marks					50
Activity Based Learning (27 Hours)					
ABL 1(14 Hours): Activity1 details					Hours
Writing Assignment with Problems on concerned to real world applications.		Submission of the final assignment report and evaluation. (Questions of loomslevelL3andHigher)			14
Total					14
ABL2(13 Hours): Activity2 details					
Problem Solving Assignment		Understand the input data requirements			3
		Formulate the methodology			5
		Design the solution			5
		Solving the problem and submission			5
Total					13
Evaluation of Learning Process (7 Hours)					
Type of Evaluation					Hours
Test (1 and 2)					3

[illegible]

Course Title		DIGITAL DESIGN AND COMPUTER ORGANIZATION				
Course Code		25CS302	(L-T-P) C		(3-0-2)4	
Exam		3	Hours/Week		5	
CIE		50 Marks	Total Hours		42L+28P+50ABL =120	
SEE		50 Marks				
Course Objective: Understand the organization of a computer system and design logic circuits for a given real life problem.						
Course Outcomes (COs): Upon completion of the course, students shall be able to:						
#	Course Outcomes			Mapping to POs	Mapping to PSOs	
1	Apply computer architecture concepts to interpret the functioning of a digital computer and solve arithmetic and cache mapping problems			1	-	
2	Analyze the operation of interrupts, DMA, and arithmetic circuits in computer system			2	-	
3	Design logic circuits using Boolean algebra and logic gates			3	-	
4	Develop combinational and sequential logic circuit for a given problem using hardware kit			3	1	
Course Contents:						
MODULE – 1					11 Hrs	
Digital Logic : The Basic Gates, The Universal Gates, Boolean Laws and Theorems, Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications - Overlapping, Eliminating Redundant Groups, Don't Care Condition Data-Processing Circuits: Multiplexers, Decoders.						
MODULE – 2					11 Hrs	
Flip-Flops: RS flip flop, Gated flip flop , Edge triggered flip-flop, D flip flop , Edge-triggered D flip flop , Edge-triggered flip flop , JK Master-slave flip flop . Various Representation of flip flops. Analysis of sequential Circuits, Conversion of flip flops, Registers: Types of Registers Counters: Counter Design as a Synthesis problem.						
MODULE – 3					10 Hrs	
Basic Structures of Computers: Functional units; Basic Operational Concepts: Bus Structures, Performance. Data Organization: Numbers, Arithmetic operations and characters, Memory Locations and Addresses: Byte addressability, Big-endian & Little-endian assignments, Word Alignment, Accessing Numbers, Characters & Character strings. Input/ Output Organization: Accessing I/O devices, Interrupts: Interrupt Hardware, Enabling & Disabling Interrupt, Handling Multiple devices, Controlling Device Requests, Direct Memory Access.						
MODULE – 4					10 Hrs	
The Memory System: Basic Concepts, Cache Memories: Mapping functions, Multiplication of Positive numbers: Booth Algorithm, Bit-pair Recoding of Multipliers; Integer division, IEEE Standard for Floating-point numbers, Arithmetic operations on Floating-point numbers, Implementing Floating-Point operations.						
Pre-requisite: Number Systems, logical levels, Boolean algebra						
Text Books						
Sl. No	Book Title		Authors	Edition	Publisher	Year
1.	Digital Principles and Applications		Donald P Leach, Albert Paul Malvino & Goutam Saha	7th	Tata McGraw Hill	2011
2.	Computer Organization		Carl Hamacher, Z. Vranesic & S. Zaky	5th	McGraw Hill	2012
Reference Books:						
Sl. No	Book Title		Authors	Edition	Publisher	Year
1.	Computer Organization and Architecture		William Stallings	9th	Pearson India	2013

2.	Digital Logic and Computer Design	M Morris Mano	1 st	Pearson	2013
EBOOKS/MOOC:					
http://www.nptelvideos.in/2012/11/computer-organization.html					
Online Courses and Video Lectures:					
Teaching -Learning– Evaluation Scheme:					
Sl. No	Teaching and Learning Method		No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning		3	14	42
2.	Integrated Lab Component		2	14	28
3.	Student Study Hours – Self Learning		-	-	28
4.	Evaluation of Learning Process		-	-	22
Total Learning Hours / Semester					120
Proposed Assessment Plan (for 50 marks of CIE):					
Tool	Remarks				Marks
CIE	CIE1	Conducted for 50 marks(Module 1& 2) & reduced to 15 marks			15
	CIE2	Conducted for 50 marks(Module 3 & 4) & reduced to 15 marks			15
Activity Details	Activity 1	Continuous Evaluation and Laboratory CIE			20
Total Marks					50
Self-Learning (28 Hours)					
Number systems- Decimal, Binary and Hexadecimal, Conversions between Decimal, Binary and Hexadecimal numbers, Basics of Analog and Digital Communication, Progression of computer technology over generations, Various levels of cache used in processors, Multicore architecture, GPU architecture.					
Laboratory Component (28 Hours)					
PART-A					
1.	Derive the Boolean expression from the given truth table, design and implement the corresponding logic circuit using appropriate logic gates, and verify the output for all input combinations.				
2.	Implement the given Boolean function using only NAND gates and only NOR gates.				
3.	Simplify the given three-variable Boolean expression using a Karnaugh Map (K-Map), design the simplified circuit, and verify the result.				
4.	Design and implement Half Adder and Full Adder and verify their outputs using truth tables.				
5.	Construct 4:1 and 8:1 Multiplexers, and realize the given Boolean function using an appropriate multiplexer.				
6.	Implement 2-to-4 and 3-to-8 Decoders, and verify their operation for all possible input combinations.				
7.	Implement J-K Flip-Flop and D Flip-Flop circuits, and verify their characteristic behaviour using clock pulses and truth tables.				
8.	Realize BCD-to-Excess-3 code converter and verify the conversion for all valid input combinations.				
9.	Implement a 3-bit/4-bit Serial-In Serial-Out (SISO) Shift Register and verify the shifting operation for each clock pulse.				
10.	Implement MOD-4 and MOD-8 counters using JK/D flip-flops, and verify the counting sequence.				
PART- B (Open-Ended Experiments)					
1.	Develop a digital control circuit for a real-world application based on the given input–output requirements by deriving the corresponding Boolean expression and validating its operation.				
2.	Implement a cost-effective digital logic solution for a given application using only universal				

Course Title	DATA STRUCTURES AND ITS APPLICATIONS		
Course Code	25CS303	(L-T-P) C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L + 28ABL+14SL + 6EV = 90
SEE	50 Marks		
Course Objective: To be able to use appropriate data structures for designing programs.			
Course Outcomes (COs): Upon completion of the course, students shall be able to :			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Apply appropriate data structures to design efficient solutions for computational problems.	1	1
2	Analyze operations on linear and non-linear data structures	2	1
3	Design programs using appropriate linear and non-linear data structures to solve a given problem	3	1
4	Implement efficient solutions to real-world problems by choosing suitable data structures	5,11	1,2
Course Contents:			
MODULE – 1			11 Hrs
Introduction: Structures and pointers revisited. Introduction to data structures - Basic terminology, Classification of data structures, Operations of data structures. Stack - Introduction, Array Representation of stacks, Operations on stack, Applications of stack: Infix, postfix and prefix, Basic definitions and examples, Converting an expression from infix to postfix, Program in C to convert an expression from infix to postfix, Evaluating a postfix expression, Program to evaluate a postfix expression			
MODULE – 2			11 Hrs
Recursion - Finding GCD, Fibonacci Series, Types of Recursion, Tower of Hanoi, and Recursion versus iteration. Queues - Introduction, Array representation of Queues: Operations on Queues, Types of Queues- Circular Queue and its implementation in C, DQueue, Applications of Queues. Linked List: Introduction to linked list: Basic terminologies, Linked list versus arrays, Singly linked list operations - Insert, Delete, Display, Search and Traverse.			
MODULE – 3			10 Hrs
Other Lists structures: Circular Linked Lists - C Implementation by adding and deleting nodes, Doubly Linked List - C implementation by adding and deleting nodes, Circular doubly linked list, Linked List Applications: Linked Implementation of stacks and Queues, Polynomial Representation. Trees: Basic Terminology, Types of trees, Representation using array and Linked List. Creating a binary tree from a general tree.			
MODULE – 4			10 Hrs
Traversing a binary tree- In-order, Pre-order, Post order, Level order, Constructing a binary tree from traversal results. Efficient Binary Trees: Binary Search trees - definition, Operations- Create, Insert, delete, display, Finding height, Finding number of nodes. AVL trees - Definition, Rotations, Constructing an AVL tree.			
Pre-requisite (If any) : Students should have completed a course in C programming in the previous semester, with a basic understanding of variables, control structures, functions, and arrays.			
Text Books			

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data Structures Using C	Reema Thereja	3 rd	Oxford Press	2023
2.	Data Structures Using C and C++ (Only chapter 5)	Yedidyah, Augenstein, Tannenbaum	2 nd	Pearson Education	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data Structures A Pseudocode Approach with C	Richard F. Gilberg and Behrouz A. Forouzan	1 st	Cengage Learning	2005
2.	Classic Data Structures	Debasis Samanta	2 nd	PHI	2009
3.	Programming in ANSI C	Balagurusamy E	7 th	Tata McGraw Hill	2017

EBOOKS/MOOC:

http://nptel.ac.in/keyword_search_result.php?word=data+structures

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Student Study Hours – Self Learning	1	14	14
3.	Activity Based Learning	2	14	28
4.	Evaluation of Learning Process			6
Total Learning Hours / Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks		Marks
CIE	CIE1	Conducted for 15 marks(Module 1 & Module 2)	15
	CIE2	Conducted for 15 marks(Module 3 & Module 4)	15
Activity Details	Activity 1	Programming laboratory test on Self Learning component	8
	Activity 2	LeetCode participation	12
Total Marks			50

Activity 1: Self-Learning

1.	File operations : read, write, append, seek, etc	
2.	Programs on reading data from a file and writing onto a file	
3.	Counting number of lines, characters in a text file.	
4.	Reading numbers from a file and storing odd numbers and even numbers into separate files	
5.	Implementation of priority queue using arrays	
6.	Creating Polynomial using linked list	
7.	Addition of two polynomials using linked list	
	Evaluation of the Process	
	Writing the program	3
	Execution	3
	Viva	2

	Total					8 Marks							
Activity2													
Students have to participate and earn badges in LeetCode online coding platform													
Evaluation of the Process													
i. ONE badge – 2 marks ii. Maximum SIX Badges can be earned : 6*2= 12 Marks													
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	-	-	-	-	-	-	-	-	-	3	-
CO3	-	-	3	-	-	-	-	-	-	-	-	3	-
CO4	-	-	-	-	3	-	-	-	-	-	3	3	3

Course Title	OBJECT ORIENTED PROGRAMMING WITH JAVA		
Course Code	25CS304	(L-T-P) C	(3-0-2) 4
Exam Hrs.	3	Hours/Week	5
CIE	50 Marks	Total Hours	42L+28P+18SL+18AB L+ 14EV =120
SEE	50 Marks		
Course Objective: Develop java application using object-oriented concepts.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the fundamentals of Object-Oriented Programming.	1	1
2.	Analyze the syntax and semantics of a given Java code snippet to identify errors and predict its output	2	1
3.	Develop java programs for a given problem using suitable Object-Oriented concepts	3	1,2
4.	Conduct practical experiments to demonstrate object-oriented programming concepts using Java.	1,2,5	1
Course Contents:			
MODULE – 1			11 Hrs
Object Oriented Concepts and Java: Concepts of Object-Oriented programming language: Object, Class, Message passing, inheritance, encapsulation, and polymorphism Difference between OOP and other conventional programming – advantages and disadvantages of OOP. Java Programming Fundamentals: Java and Java Applications, Java Development Kit (JDK), The Byte Code, The Java Buzzwords, A first Simple program, handling syntax errors, The Java Keywords, Identifiers in Java. Introducing Classes, Objects and Methods: Class Fundamentals, Declaring Objects, Object Reference Variables, Methods, Data Types and Operators: Java's Primitive Types, A Closer Look at Variables, The Scope and Lifetime of Variables, Operators: Arithmetic, Bitwise, Relational, Boolean Logical, Assignment Operators, the '?' Operator, Type conversion and Casting, Arrays, Strings.			
MODULE – 2			11 Hrs
Program Control Statements: Input characters from the Keyboard, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do- while Loop, Nested Loops, Use of break and continue. Closer Look at Methods and Classes Constructors, the "This" keyword, Garbage collection, Overloading Methods and constructors, Argument Passing, Returning Objects, Access Control, Understanding Static, Nested and Inner Classes. Inheritance: Inheritance Basics, Member Access and Inheritance, Constructors and inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members.			
MODULE – 3			10 Hrs
Inheritance: Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why overridden Methods, Using Abstract Classes, Using final, The object class. Interfaces: Interface Fundamentals, Creating an Interface, Implementing an Interface, Implementing Multiple Interfaces, Interfaces can be extended, Nested Interfaces. Packages: Package Fundamentals, Packages and Member Access, Importing Packages, Static import.			
MODULE – 4			10 Hrs
Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and Catch, Multiple catch Clauses, throw, finally, Java's Built-in Exceptions, Customized exceptions.			

Multithreaded Programming: Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All().						
Pre-requisite:						
Text Books						
Sl. No	Book Title	Authors	Edition	Publisher	Year	
1.	Java Fundamentals: A Comprehensive Introduction.	Herbert Schildt, Dale Skrien	6th	Tata McGraw Hill	2017	
2.	Java –The complete Reference	Herbert Schildt	13th	Tata McGraw Hill	2024	
3.	Programming with Java	E. Balagurusamy	7th	Tata McGraw Hill	2023	
Reference Books:						
Sl. No	Book Title	Authors	Edition	Publisher	Year	
1.	Head First Java	Kathy Sierra, Bert Bates	3rd	O’Reilly	2023	
EBOOKS/MOOC:						
1. http://nptel.ac.in/courses/106106147/						
2. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php						
3. https://www.youtube.com/watch?v=0KL_zftem4g						
https://www.coursera.org/specializations/object-oriented-programming						
Online Courses and Video Lectures:						
https://onlinecourses.nptel.ac.in/noc22_cs47/preview						
https://www.tutorialspoint.com/java/index.htm						
Teaching -Learning– Evaluation Scheme:						
Sl. No	Teaching and Learning Method		No. of Hours/ Week	No. of Weeks	Hours/ Semester	
1.	Class Room Teaching & Learning		3	14	42	
2.	Integrated Lab Component		2	14	28	
3.	Student Study Hours – Self Learning		-	-	18	
4.	Activity Based Learning		-	-	18	
5.	Evaluation of Learning Process		-	-	14	
Total Learning Hours / Semester					120	
Proposed Assessment Plan (for 50 marks of CIE):						
Tool		Remarks			Marks	
CIE		CIE1	Conducted for 50 marks(Module 1& 2) & reduced to 15 marks			15
		CIE2	Conducted for 20 marks(Module 3 & 4) & reduced to 15 marks			15
Activity Details		Activity 1	Laboratory CIE-1, Record & Continuous evaluation			15
		Activity 2	ABL			5
Total Marks					50	
Self-Learning:						
1. Applets, string handling.						
Practice coding daily on platforms like:						
• HackerRank • LeetCode						
Laboratory Component						
PART – A : Fixed Experiments (Minimum 10)						

SLNO	Programs	Hours
1.	Design a Java application for a Digital Library Book Management System . Create a Book class with attributes such as Book ID, Title, Author, and Availability Status . Implement methods to issue and return books, updating the availability status accordingly, and display the current details of the book.	2
2.	Develop a Java application to process the results of an online examination. Store the marks obtained in multiple subjects using arrays , calculate the total marks, average, and grade , and display the student's result using appropriate operators and control statements.	1
3.	Develop a Java application for Malnad College of Engineering to maintain student academic records. The application should store student details and course information , calculate the attendance percentage , determine examination eligibility based on attendance and internal assessment marks, and display the complete student academic record.	1
4.	Develop a menu-driven Java application that allows users to perform banking operations such as Balance Inquiry, Deposit, Withdrawal, and Exit . Implement the application using switch statements and looping constructs to repeatedly display the menu until the user chooses to exit.	1
5.	Develop a Java application to automate the payroll system of an organization. Create a superclass Employee containing common employee details and two subclasses, TeachingStaff and NonTeachingStaff, that inherit these details. Calculate the total salary by adding the appropriate allowances for each employee category and display the payroll details.	2
6.	Develop a Java application for an Online Shopping System . Create a superclass Product with common attributes such as Product ID, Product Name, and Price , and a subclass ElectronicsProduct with an additional attribute Warranty Period . Use the super keyword to invoke the superclass constructor and access superclass members while displaying the product details.	1
7.	Develop a Java application for a Vehicle Rental System . Create a superclass Vehicle and subclasses Car and Bike. Override the displayDetails() method in each subclass and use a superclass reference to invoke the appropriate overridden method at runtime, demonstrating runtime polymorphism .	2
8.	Develop a Java application for a banking system where the account number cannot be modified after it is assigned. Use the final keyword for variables and methods wherever appropriate to prevent modification and overriding, thereby ensuring data integrity.	1
9.	Develop a Java application for a Smart Home Automation System . Define an interface SmartDevice with the methods turnOn() and turnOff(). Implement the interface in classes such as Fan, Light, and AirConditioner, and demonstrate the operation of each smart device.	1
10.	Develop a Java application for an Online Shopping System that processes customer orders and generates invoices. Implement appropriate exception handling using try, catch, and finally blocks. Ensure that, irrespective of whether an exception occurs during payment processing, the application always closes the database or file connection using the finally block and displays an appropriate status message.	2
PART - B : Open-Ended Experiments		
SLNO	Open-Ended Problem Statement	

1.	Develop a Java application using String class methods.
2.	Develop a Java application using data types, operators, and type casting.
3.	Develop a Java application using constructor overloading and the 'this' keyword.
4.	Develop a Java application using static members and an inner class.
5.	Develop a Java application using multilevel inheritance.
6.	Develop a Java application using abstract classes.
7.	Develop a Java application using multiple interfaces.
8.	Develop a Java application using packages.
9.	Develop a Java application using custom exceptions.
10.	Develop a Java application using multithreading.

Note: PART-A and PART-B experiments are both considered for CIE. Students answer 1 (one) question from PART-A and 1 (one) question from PART-B. The PART-B (open-ended) question set for CIE/SEE shall be any open-ended problem not done in regular lab sessions.

Activity Based Learning

Develop a java application for the identified problems using OOP concepts.

Evaluation of Learning Process (6 Hours)

Type of Evaluation	Hours
Test (1, 2)	3
Semester End Exam	3
Total	6

Course Articulation matrix

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

Course Title		DATA STRUCTURES LABORATORY	
Course Code	25CS305	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
CIE	50 Marks	Total Hours	28P+2EV = 30
SEE	50 Marks		
Course Objective: Design and implement various data structures.			
Course Outcomes (COs): Upon the completion of the course the students will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop programs to demonstrate applications of data structures	3, 5,11	2
2.	Document the programs executed	9,11	-
Course Contents:			
PART – A Programs			
1.	Files are placed one over another in my study room. The file which is at the top is the first one to be removed, i.e. the file which has been placed at the bottom most position remains in the pile of files for the longest period of time. Help me out to add a file and remove the bottom most file from the pile of files.		
2.	Assume you have converted an algebraic expression into its postfix form to process the expression fast. This expression need to be evaluated for a given set of values.		
3.	a) Suppose you want to search a text book in a huge library where books are arranged in alphabetical order. Optimize your search by using recursion. b) Implement Tower of Hanoi problem using recursion.		
4.	Assume you come across a toll gate while you are on your way to home town. Illustrate the working of the toll gate using suitable data structure.		
5.	Consider a traffic signal controlled by a computer system. Traffic signal has three colors: Red, yellow and Green. All these glow in a circular fashion based on the traffic. Implement the above using suitable data structure.		
6.	Consider a treasure hunt task where a series of clues are given. Clue1 gives hint to clue2, clue2 Provides hint for clue3 and so on until you can get a hint to the final treasure. Develop an illustration to demonstrate the above scenario.		
7.	The parking lot has a fixed number of parking spaces. Cars can enter the parking lot and occupy an available space, and they can also exit the parking lot, freeing up the space for other cars. Designing a parking lot management system using a circular linked list to simulate circular queue.		
8.	The phonebook will contain a list of contacts sorted in ascending order based on their names. Each contact will have a name and a phone number. Developing a phonebook management system using an ordered linked list.		
9.	Assume you have an iPod, where in you have stored plenty of songs so that you get engaged during a long journey. If you want to hear a particular song, you need to use forward button to reach that song and can also traverse back using backward button. Implement the following using relevant data structure.		
10.	Your text book contains chapters, sections, subsections, subdivisions, etc. Illustrate this scenario of text book using tree structure.		
PART – B Programs			
1.	Develop a Stack application for a real-world scenario and demonstrate its operations.		

2.	Demonstrate real time applications of Queue implementing INSERTION, DELETION and PEEK operations
3.	Apply recursion to solve computational problems through recursive techniques.
4.	Model a real-world application using a Singly Linked List with insertion, deletion, searching, and traversal operations.
5.	Simulate a cyclic application using a Circular Singly Linked List with insertion, deletion, searching, and traversal operations.
6.	Develop a real-time application by implementing insertion, deletion, forward traversal, and backward traversal operations using a Doubly Linked List.
7.	Construct a hierarchical application using Trees with insertion, deletion, searching, and traversal operations.

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Laboratory CIE	20
Continuous Evaluation	Conduction of experiments	30
Total		50

Teaching - Learning – Evaluation Scheme

Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching	2	14	28
2.	Evaluation of Learning Process			2
Total Learning Hours / Semester				30

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	3	-	3	-	-	-	-	-	3	-	3
CO2	-	-	-	-	-	-	-	-	3	-	3	-	-

NOTE : Students have to execute ONE program from PART-A and ONE from PART-B in laboratory CIE and SEE

Course Title	UNIX AND SHELL PROGRAMMING LABORATORY		
Course Code	25CS306	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	2
CIE	50 Marks	Total Hours	28P+2EV = 30
SEE	50 Marks		

Course Objective: Equip students to apply Unix fundamentals in executing commands and utilities for practical computing tasks.

Course Outcomes (COs): Upon the completion of the course the students will be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply Unix utilities and commands to perform file manipulation, retrieve system information, and facilitate user communication effectively.	1	-
2.	Develop solutions to given problems using shell scripting concepts and document the implementation effectively.	3	1

Course Contents:

Practice Programs

1.	Engage in self-directed practice of Unix commands such as man, echo, passwd, uname, who, date, cal, banner, tty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, date, touch, clear, more, wc, cmp, diff, comm, head, tail, cut, paste, sort, and tr.
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PART A

1.	Write a shell script to evaluate a given expression involving many arithmetic operators.
2.	a. Write a shell script to search a given pattern in file, if found display the message “Found” or else display “Not found”. Accept the pattern and input file as command line arguments. Display appropriate message if the input is not properly entered. b. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
3.	a) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else. Also check whether the given file has read, write and execute permission. b) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
4.	a) Write a shell script to display all the process running in the system five times at regular interval of 30 sec. b) Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.
5.	Write an interactive shell program which offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the user for the necessary information, such as the file name, new name and so on.
6.	Write a shell script to accept a string as a command line argument and perform the following string operations: i. To find the length of a given string. ii. To reverse the String iii. To extract a sub-string from a given string. .
7.	Write a menu driven shell script to perform the following: i. List of users who are logged in ii. List of files in the current directory iii. List of processes of users iv. Today’s date

	v. Quit to Unix				
8.	a) Write a shell script to display a message “Unix Shell Programming” specified number of times, using function. b) Write a shell script to display all variables in shell scripts that are LOCAL and GLOBAL using functions				
9.	Write an awk script that accepts date argument in the form of dd-mm-yy and displays it in the form if month, day and year. The script should check the validity of the argument and in the case of error, display a suitable message.				
10.	Write a shell script for monitoring disk space and CPU load average.				
PART B (Open end Problems)					
1.	Scripting on arithmetic operations.				
2.	Scripting based on filters using regular expression.				
3.	Scripting on files and directories.				
4.	Scripting for basic process status using looping.				
5.	Scripting for file handling.				
6.	Scripting for String handling.				
7.	Scripting on selection control structure				
8.	Scripting on functions.				
9.	Scripting based on awk.				
10.	Scripting on essential Unix system administration health check				
Pre-requisite (If any): Fundamental of C Programming Language					
Text Books					
Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Unix Concepts and Applications	Sumitabha Das	4	McGraw Hill	2017
EBOOKS/MOOC:					
https://www.coursera.org/learn/hands-on-introduction-to-linux-commands-and-shell-scripting					
https://www.udemy.com/topic/shell-scripting/					
Online Courses and Video Lectures:					
https://onlinecourses.swayam2.ac.in/e-learning/preview/aic20_sp05					
Teaching - Learning – Evaluation Scheme					
Teaching - Learning Method		No. of Hours/ Week	No. of Weeks	Hours/ Semester	
Laboratory Teaching		2	14	28	
Evaluation of Learning Process				2	
Total Learning Hours / Semester				30	
Proposed Assessment Plan (for 50 marks of CIE):					
Tool		Remarks			Marks
CIE		Laboratory CIE - conducted for 50 marks and scaled down to 20			20
Continuous Evaluation		Continuous Evaluation in every lab session by the Course Coordinator			30
Total				50	
Teaching - Learning – Evaluation Scheme					
Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester	
1.	Laboratory Teaching	2	14	28	
2.	Evaluation of Learning Process			2	
Total Learning Hours / Semester				30	
Evaluation of Learning Process (6 Hours)					

Conducting Lab CIE for the listed program Part A & Open-ended question not done in regular lab sessions under PART-B

Course Articulation matrix

[illegible]

Course Title	DATA ANALYSIS USING R		
Course Code	25CS307A	(L-T-P) C	(0-0-2) 1
Exam	3	Hours/Week	2
CIE	50 Marks	Total Hours	28P+2EV = 30
SEE	50 Marks		
Course Objective: To learn and Practice Programming techniques using R Programming.			
Course Outcomes (COs): Upon completion of the course, students shall be able to			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply R programming concepts to develop solutions for data analysis and visualization problems.	1, 5, 11	1, 2
2.	Develop analytical applications and mini-projects using R programming to perform data processing, statistical analysis, visualization, reporting, and interpretation of real-world datasets.	3, 5, 8, 9, 11	1, 2
Course Contents:			
Practice Programs: (Self Learning)			
1. Installation of R Studio 2. Write an R Program to take input from the user (name and age) and display the values. Also print the version of R installation. 3. Write an R Program to get the details of the objects in memory. 4. Write an R Program to create a sequence of numbers from 20 to 50 and find the mean and product of numbers from 20 to 60 and sum of numbers from 51 to 91. 5. Write an R Program to multiply two vectors of integer's type and length 3.			
PART A			
1. Demonstrate the steps for installation of R and R Studio. Perform the following: a) Assign different type of values to variables and display the type of variable. Assign different types such as Double, Integer, Logical, Complex and Character and understand the difference between each data type. b) Demonstrate Arithmetic and Logical Operations with simple examples. c) Demonstrate generation of sequences and creation of vectors. d) Demonstrate Creation of Matrices e) Demonstrate the Creation of Matrices from Vectors using Binding Function. f) Demonstrate element extraction from vectors, matrices and arrays 2. Assess the Financial Statement of an Organization being supplied with 2 vectors of data: Monthly Revenue and Monthly Expenses for the Financial Year. You can create your own sample data vector for this experiment) Calculate the following financial metrics: a. Profit for each month. b. Profit after tax for each month (Tax Rate is 30%). c. Profit margin for each month equals to profit after tax divided by revenue. d. Good Months – where the profit after tax was greater than the mean for the year. e. Bad Months – where the profit after tax was less than the mean for the year. f. The best month – where the profit after tax was max for the year. g. The worst month – where the profit after tax was min for the year. Note: a. All Results need to be presented as vectors b. Results for Dollar values need to be calculated with \$0.01 precision, but need to be presented in Units of \$1000 (i.e 1k) with no decimal points c. Results for the profit margin ratio need to be presented in units of % with no decimal point. d. It is okay for tax to be negative for any given month (deferred tax asset) e. Generate CSV file for the data. 3. Develop a program to create two 3 X 3 matrices A and B and perform the following operations a) Transpose of the matrix b) addition c) subtraction d) multiplication 4. Develop a program to find the factorial of given number using recursive function calls.			

5. Develop an R Program using functions to find all the prime numbers up to a specified number by the method of Sieve of Eratosthenes.
6. The built-in data set mammals contain data on body weight versus brain weight. Develop R commands to:
 - a) Find the Pearson and Spearman correlation coefficients. Are they similar?
 - b) Plot the data using the plot command.
 - c) Plot the logarithm (log) of each variable and see if that makes a difference.
7. Develop R program to create a Data Frame with following details and do the following operations.

Item code	Item category	Item price
1001	Electronics	700
1002	Desktop Supplies	300
1003	Office Supplies	350
1004	USB	400
1005	CD Drive	800

- a) Subset the Data frame and display the details of only those items whose price is greater than or equal to 350.
 - b) Subset the Data frame and display only the items where the category is either “Office Supplies” or “Desktop Supplies”
 - c) Create another Data Frame called “item-details” with three different fields item_Code, ItemQtyonHand and ItemReorderLvl and merge the two frames
8. Let us use the built-in dataset air quality which has Daily air quality measurements in New York, May to September 1973. Develop R program to generate histogram by using appropriate arguments for the following statements.
 - a) Assigning names, using the air quality data set.
 - b) Change colors of the Histogram
 - c) Remove Axis and Add labels to Histogram
 - d) Change Axis limits of a Histogram
 - e) Add Density curve to the histogram
9. Design a data frame in R for storing about 20 employee details. Create a CSV file named “input.csv” that defines all the required information about the employee such as id, name, salary, start_date, dept. Import into R and do the following analysis.
 - a) Find the total number rows & columns
 - b) Find the maximum salary
 - c) Retrieve the details of the employee with maximum salary
 - d) Retrieve all the employees working in the IT Department.
 - e) Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file “output.csv”
10. Using the built in dataset mtcars which is a popular dataset consisting of the design and fuel consumption patterns of 32 different automobiles. The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973-74 models). Format A data frame with 32 observations on 11 variables : [1] mpg Miles/(US) gallon, [2] cyl Number of cylinders [3] disp Displacement (cu.in.), [4] hp Gross horsepower [5] drat Rear axle ratio,[6] wt Weight (lb/1000) [7] qsec 1/4 mile time, [8] vs V/S, [9] am Transmission (0 = automatic, 1 = manual), [10] gear Number of forward gears, [11] carb Number of carburetors
Develop R program, to solve the following:
 - a) What is the total number of observations and variables in the dataset?
 - b) Find the car with the largest hp and the least hp using suitable functions
 - c) Plot histogram / density for each variable and determine whether continuous variables are

normally distributed or not. If not, what is their skewness?

d) What is the average difference of gross horse power (hp) between automobiles with 3 and 4 number of cylinders (cyl)? Also determine the difference in their standard deviations.

e) Which pair of variables has the highest Pearson correlation?

PART B (Open end Problems)

1. Exploring R Programming Fundamentals

Tasks

- Create variables of different data types (Integer, Double, Logical, Character, and Complex). Investigate how R identifies each data type and compare their characteristics.
- Design and execute arithmetic, relational, and logical expressions using your own input values. Interpret the results and identify scenarios where each operator is useful.
- Generate sequences and vectors using different R functions (such as `:`, `seq()`, `rep()`, and `c()`). Compare the outputs obtained using different approaches.
- Construct matrices using multiple methods, including direct initialization and matrix creation functions. Analyze how dimensions affect the arrangement of elements.
- Create matrices from vectors using row-binding (`rbind()`) and column-binding (`cbind()`). Experiment with vectors of different lengths and observe the outcomes.
- Perform element extraction and indexing on vectors, matrices, and arrays using different indexing techniques. Explore positive, negative, logical, and conditional indexing, and summarize your observations.

2. Financial Performance Analysis Using R

Tasks

- Create or import two vectors representing **monthly revenue** and **monthly expenses** for 12 months.
- Develop an R program to calculate the following financial metrics:
 - Monthly profit.
 - Monthly profit after tax (assume a tax rate of **30%**).
 - Monthly profit margin (profit after tax divided by revenue).
 - Identify **good months** where profit after tax exceeds the annual average.
 - Identify **bad months** where profit after tax falls below the annual average.
 - Determine the **best-performing month** and **worst-performing month** based on profit after tax.
- Present all computed results as vectors. Format:
 - Monetary values in **thousands of dollars (or ₹ thousands)** with no decimal places.
 - Profit margins as percentages without decimal places.
- Export the complete financial dataset, along with all computed metrics, to a **CSV file**.
- Create suitable visualizations (e.g., bar charts, line charts, or pie charts) to illustrate trends in revenue, expenses, profits, and profit margins.
- Analyze the generated results and prepare a brief report highlighting:
 - Overall financial performance.
 - Seasonal trends or anomalies.
 - Months with exceptional performance.
 - Recommendations for improving profitability.

3. Matrix Operations and Analysis Using R

Tasks

- Create two matrices (**A** and **B**) of appropriate dimensions (minimum **3 × 3**) using user-defined or randomly generated values.
- Develop an R program to perform the following matrix operations:
 - Compute the transpose of each matrix.
 - Perform matrix addition and subtraction.
 - Perform matrix multiplication.

- d. Verify the compatibility conditions required for each operation.
- c) Interpret the results obtained from each operation and explain their significance.
- d) Modify the size and values of the matrices (e.g., 2×2 , 3×4 , 4×4) and observe how the results change. Identify operations that are not feasible and justify the reasons.
- e) Export the input matrices and the computed results to a **CSV file** or generate a formatted report.

4. Recursive Programming for Mathematical Computation Using R

Tasks

- a) Design and implement a recursive function to calculate the **factorial** of a user-specified positive integer.
- b) Test the recursive function with different input values, including:
 - a. Small positive integers
 - b. Larger integers
 - c. Boundary cases (e.g., 0 and 1)
 - d. Invalid inputs (negative numbers or non-integer values) and implement appropriate error handling.
- c) Compare the recursive solution with an iterative approach in terms of:
 - a. Program logic
 - b. Number of function calls
 - c. Execution time
 - d. Memory utilization
- d) Display the computed factorial values and document your observations on the advantages and limitations of recursion.

5. Prime Number Generation Using the Sieve of Eratosthenes in R

Tasks

- a) Design and implement an R program using **functions** to generate all prime numbers up to a user-specified number using the **Sieve of Eratosthenes**.
- b) Accept different input values and display:
 - a. The list of prime numbers.
 - b. The total number of prime numbers generated.
 - c. The largest prime number within the specified range.
- c) Validate the program for boundary and exceptional cases, including:
 - a. Values less than 2.
 - b. Large input values.
 - c. Invalid or non-numeric inputs.
- d) Measure and analyze the execution time of the algorithm for different input sizes and discuss its computational efficiency.

6. Exploratory Data Analysis and Correlation Using the problem specific Dataset in R

Tasks

- a) Load the equivalent dataset containing two numerical variables).
- b) Perform exploratory data analysis (EDA) by:
 - a. Summarizing the dataset.
 - b. Identifying missing values and outliers.
 - c. Computing descriptive statistics for both variables.
- c) Calculate and compare:
 - a. Pearson correlation coefficient.
 - b. Spearman rank correlation coefficient.
 - c. Interpret the similarities and differences between the two correlation measures.
- d) Visualize the relationship between body weight and brain weight using:
 - a. Scatter plot.
 - b. Appropriate labels, titles, and legends.
 - c. Trend line (if applicable).

- e) Apply suitable data transformations (e.g., logarithmic transformation) to one or both variables and:
 - a. Recalculate the correlation coefficients.
 - b. Generate transformed scatter plots.
 - c. Compare the transformed results with the original analysis.
- f) Summarize your observations and discuss how data transformation affects the strength and interpretation of relationships between variables.

7. Data Frame Manipulation and Data Integration Using R

Tasks

- a) Create a **Data Frame** representing an inventory database with fields such as:
 - a. Item Code
 - b. Item Category
 - c. Item Price
 - d. *(Students may use the given sample data or create their own dataset with at least 10 records.)*
- b) Perform the following data manipulation operations:
 - a. Retrieve items whose price is greater than or equal to a specified value.
 - b. Filter items belonging to one or more selected categories.
 - c. Sort the data frame based on price or category.
 - d. Display summary statistics for the numerical fields.
- c) Create another data frame containing inventory-related information such as:
 - a. Item Code
 - b. Quantity on Hand
 - c. Reorder Level
 - d. Supplier Name *(optional)*
- d) Merge the two data frames using an appropriate key and verify the correctness of the merged data.
- e) Export the merged dataset to a **CSV file** and generate a brief report summarizing the inventory status.

8. Exploratory Data Visualization Using the airquality Dataset in R

Tasks

- a) Load the built-in airquality dataset and perform preliminary exploration by:
 - a. Displaying the structure and summary of the dataset.
 - b. Identifying missing values.
 - c. Selecting one or more numerical variables suitable for visualization.
- b) Develop an R program to create histograms with different customization options, including:
 - a. Assigning appropriate titles and axis labels.
 - b. Applying different color schemes.
 - c. Modifying axis visibility and formatting.
 - d. Adjusting axis limits and bin widths.
 - e. Adding a density curve or other suitable distribution overlays.
- c) Compare multiple histogram configurations and explain how each customization improves or affects data interpretation.
- d) Interpret the distribution by identifying characteristics such as:
 - a. Central tendency.
 - b. Spread of the data.
 - c. Skewness.
 - d. Presence of outliers or unusual observations.
- e) Export the processed dataset and generated visualizations for documentation or reporting.

9. Student Academic Performance Analysis Using CSV Files in R

Tasks

- a) Create a **CSV file** containing details of **at least 20 students** with the following attributes:

- a. Student ID
 - b. Student Name
 - c. Department
 - d. Semester
 - e. Marks
 - f. Attendance Percentage
- b) Import the CSV file into R and perform the following analyses:
- a. Determine the total number of rows and columns.
 - b. Generate summary statistics for marks and attendance.
 - c. Identify the student(s) with the highest marks.
 - d. Retrieve students belonging to a selected department.
 - e. Filter students whose marks exceed a user-defined threshold and whose attendance is above a specified percentage.
 - f. Sort students based on marks or attendance.
- c) Export the filtered dataset into a new CSV file with an appropriate filename.
- d) Interpret the analytical results and prepare a brief report highlighting academic performance trends.

10. Healthcare Data Analysis Using the iris Dataset in R

Tasks

- a) Load the built-in iris dataset and examine its structure by:
 - a. Determining the number of observations and variables.
 - b. Displaying the data types and summary statistics.
 - c. Checking for missing values.
- b) Perform exploratory data analysis by:
 - a. Identifying the flowers with the maximum and minimum values for selected attributes.
 - b. Comparing feature values among different species.
 - c. Summarizing the dataset using descriptive statistics.
- c) Visualize the dataset using appropriate graphical techniques such as:
 - a. Histograms
 - b. Density plots
 - c. Box plots
 - d. Scatter plots
 - e. Analyze the distribution of numerical variables and comment on their normality, skewness, and presence of outliers.
- d) Perform statistical analysis by:
 - a. Comparing the mean and standard deviation of selected features across different species.
 - b. Computing Pearson correlation coefficients among numerical variables.
 - c. Identifying the pair of variables exhibiting the strongest correlation.
- e) Interpret the analytical results and discuss how different flower characteristics contribute to species classification.

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	2	14	28
2.	Evaluation of Learning Process	-	-	2
Total Learning Hours / Semester				30
Proposed Assessment Plan (for 50 marks of CIE):				
Tool	Remarks			Marks
CIE	Laboratory CIE - conducted for 50 marks and scaled down to 20			20

Continuous Evaluation		Continuous Evaluation in every lab session by the Course Coordinator										30	
Total Marks												50	
Evaluation of Learning Process													
Conducting Lab CIE for the listed program Part A & Open-ended question not done in regular lab sessions under PART-B													
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	1	2	2
CO2	-	-	3	-	3	-	-	3	3	-	2	2	2

Course Title	DATA ANALYTICS WITH EXCEL		
Course Code	25CS307B	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
CIE	50 Marks	Total Hours	28L+2EV = 30
SEE	50 Marks		

Course Objective: To perform Data analytics using Excel.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply Microsoft Excel tools and functions to perform data management, calculations, data import, sorting, filtering, lookup operations, and What-If analysis for solving business and organizational problems.	1, 5, 11	1, 2
2.	Develop interactive reports, dashboards, Pivot Tables, charts, infographics, and analytical visualizations using Microsoft Excel, and document the laboratory experiments effectively.	3, 5, 8, 9, 11	1, 2

Course Contents:

PART A

1.	In a company, 30 employee details (name, Date of Joining, Qualification, and Salary) are stored in MySQL(XAMPP). Using Excel tool import the data from different sources for analysis and perform the following: Show average salary. Show salary between 30000/- and 50000/- Sort the employee list on the date of joining.					
2.	Suppose a class of size 40 having SGPA of 8 semesters between 5 to 10. Calculate the CGPA of each student in below Grade form:					
	O	S	A	B	C	
	10 $\geq$ 9	8 - 8.9	7 – 7.9	6 – 6.9	5 – 5.9	
3.	Create 40 students name in the form of First name, Middle name and Last name. Concatenate all the names and store in one column and also find the length of each name.					
4.	Suppose your customer survey results from the east and west regions, month wise are					
	Month	East	West	Low (<50%)	Medium (50%-80%)	High (>80%)
	Apr-15	86.4%	63.0%	50%	30%	20%
	May-15	45.8%	58.9%	50%	30%	20%
	Jun-15	44.1%	81.6%	50%	30%	20%
	Jul-15	77.6%	86.1%	50%	30%	20%
	Aug-15	80.7%	95.0%	50%	30%	20%
	For the above data, display customer satisfaction survey using Band Chart					
5.	A Person takes a loan of Rs. 5,00,000/- for a tenure of 30 years, find the monthly payments (EMI) for the varied interest rates (Assume interest rate start with 12% and incremented by 2% in each month). Calculate the amount of interest and Principal that is paid in the second year. (use what if Analysis tool)					
6.	Suppose there is a bookstore that has 100 books in storage. The original price of the book is 250 and certain number of books was sold at that price. Later, the bookstore announced a 10% discount on that book and cleared off the stock. You might want to know how many books are sold at the original price to obtain total revenue of 25,500.					
7.	Suppose you want to have a report displaying the following – (Explore Data using Pivot Table)					
	a. Data for five disciplines - Archery, Diving, Fencing, Figure Skating and Speed Skating.					
	b. Regions that scored more than 80 medals in these 5 disciplines.					

	c. The count of medals in each of the five disciplines in each of these regions. d. Total count of medals for the five disciplines in each of these regions.
8.	Consider the data of 30 employees are stored in two different tables. First table consists of name, employee ID and Second table consists of employee ID, salary. Find the employee salary using lookup table from second table to first.
9.	In Olympic, 20 countries participated and won various medals by male and female in equal proportions. Display the medal count for each country with the charts (Pie, Column, Bar, Line, Scatter, and Bubble).
10.	Consider the sequence of data from 1 to 100, where Male are 48% and Female are 52% in the data. For the given data create Male vs Female Info-graphic Chart, Male vs Female Ratio Chart and Waffle chart.

PART B (Open end Problems)

1.	Sales Data Analysis and Business Reporting Using Microsoft Excel Tasks a) Create a Sales database in MySQL (XAMPP) containing at least 30 records with attributes such as: - Product ID - Product Name - Category - Quantity Sold - Unit Price - Sales Date - Region b) Import the sales data into Microsoft Excel using appropriate data import methods (CSV, ODBC, or Power Query). c) Perform the following analyses: - Determine the total number of records and fields. - Calculate the total and average sales for each product category. - Filter products with sales greater than a user-defined threshold. - Sort the sales records based on sales amount or sales date. - Identify the top five best-selling products.												
2.	Patient Health Assessment and Risk Classification Using Microsoft Excel Tasks a) Create a dataset containing records of at least 40 patients with the following attributes: - Patient ID - Patient Name - Eight Health Assessment Scores (Assessment 1 to Assessment 8) b) Calculate the Overall Health Index for each patient as the average of the eight assessment scores. c) Classify patients into the following health categories: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Health Index</th><th>Category</th></tr> </thead> <tbody> <tr> <td>9.0 – 10.0</td><td>Excellent</td></tr> <tr> <td>8.0 – 8.9</td><td>Very Good</td></tr> <tr> <td>7.0 – 7.9</td><td>Good</td></tr> <tr> <td>6.0 – 6.9</td><td>Fair</td></tr> <tr> <td>5.0 – 5.9</td><td>Needs Attention</td></tr> </tbody> </table> d) Perform the following analyses: - Count the number of patients in each health category. - Identify patients with the highest and lowest Health Index.	Health Index	Category	9.0 – 10.0	Excellent	8.0 – 8.9	Very Good	7.0 – 7.9	Good	6.0 – 6.9	Fair	5.0 – 5.9	Needs Attention
Health Index	Category												
9.0 – 10.0	Excellent												
8.0 – 8.9	Very Good												
7.0 – 7.9	Good												
6.0 – 6.9	Fair												
5.0 – 5.9	Needs Attention												

	c. Calculate the average Health Index of all patients. d. Highlight patients requiring immediate medical attention using conditional formatting.								
3.	Product Catalog Management Using Microsoft Excel Tasks a) Create a dataset containing details of at least 40 products with the following attributes: a. Brand Name b. Product Model c. Product Variant b) Use appropriate Excel text functions to: a. Concatenate the three fields into a single Product Description. b. Determine the length of each product description. c. Convert the product description to uppercase, lowercase, and proper case. d. Remove extra spaces, if any, using suitable text functions. c) Sort the products based on the length of the product description. d) Identify: a. Product with the longest description. b. Product with the shortest description. c. Average length of product descriptions.								
4.	Monthly Power Consumption Analysis Using Band Charts in Microsoft Excel Tasks a) Create a dataset containing monthly energy efficiency (%) for two service zones (North and South) over a period of at least six months. b) Define performance bands as follows (students may modify the thresholds based on their analysis): <table border="1"> <thead> <tr> <th>Efficiency (%)</th><th>Performance Band</th></tr> </thead> <tbody> <tr> <td>Less than 50%</td><td>Low</td></tr> <tr> <td>50% – 80%</td><td>Medium</td></tr> <tr> <td>Greater than 80%</td><td>High</td></tr> </tbody> </table> c) Using Microsoft Excel: a. Organize the data appropriately. b. Create a Band Chart to visualize the efficiency levels across the defined performance bands. c. Compare the performance of the two service zones over time. d) Analyze the chart and identify: a. Months with high, medium, and low efficiency. b. The best and worst performing service zone. c. Overall performance trends during the observation period. e) Summarize your findings and suggest measures to improve efficiency in underperforming months.	Efficiency (%)	Performance Band	Less than 50%	Low	50% – 80%	Medium	Greater than 80%	High
Efficiency (%)	Performance Band								
Less than 50%	Low								
50% – 80%	Medium								
Greater than 80%	High								
5.	Equipment Leasing Cost Analysis Using Microsoft Excel Tasks a) Assume the following details: a. Equipment Cost: ₹8,00,000 b. Lease Period: 10 years c. Initial Annual Interest Rate: 8% d. Increase the interest rate by 1% for each scenario up to 16%. b) Using Excel financial functions:								

	a. Calculate the monthly lease payment (EMI) for each interest rate. b. Determine the interest amount and principal amount paid during the third year of the lease. c. Prepare an amortization schedule for the lease period. c) Use What-If Analysis (Data Table) to evaluate the effect of varying interest rates on monthly payments. d) Visualize the relationship between interest rate and monthly EMI using appropriate charts. e) Interpret the results and recommend the most economical financing option.
6.	Event Ticket Revenue Analysis Using Microsoft Excel Tasks a) Assume the following details: a. Total Tickets Available: 500 b. Original Ticket Price: ₹1,000 c. Discount Offered on Remaining Tickets: 15% d. Target Revenue: ₹4,60,000 b) Develop an Excel worksheet to: a. Calculate the revenue generated from tickets sold at the original price. b. Calculate the revenue from tickets sold after applying the discount. c. Determine the total revenue generated. d. Calculate the number of unsold tickets before the discount is applied. c) Use Goal Seek to determine the number of tickets that must be sold at the original price to achieve the specified target revenue.
7.	Retail Store Sales Analysis Using Pivot Tables in Microsoft Excel Tasks a) Create or import a sales dataset containing at least 100 records with the following attributes: a. Order ID b. Product Category c. Product Name d. Region e. Quantity Sold f. Sales Amount g. Order Date b) Select five product categories (e.g., Electronics, Furniture, Grocery, Clothing, and Sports). c) Using Pivot Tables, perform the following analyses: a. Display sales data for the selected five product categories. b. Identify regions where the total sales amount exceeds ₹5,00,000 (students may choose an appropriate threshold). c. Display the total quantity sold for each selected category in those regions. d. Calculate the overall sales amount for the selected categories in each qualifying region. d) Create Pivot Charts to visualize: a. Category-wise sales across regions. b. Region-wise total sales. c. Contribution of each product category to total sales. e) Interpret the results and recommend strategies to improve sales performance in low-performing regions.

8.	Library Book Inventory Management Using Lookup Functions in Microsoft Excel Tasks a) Create two worksheets containing at least 30 book records. a. Worksheet 1 – Book Details b. Book ID c. Book Title d. Author e. Category f. Worksheet 2 – Inventory Details g. Book ID h. Available Copies i. Shelf Location j. Book Price b) Use appropriate lookup functions (VLOOKUP, XLOOKUP, or INDEX-MATCH) to: a. Retrieve the available copies and price of each book into the first worksheet. b. Identify books with low stock (e.g., fewer than 5 copies). c. Display "Out of Stock" for books with zero available copies. c) Validate the retrieved data and resolve any missing or unmatched records. d) Generate summary statistics such as: a. Total number of books available. b. Average book price. c. Number of books in each category. e) Create charts or Pivot Tables to visualize inventory distribution and category-wise book availability.
9.	University Admission Analysis and Data Visualization Using Microsoft Excel Tasks a) Create a dataset containing admission details for 20 departments with the following attributes: a. Department Name b. Number of Male Students c. Number of Female Students d. Total Students b) Ensure that the dataset contains realistic admission figures (students may generate their own sample data). c) Create the following charts to visualize the admission statistics: a. Pie Chart b. Column Chart c. Bar Chart d. Line Chart e. Scatter Chart f. Bubble Chart d) Analyze the visualizations and identify: a. Department with the highest and lowest student admissions. b. Gender-wise admission distribution across departments. c. Overall admission trends and patterns. d. Departments with balanced and unbalanced gender ratios. e) Prepare a summary report highlighting key observations and recommendations based on the graphical analysis.

10.	Market Share Visualization Using Infographic and Waffle Charts in Microsoft Excel Tasks a) Create a dataset representing 100 smartphone sales , categorized into: a. Brand A – 48% b. Brand B – 52% b) Using Microsoft Excel, create the following visualizations: a. Infographic Chart showing the sales distribution of the two brands. b. Ratio Chart comparing the market share of Brand A and Brand B. c. Waffle Chart representing the percentage contribution of each brand. c) Analyze the visualizations and identify: a. Which brand has the larger market share. b. The percentage difference between the two brands. c. How effectively each chart communicates the market share. d) Prepare a brief report discussing the advantages and limitations of each visualization technique for presenting categorical data.												
Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks										Marks	
CIE		Laboratory CIE - conducted for 50 marks and scaled down to 20										20	
Continuous Evaluation		Continuous Evaluation in every lab session by the Course Coordinator										30	
Total												50	
Teaching - Learning – Evaluation Scheme													
Sl. No	Teaching - Learning Method						No. of Hours/ Week		No. of Weeks		Hours/ Semester		
1.	Class Room Teaching						2		14		28		
2.	Evaluation of Learning Process						-		-		2		
Total Learning Hours / Semester												30	
Evaluation of Learning Process													
Conducting Lab CIE for the listed program Part A & Open-ended question not done in regular lab sessions under PART-B													
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	1	2	2
CO2	-	-	3	-	3	-	-	3	3	-	2	2	2

Course Title	DATA VISUALIZATION WITH PYTHON		
Course Code	25CS307C	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	02
CIE	50 Marks	Total Hours	28P + 2EV = 30
SEE	50 Marks		
Course Objective: To explore principles and techniques of data visualization using Python.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply Python programming and data visualization libraries (Matplotlib, Seaborn, Plotly, and GeoPandas) to analyze datasets and generate meaningful graphical representations.	1, 5, 11	1, 2
2.	Develop interactive data visualization applications and dashboards using Python libraries, and effectively document laboratory experiments and project outcomes.	3, 5, 8, 9, 11	1, 2
Course Contents:			
Practice Programs: (Self Learning)			
1. Installation of Pycharm 2. Importing numpy, CSV, matplotlib libraries.			
PART A			
1. Write a Python program to read data from a CSV file and create a line plot to visualize the trend over time. Customize the plot with appropriate labels, title, and color. 2. Load a dataset containing information about students' scores in different subjects. Create a scatter plot to visualize the relationship between two variables (e.g., math score vs. science score). Use Seaborn to enhance the plot with appropriate styling and add labels. 3. Given a dataset with multiple variables, create a figure with two subplots: one displaying a line plot and the other showing a bar chart. Customize the subplots with appropriate titles, legends, and colors. 4. Load a dataset containing information about employees' salaries across different departments. Create a box plot and a violin plot to visualize the distribution of salaries by department. Customize the plots and add appropriate labels and titles. 5. Load a dataset containing stock prices over time. Create a line plot to visualize the stock prices and add appropriate labels and titles. Format the x-axis tick labels to display the dates properly. 6. Load a dataset containing temperature readings over time. Create an interactive line plot using Plotly, which displays the temperature when hovering over the data points. Add appropriate labels and customize the plot's appearance. 7. Load a dataset with information about population density by country. Create a choropleth map using GeoPandas to visualize the population density. Customize the map's appearance and add a color legend. 8. Design and implement an interactive dashboard using Dash to display various visualizations. Include at least two interactive controls (e.g., dropdowns, sliders) to update the visualizations dynamically.			
PART B (Open end Problems)			
1	Stock Market Trend Analysis Using Python and Data Visualization Tasks a) Create or download a CSV file containing at least 30 observations with the following attributes: a. Date b. Opening Price c. Closing Price d. Highest Price e. Lowest Price f. Trading Volume b) Write a Python program to: a. Import the CSV file using an appropriate Python library. b. Read and inspect the dataset.		

	c. Handle missing or inconsistent values. d. Select the Closing Price (or any suitable attribute) for trend analysis. c) Create a line plot to visualize the selected variable over time by: a. Adding an appropriate title. b. Labeling the X-axis and Y-axis. c. Customizing the line color, style, markers, and grid. d. Formatting the date axis for improved readability. d) Analyze the graph to identify: a. Overall increasing or decreasing trends. b. Periods of significant growth or decline. c. Maximum and minimum stock prices. d. Possible reasons for unusual fluctuations (based on observations). e) Save the generated plot as an image and prepare a brief report summarizing the analysis.
2	Vehicle Performance Analysis Using Python and Seaborn Tasks a) Create or download a dataset containing at least 50 vehicle records with attributes such as: a. Vehicle Model b. Engine Capacity (cc) c. Horsepower d. Fuel Efficiency (km/l) e. Vehicle Weight (kg) f. Price b) Write a Python program to: a. Import the dataset using an appropriate library. b. Read and inspect the dataset. c. Handle missing or inconsistent values. d. Select two numerical variables (e.g., Engine Capacity vs. Fuel Efficiency or Horsepower vs. Vehicle Weight) for analysis. c) Create a Seaborn scatter plot to visualize the relationship between the selected variables by: a. Applying an appropriate Seaborn style. b. Adding axis labels and a meaningful title. c. Customizing marker size, color, and transparency. d. Including a legend (if applicable). d) Interpret the scatter plot by identifying: a. Positive, negative, or no correlation. b. Clusters or groups of similar vehicles. c. Outliers and possible reasons for their occurrence. e) Save the visualization as an image and prepare a brief report summarizing the observed relationship.
3	Hospital Patient Statistics Dashboard Using Python Subplots Tasks a) Create or download a dataset containing at least 30 observations with attributes such as: a. Month b. Number of Patients Admitted c. Number of Patients Discharged d. Number of Emergency Cases e. Average Treatment Cost b) Write a Python program to: a. Import the dataset using an appropriate library. b. Read and inspect the dataset. c. Handle missing or inconsistent values, if any. d. Select relevant variables for visualization. c) Create a figure containing two subplots: a. Subplot 1: A line plot showing the monthly trend of patient admissions. b. Subplot 2: A bar chart comparing the number of emergency cases across different months.

	d) Customize both subplots by: a. Adding meaningful titles. b. Labeling the X-axis and Y-axis. c. Including legends where appropriate. d. Applying suitable colors, gridlines, and figure layout for improved readability. e) Analyze the visualizations and identify: a. Months with the highest and lowest patient admissions. b. Trends in emergency cases over time. c. Possible relationships between admissions and emergency cases. f) Save the combined figure as an image and prepare a brief report summarizing the findings.
4	Product Price Analysis Across Categories Using Python Tasks a) Create or download a dataset containing at least 100 product records with attributes such as: a. Product ID b. Product Category c. Product Name d. Brand e. Price f. Customer Rating b) Write a Python program to: a. Import the dataset using an appropriate library. b. Read and inspect the dataset. c. Handle missing or inconsistent values. d. Explore summary statistics of the product prices. c) Create the following visualizations: a. Box Plot to compare the distribution of product prices across different categories. b. Violin Plot to examine the density and spread of prices within each category. d) Customize the visualizations by: a. Adding meaningful titles. b. Labeling the X-axis and Y-axis. c. Applying suitable colors and themes. d. Rotating category labels if required for better readability. e) Analyze the visualizations and identify: a. Categories with the highest and lowest median prices. b. Categories showing high price variation. c. Presence of outliers and possible reasons. d. Differences in price distribution among product categories. f) Save the generated plots as image files and prepare a brief report summarizing the observations.
5	Monthly Electricity Consumption Trend Analysis Using Python Tasks a) Create or download a dataset containing at least 12 months (or 50 observations) with attributes such as: a. Month/Date b. Consumer ID (optional) c. Electricity Consumption (kWh) d. Billing Amount e. Consumer Category (Residential/Commercial) b) Write a Python program to: a. Import the dataset using an appropriate Python library. b. Read and inspect the dataset. c. Handle missing or inconsistent values. d. Convert the date column into an appropriate date format. c) Create a line plot to visualize the monthly electricity consumption by: a. Adding a meaningful title. b. Labeling the X-axis and Y-axis. c. Formatting the date labels on the X-axis for better readability.

	d. Customizing the line style, color, markers, and grid. d) Analyze the visualization and identify: a. Months with the highest and lowest electricity consumption. b. Seasonal or periodic trends in electricity usage. c. Sudden increases or decreases in consumption and possible reasons. e) Save the generated plot as an image and prepare a brief report summarizing the observed trends.
6	Website Traffic Analysis Using Interactive Plotly Visualization Tasks a) Create or download a dataset containing at least 30 observations with attributes such as: a. Date b. Number of Website Visitors c. Page Views d. Average Session Duration (minutes) e. Bounce Rate (%) b) Write a Python program to: a. Import the dataset using an appropriate Python library. b. Read and inspect the dataset. c. Handle missing or inconsistent values. d. Convert the date column into an appropriate date format. c) Create an interactive line plot using Plotly to visualize the trend in the number of website visitors over time. d) Customize the visualization by: a. Adding a meaningful title. b. Labeling the X-axis and Y-axis. c. Displaying detailed information (such as date and visitor count) when the user hovers over data points. d. Applying suitable colors, markers, templates, and gridlines. e. Enabling zooming and panning for better data exploration. e) Analyze the interactive visualization and identify: a. Days with the highest and lowest website traffic. b. Overall traffic trends and seasonal patterns. c. Sudden spikes or drops in visitor count and possible reasons. f) Save the interactive visualization as an HTML file and prepare a brief report summarizing the observations.
7	Air Quality Index (AQI) Analysis Using GeoPandas Tasks a) Create or download a dataset containing AQI data for multiple cities, districts, or states with attributes such as: a. Region/State/District Name b. Air Quality Index (AQI) c. Latitude (optional) d. Longitude (optional) b) Obtain the corresponding geospatial boundary (Shapefile or GeoJSON) for the selected regions. c) Write a Python program to: a. Import the attribute dataset and geospatial dataset. b. Read and inspect both datasets. c. Merge the AQI data with the geographic boundaries using a common key. d. Handle missing or inconsistent values. d) Create a choropleth map using GeoPandas by: a. Displaying AQI values with an appropriate color gradient. b. Adding a color legend. c. Customizing the map title, boundary colors, and figure size. d. Removing unnecessary map elements to improve readability. e) Analyze the map and identify: a. Regions with the highest and lowest AQI values. b. Geographic patterns in air pollution.

	c. Areas requiring priority environmental interventions. f) Save the generated map as an image and prepare a brief report summarizing the findings.
8	Interactive Retail Sales Dashboard Using Dash Tasks a) Create or download a dataset containing at least 200 sales records with attributes such as: a. Order Date b. Product Category c. Product Name d. Region e. Sales Amount f. Quantity Sold g. Profit b) Develop an interactive dashboard using Dash that includes: a. At least two interactive controls, such as: i. Dropdown menu for selecting a product category. ii. Slider for filtering sales by date or profit range. iii. Radio buttons or checklist for selecting regions (optional). c) Display at least two dynamic visualizations, such as: a. Bar chart showing category-wise sales. b. Line chart showing monthly sales trends. c. Pie chart showing regional sales contribution. d. Scatter plot showing the relationship between sales and profit. d) Configure the dashboard so that the visualizations update automatically based on user selections. e) Include appropriate: a. Dashboard title b. Axis labels c. Legends d. Color themes e. Tooltips and hover information f) Evaluate the dashboard and summarize key business insights, including: a. Best-performing product categories. b. Regional sales performance. c. Monthly sales trends. d. High-profit and low-profit products.

Pre-requisite (If any): Fundamental of Python Programming

Text Books

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Python Data Visualization Using Plotly Framework	Stephen G Schmitt	1 st		2024

EBOOKS/MOOC:

<https://www.coursera.org/learn/python-for-data-visualization>

<https://www.edx.org/learn/data-visualization/ibm-visualizing-data-with-python>

Online Courses and Video Lectures:

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01435409413326438427/overview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	-	-	-
2.	Laboratory Teaching	2	14	28
3.	Student Study Hours – Self Learning	-	-	-
4.	Activity Based Learning (ABL1 & ABL2)	-	-	-
5.	Evaluation of Learning Process	-	-	2
Total Learning Hours / Semester				30

Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks										Marks	
CIE		Laboratory CIE - conducted for 50 marks and scaled down to 20										20	
Continuous Evaluation		Continuous Evaluation in every lab session by the Course Coordinator										30	
Total Marks												50	
Evaluation of Learning Process													
Conducting Lab CIE for the listed program Part A & Open-ended question not done in regular lab sessions under PART-B													
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	1	2	2
CO2	-	-	3	-	3	-	-	3	3	-	2	2	2

Course Title	VERSION CONTROLLER WITH GiT		
Course Code	25CS307D	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	02
CIE	50 Marks	Total Hours	28P + 2EV = 30
SEE	50 Marks		
Course Objective: To use GitLab/Git and utilize it for software development.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply Git commands and version control concepts to manage repositories, branches, commits, merges, conflict resolution, and repository history for software development.	1, 5, 11	1, 2
2.	Develop collaborative software projects using Git and GitHub by managing remote repositories, releases, project activities, and documenting laboratory experiments effectively.	3, 5, 8, 9, 11	1, 2
Course Contents:			
Practice Programs: (Self Learning)			
1. Installation of Desktop Git repository			
PART A			
1. Initializing a Repository: Initialize a new Git repository for a simple project. Add a few files to the repository and commit them. 2. Committing Changes: Make changes to the files in the repository and commit them. Practice creating meaningful commit messages 3. Creating and Switching Branches: Create a new branch in the repository, make changes in the branch, and switch between branches. 4. Merging Branches: Create a branch, make changes in both the main branch and the new branch, and merge the changes back into the main branch. 5. Resolving Merge Conflicts: Create a merge conflict by making conflicting changes in two different branches. Practice resolving the conflict using Git's conflict resolution tools. 6. Working with Remote Repositories: Clone a remote repository to your local machine. Make changes locally and push the changes back to the remote repository. 7. Collaborating with Others: Practice collaborating with others using Git. Clone a shared repository, make changes, push the changes, and pull changes made by others. 8. Reverting and Rolling Back Commits: Experiment with reverting commits and rolling back changes to a previous state in the repository using Git commands. 9. Tagging Releases: Tag a specific commit in the repository as a release version. Practice creating annotated tags and lightweight tags. 10. Ignoring Files: Create a .gitignore file to exclude certain files or directories from being tracked by Git. 11. Viewing Repository History: Use Git commands to view the commit history, explore differences between commits, and track changes made over time. 12. Branch Management: Practice creating, deleting, and renaming branches in the repository using Git commands.			
PART B (Open end Problems)			
1	Version Control for a Personal Portfolio Website Using Git Tasks a) Create a simple project (e.g., Personal Portfolio, Student Resume Website, or To-Do Application) containing at least three files , such as: a. index.html b. style.css c. README.md b) Initialize a Git repository in the project directory. c) Configure Git with your username and email (if not already configured). d) Add the project files to the staging area and create an initial commit with a meaningful commit message.		

	e) Modify one or more project files by adding new features or updating content, then: a. Check the repository status. b. Stage the modified files. c. Create a second commit with an appropriate message. f) Display the commit history and verify that all project changes have been recorded successfully.
2	Project Documentation Version Management Using Git Tasks a) Create a simple project folder containing at least the following files: a. README.md b. Installation.md c. Features.md b) Initialize a Git repository (or use an existing repository) and create an initial commit. c) Modify the project documentation by performing activities such as: a. Adding new project features. b. Updating installation instructions. c. Correcting formatting or grammatical errors. d. Including project screenshots or references (optional). d) After each logical modification: a. Check the repository status. b. Stage the updated files. c. Commit the changes using clear and meaningful commit messages that describe the purpose of the update. e) Display the commit history and analyze how the documentation has evolved over multiple versions.
3	Feature Development Using Git Branches Tasks a) Create a simple project containing at least the following files: a. README.md b. index.html (or main.py, app.java, etc.) c. style.css (or any supporting file) b) Initialize a Git repository and create an initial commit on the main branch. c) Create a new branch named feature-book-search (or any meaningful feature name). d) Switch to the newly created branch and perform one or more of the following: a. Add a new feature. b. Modify an existing file. c. Update project documentation. d. Create a new source code file. e) Commit the changes made in the feature branch with appropriate commit messages. f) Switch back to the main branch and verify that the new feature is not present. g) Switch again to the feature branch and confirm that the changes are available. h) Display all available branches and examine the commit history of each branch.
4	Collaborative Website Development Using Git Merge Tasks a) Create a simple project containing at least the following files: a. index.html b. style.css c. README.md b) Initialize a Git repository and make an initial commit on the main branch. c) Create a new branch named feature-events (or any meaningful branch name). d) Perform the following modifications: a. On the main branch: Update the homepage by adding a welcome message or modifying the layout. b. On the feature branch: Add an "Upcoming Events" section or create a new file related to event details. e) Commit the changes separately in both branches using meaningful commit messages. f) Merge the feature-events branch into the main branch. g) Verify that changes from both branches are successfully reflected in the main branch.

	h) Display the commit history and branch graph to observe the merge operation.
5	Managing Configuration Changes and Resolving Merge Conflicts Using Git Tasks - Create a simple project containing at least the following files: - README.md - config.txt (or config.json, .env, or settings.py) - main.py (or any source file) - Initialize a Git repository and make an initial commit on the main branch. - Create a new branch named feature-configuration. - Modify the same section of the configuration file differently in: - The main branch. - The feature-configuration branch. - Commit the changes separately in both branches using meaningful commit messages. - Attempt to merge the feature-configuration branch into the main branch and observe the merge conflict. - Resolve the conflict by: - Examining the conflicting sections. - Editing the file to retain the correct configuration. - Marking the conflict as resolved. - Completing the merge with an appropriate commit message. - Verify that the merged project functions correctly and display the repository history to confirm the successful conflict resolution.
6	Collaborative Documentation Management Using Remote Git Repository Tasks - Create or use an existing remote Git repository (e.g., GitHub, GitLab, or Bitbucket) containing a simple documentation project with files such as: - README.md - UserGuide.md - ReleaseNotes.md - Clone the remote repository to your local machine. - Verify the repository contents and configure Git (if required). - Modify the project by performing one or more of the following: - Update the user guide. - Add a new feature description. - Correct formatting or spelling errors. - Create an additional documentation file. - Stage and commit the changes using meaningful commit messages. - Push the committed changes to the remote repository. - Verify that the remote repository has been updated successfully by viewing the latest commit history.
7	Collaborative Open-Source Development Using Git Tasks - Create or use a shared remote repository containing a simple project with files such as: - README.md - tasks.py (or index.html) - requirements.txt (or any supporting file) - Clone the shared repository to your local machine. - Create a new branch for your assigned feature (e.g., feature-task-filter or feature-ui-update). - Implement a small enhancement or modification, such as: - Adding a new feature. - Improving the user interface. - Updating project documentation. - Fixing a minor issue. - Stage and commit the changes using meaningful commit messages. - Push your branch to the remote repository and merge it into the main branch using a Pull Request (or Merge Request). - Pull the latest changes made by other contributors into your local repository and verify that your local

	project is synchronized with the remote repository. h) Review the commit history and identify the contributions made by different collaborators.
8	Managing Software Releases Using Git Version History Tasks - Create a simple project containing at least the following files: - README.md - main.py (or index.html) - config.txt (or any supporting file) - Initialize a Git repository and create an initial commit. - Make a series of modifications to the project, such as: - Adding a new feature. - Updating the user interface or documentation. - Modifying configuration settings. - Fixing a bug. - Commit each modification separately using meaningful commit messages. - Simulate an incorrect update by introducing an intentional error in the project. - Use appropriate Git commands to: - Examine the commit history. - Restore the project to a previously stable version. - Revert a specific commit while preserving repository history. - Compare the project before and after the restoration. - Verify that the restored version functions correctly and document the changes made during the recovery process.
9	Software Version Release Management Using Git Tags Tasks - Create a simple project containing at least the following files: - README.md - main.py (or index.html) - menu.txt (or any supporting file) - Initialize a Git repository and create an initial commit. - Develop the project incrementally by implementing at least three logical updates, such as: - Adding a new feature. - Improving the user interface. - Fixing a bug. - Updating project documentation. - Commit each update with a meaningful commit message. - Create the following Git tags: - A lightweight tag for one stable version. - An annotated tag for another stable version, including version information and release notes. - Display all tags and examine the commit history to identify the tagged releases. - Checkout a tagged version and verify the project state corresponding to that release.
10	Managing Project Files Using .gitignore in Git Tasks - Create a simple project containing files and directories such as: - README.md - app.py (or index.html) - requirements.txt - logs/ - temp/ __pycache__/ .vscode/ (or any IDE configuration folder) - Initialize a Git repository and create an initial commit with the required project files. - Create a .gitignore file to exclude: - Log files (*.log) - Temporary files (*.tmp)

	c. Compiled files (*.pyc, *.class) d. Cache directories (__pycache__/) e. IDE configuration folders (.vscode/, .idea/) f. Any other generated or unnecessary files. d) Verify that the ignored files and directories are not tracked by Git while the required project files remain under version control. e) Modify the .gitignore file by adding new ignore rules and observe the effect on Git status. f) Document the purpose of each ignore rule and explain why excluding these files is considered a best practice.
11	Auditing Project Evolution Using Git Repository History Tasks a) Create a simple project containing at least the following files: a. README.md b. main.py (or index.html) c. config.txt (or any supporting file) b) Initialize a Git repository and create an initial commit. c) Make at least five logical updates to the project, such as: a. Adding a new feature. b. Updating documentation. c. Fixing a bug. d. Modifying configuration settings. e. Improving the user interface. d) Commit each modification with a meaningful commit message. e) Use appropriate Git commands to: a. Display the complete commit history. b. View concise and detailed commit logs. c. Compare differences between two selected commits. d. Identify which files were modified in each commit. e. Track the evolution of a selected file over multiple commits. f) Analyze the repository history and prepare a report highlighting: a. Major project milestones. b. Significant feature additions. c. Bug fixes and enhancements. d. Overall project evolution based on the commit history.
12	Managing Feature Development Through Git Branch Administration Tasks a) Create a simple project containing at least the following files: a. README.md b. main.py (or index.html) c. requirements.txt (or any supporting file) b) Initialize a Git repository and create an initial commit on the main branch. c) Create multiple branches representing different development activities, such as: a. feature-payment b. feature-search c. bugfix-login d) Switch between branches and make small modifications in each branch, committing the changes with meaningful commit messages. e) Rename one of the feature branches using the appropriate Git command to reflect an updated development requirement (e.g., rename feature-search to feature-advanced-search). f) Delete a branch that has completed its purpose and verify that only the required branches remain in the repository. g) Display all local branches and identify: a. Active development branches. b. Renamed branches. c. Deleted branches (verify removal). h) Document the branch management process and explain how effective branch organization supports

	collaborative software development.												
Pre-requisite (If any): Fundamental of Tools operations													
Text Books													
Sl.No	Book Title				Authors				Edition		Publisher		Year
1.	Version Control with Git				Prem Kumar Ponuthorai, Jon Loeliger				3 rd		O'Reilly Media Inc		2022
EBOOKS/MOOC: https://www.oreilly.com/library/view/version-control-with/9781492091189/													
Online Courses and Video Lectures:													
1. https://www.coursera.org/learn/version-control-with-git													
2. https://www.classcentral.com/course/microsoft-learn-introduction-to-version-control-with-git-2391													
Teaching -Learning– Evaluation Scheme:													
Sl. No	Teaching and Learning Method						No. of Hours/ Week		No. of Weeks		Hours/ Semester		
1.	Laboratory Teaching						2		14		28		
2.	Evaluation of Learning Process						-		-		2		
Total Learning Hours / Semester											30		
Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks										Marks	
CIE		Laboratory CIE - conducted for 50 marks and scaled down to 20										20	
Continuous Evaluation		Continuous Evaluation in every lab session by the Course Coordinator										30	
Total Marks											50		
Evaluation of Learning Process													
Conducting Lab CIE for the listed program Part A & Open-ended question not done in regular lab sessions under PART-B													
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	1	2	2
CO2	-	-	3	-	3	-	-	3	3	-	2	2	2

Course Title	Community Project / Societal Project		
Course Code	25SCR	(L-T-P)C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
CIE + SEE	50 marks + 50 Marks	Total Hours	30

Course Objective: The Community Project / Societal Project is a practical, project-based learning course that builds students' awareness on Educational Social Responsibility (ESR). It focuses on real issues such as the adaptation of technology for rural and urban development, the application of tools for enhanced governance in civic societies, and sustainable technological solutions for better living. Students may work individually or in groups of up to four, including interdisciplinary topics, and assessment is based on the prescribed rubrics.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Identify and analyze societal problems through field interaction and technical assessment.	1,2,3,4,6,9	-
2	Develop skills in project planning, field survey, data collection, implementation, documentation and reporting.	1,2,3,4,5,8,9,10	-
3	Apply principles of social responsibility in engineering practice through community-oriented interventions	1,2,3,5,6,7,10	-
4	Formulate feasible societal problem statements and solutions considering practical constraints and sustainability aspects.	6, 7	-
5	Exhibit multidisciplinary learning and problem-solving ability based on collected data, user feedback and baseline conditions.	2,3,4,5,8,9,11	-
6	Demonstrate teamwork and communication skills while interacting with technical and non-technical stakeholders and reflect on project impact on society.	6,8,9,10,11	-

Restrictions and professional conduct:

Community / Societal Projects shall remain **academic, socially responsible, technically focused, and politically neutral**. Students and faculty shall maintain professionalism, ethical conduct, public respect and institutional integrity while interacting with communities, public groups, organizations and stakeholders. Students and faculty shall avoid the following during project execution:

- Association with political party activities, campaigns or propaganda.
- Participation in activities that may disturb communal harmony, public order or institutional reputation.
- Use of the project platform for personal, political, ideological or commercial promotion.
- Disrespectful, discriminatory or unethical interaction with community members or stakeholders.

Projects must also recognize constraints related to cost, resources, environment and safety, and stakeholder behavior/cooperation/acceptance when planning and implementing activities.

SET OF PROJECT ACTIVITIES (TW/SL = 30 HOURS)

Methods for Project Identification:

Students may identify the project topic using one or more of the following methods:

- Interaction with local rural or urban stakeholders such as local leaders, corporation/municipality personnel, NGOs, panchayat representatives, etc.
- Review of issues highlighted in print and electronic media, and social networks (WhatsApp, Facebook, X, Instagram, etc.).
- After selecting a broad topic, students shall collect data, conduct a feasibility survey, estimate timelines and resources, approximate expenditure, and then define the problem statement and objectives clearly.

List of Project Topics and Engineering Outcomes:

The following structured sequence of activities is to be carried out during the semester:

Sl.No	Project Title	Measurable Engineering Outcome	Mapped POs	SDGs
1.	Computer-Based Learning Tool for Mentally Challenged Students	Design and develop a web/browser based learning tool as per the requirements of the special school.	5, 6	4
2.	Medication management system for an old age home	Design and develop a web-based application to monitor the administration of medicine to senior citizens residing at an old-age home.	6	3
3.	Virtual Labs for Learning Science	Design and Development of simulation environment to do the experimentation list in Physics/Chemistry/Biology for high school in a rural area	5, 6	4
4.	Local Skill Development and Employment Information Portal	Design and develop a web-based portal that provides information on local skill development programs, vocational training, internships, and employment opportunities for youth in the community.	6	4, 8
5.	Digital Complaint Portal for Gram Panchayat	Design and develop a web-based complaint portal (Specific nature) for Gram Panchayat	6	16
6.	Plant Care Reminder Application	Implement a reminder mechanism that generates timely notifications for watering, fertilizing, pruning, and other plant-care activities.	6	13, 15

7.	Basic Crop Recommendation System	Develop a basic crop recommendation system that recommends suitable crops based on user-provided parameters such as soil type, season, rainfall, and water availability	6	2, 13, 15
8.	Lost and Found Application	Develop a lost and found application that enables users to report, search, and manage lost and found items	6	11, 16
9.	Campus Navigation System	Develop a campus navigation system that enables users to locate important campus facilities and obtain directions between selected locations, which provides a simple digital map and location information for important facilities on campus.	6	15
10.	Public Waste Collection Monitoring System	Design and develop a web/mobile application that enables citizens to report uncollected garbage with geo tagged photos, track complaint status, and assist local municipal authorities in monitoring waste collection and sanitation services.	6	3, 11, 16
11.	Volunteer Management System for NGOs	Develop a web-based system to manage volunteer registration, event scheduling, attendance, and activity reporting for NGOs.	6	16
12.	Local Farmer Market Information System	Design and develop a digital platform that connects farmers directly with consumers by providing crop availability, prices, and contact information.	6	2, 8, 12
13.	Government scheme awareness for betterment of livelihood	Design a UI in the native language for people in rural areas to make best utilization of the government scheme.	6	11
14.	Community Renewable Energy Awareness and Management Portal	Design and develop a web/mobile portal to provide information on renewable energy resources and estimate energy savings within the community.	6	7, 11, 13
15.	Digital Learning Platform for Rural Government Schools	Design and develop a digital learning platform (Tool) that provides interactive learning content and activity-based learning materials in regional languages for rural and small village govt schools (primary govt. schools often lack interactive learning tools)	5, 6	4

16.	Digital Heritage Preservation and Cultural Information Portal	Develop a digital platform to document, preserve, and promote local heritage sites, cultural events, and historical information	6	11, 16
17.	Community Disaster Preparedness and Emergency Information System	Design and develop a web/mobile application for disaster preparedness and emergency alerts during natural disasters.	6	11, 13
18.	Pesticide Usage Advisory and Organic Farming Awareness System	Design and develop an application that provides recommendations on appropriate pesticide usage, promotes organic farming practices, and suggests suitable organic alternatives based on soil test reports and crop information.	6	2, 3, 15
19.	Cyber Security Awareness Platform for Phishing, Digital Arrest Scams, and Malicious Applications	Create a simple web app where users paste suspected text/links to get a risk score based on known phishing patterns, deceptive URLs, and high-risk keywords	5, 6	16
20.	Local Public Transportation Information and Route Assistance System	Design and develop a web or mobile application that provides location based information on available public transportation services, route maps, estimated travel options, and nearby transport facilities to improve accessibility and promote the use of public transportation.	6	11, 15
21.	Digital Inventory and Sales Management System	Design and develop a web-based inventory, billing, and sales analytics system for small businesses with dashboard reports and low-stock alerts.	6	8, 9
22.	Smart Financial Literacy and Budget Planner for public	Develop a mobile/web application that helps users manage household budgets, savings, government schemes, and financial planning through support.	6	1, 8
23.	Local Business Promotion and Market Analytics Portal	Design a digital platform that enables local vendors and small businesses to advertise products, analyze customer trends, and improve digital visibility.	6	8, 9
24.	Blood Donor and Emergency Blood Availability Portal	Develop a web/mobile platform to connect blood donors, hospitals, and patients with real-time blood availability information.	6	3
25.	Women Safety and Emergency Alert	Develop a mobile application with SOS alerts, live location sharing, emergency	6	5, 11, 16

	Application	contacts, and nearby police station information.		
26.	Public Grievance and Civic Issue Reporting System	Develop a web/mobile application that allows citizens to report civic issues such as potholes, streetlight failures, and drainage problems and monitor complaint resolution status.	6	11, 15, 16
27.	Digital Public Library and Book Exchange System	Design and develop a web-based platform that enables community members or schools to manage book donations, borrowing, returns, and book exchange activities	6	4
28.	Community Water Quality Reporting and Awareness Portal	Design and develop a web-based portal for citizens to report drinking water issues, record simple water quality observations, and provide awareness on safe water practices through educational resources.	6	3, 6
29.	Community Blood Donor Registry and Emergency Request System	Design and develop a web/mobile application that maintains a local blood donor database, enables emergency blood requests, and notifies eligible donors based on blood group and location.	6	3, 11
30.	Smart Community Health Camp Management System	Design and develop a web/mobile application to manage community health camps by facilitating online patient registration & doctor scheduling/digital health record maintenance/medicine inventory tracking.	6	3
31.	Food Waste Reduction and Food Donation Platform	Develop a platform connecting restaurants, hotels, and households with NGOs to donate surplus food before it is wasted.	6	2, 12
32.	Community Tree Plantation and Green Cover Monitoring Portal	Develop a web/mobile application to record tree plantation activities.	6	13, 15
33.	Career Guidance and Information Portal	Develop an app to get information on aptitude tests, Course/scholarship alerts/placement information	6	4, 8
34	NGO Donation and Resource Management System	Develop a web application to manage donations, inventory, volunteers, and financial transparency for NGOs.	6	16

35	Smart Local Tourism Business Portal	Develop a web platform promoting local tourism, homestays, guides, and cultural businesses with booking facilities.	6	8, 11, 15
36	Local Artisan and Handicraft Marketplace	Design and develop a platform promoting local artisans and traditional handicraft products.	6	8, 11
37	Waste Recycling Marketplace	Develop a digital platform connecting households, recyclers, and scrap collectors with pickup scheduling.	6	11, 12
38	Digital Accessibility Evaluation and Improvement for Public Websites	Evaluate the accessibility of at least 10 government or public-service websites using WCAG guidelines, develop accessibility improvement recommendations, and implement a prototype demonstrating compliance improvements.	6	16
39	Digital Library and Knowledge Sharing Platform for Government Schools	Develop a multilingual digital library with e-books, educational videos, and quizzes to improve access to learning resources.	6	4
40	Community Renewable Energy Awareness and Management Portal	Design and develop a web/mobile portal to provide information on renewable energy resources and promote the adoption of sustainable energy practices within the community.	6	7, 11, 15
41	Local Business Digital Marketplace	Web portal onboarding of at least 25 local vendors and product catalog.	6	8, 12
42	Community Blood Donor and Emergency Volunteer Network	Web/mobile application connecting donors and volunteers.	6	3
43	Mental Health Awareness and Helpline Directory App	Develop an application providing verified helpline contacts, self-help resources, and stigma-reducing content.	6	3
44	Diet & Nutrition Awareness Tool for Anganwadi Children	Develop an application to track and suggest balanced meal plans for children under a nutrition scheme.	5, 6	2, 3
45	Digital Literacy Portal for Elderly Citizens	Develop a simplified, accessible web application teaching basic smartphone and internet skills to senior citizens.	6	4, 11
46	Scholarship & Government Scheme Eligibility Checker	Develop a Web tool matching students to eligible scholarships and welfare schemes based on entered criteria.	5, 6	4
47	Digital Record keeping	Develop a ledger and record keeping	6	5, 8

	system for self help groups	application to help women's SHGs manage savings, loans and meeting records		
48	Elderly Companion & Wellness Check-In App	Develop an application enabling family/volunteers to schedule and log wellness check-ins for the elderly living alone.	6	3
49	Old-Age Home Volunteer Coordination Portal	Develop a platform matching volunteers with old-age homes for scheduled visits, events, and support activities.	6	3, 11
50	Local Job & Skill Matching Portal for Daily-Wage Workers	Develop a Web application connecting unskilled and semi-skilled workers with nearby job opportunities.	6	8
51	Street Vendor Digital Registry and Support Portal	Develop an application for the registry helping street vendors to access municipal registration information and gain customer visibility.	6	8
52	Microloan and Repayment Tracker for Small Vendors	Develop an application helping small vendors track micro-loans, repayments, and daily sales.	6	8
53	Rainwater Harvesting Feasibility & Awareness Tool	Develop a tool estimating rooftop rainwater harvesting potential based on roof area and local rainfall data.	5, 6	6, 13
54	Water Quality Reporting System for a Village / Ward	Develop a Web/mobile application for citizens to report water contamination issues and track resolution status.	6	6
55	Community Skill-Building Workshop Registration and Tracker App	Develop an application to register participants and track attendance for community skill-building workshops such as tailoring, computer usage, and first-aid.	6	4, 11
56	Local Event & Festival Information Aggregator App	Develop an application aggregating community event and festival schedules for a town or ward.	6	11
57	Community Sports Ground / Facility Booking App	Develop an application for local youth to check availability and book shared sports grounds or courts.	6	3, 11
58	Talent Scouting Platform for Rural Sports Players	Develop a platform where local sports talent can register profiles and gain visibility to coaches and scouts.	6	3
59	Youth Skill Development and Internship Finder App	Develop an application listing local internships, apprenticeships, and skill-training programs for youth.	6	4, 8

60	Financial Literacy Awareness App for Rural Households	Develop an application teaching basic banking, savings, and fraud-avoidance concepts with local-language support.	6	4, 8
61	Legal Aid & Rights Awareness Portal	Develop a portal listing free legal aid contacts with simplified explanations of common citizen legal rights.	6	16
62	Digital Insurance / Pension Scheme Awareness Tool	Develop a tool helping unorganized-sector workers check eligibility and enroll in government insurance/pension schemes.	5, 6	8
63	Livestock Health Record and Vaccination Tracker	Develop an application to record cattle and livestock health history and vaccination schedules for farmers.	6	15
64	Soil Testing Appointment & Report Access Portal	Develop a portal letting farmers book soil-testing slots and access digital test reports.	6	15
65	Power Outage Reporting and Tracking App for a Locality	Develop an application allowing residents to report and track power outages to the local utility board.	6	7, 11
66	Community Borewell / Water Tanker Scheduling App	Develop an application to schedule and track water tanker deliveries for water-scarce localities.	6	6, 11
67	Cyber Safety and Digital Fraud Awareness App	Develop an application educating students and senior citizens on common online scams and safe digital practices.	6	16
68	Adult Literacy Program Registration and Progress Tracker	Develop an application to register learners and track attendance and progress in a community adult-literacy drive.	6	4
69	Inclusive Learning Content Tool for Differently Abled Students	Develop a tool delivering audio/visual learning content adapted for students with visual or hearing impairments.	5, 6	4
70	School Dropout Tracking and Follow-up System	Develop an application for teachers to record attendance trends and flag/follow up on students at risk of dropping out.	6	4
71	Public Park / Garden Maintenance Complaint Tracker	Develop an application for citizens to report maintenance issues in public parks and gardens and track resolution.	6	11, 15
72	Digital Suggestion Box for Local Governance	Develop an application allowing citizens to submit suggestions and feedback to local governing bodies on civic matters.	5, 6	16

73	Community Health Screening Camp Scheduler	Develop an application to schedule and manage attendance for community blood-pressure/diabetes screening camps.	6	3
74	Digital Queue Management System for Health Camps	Develop a token-based appointment and queue management system/application for health camps.	6	3
75	Streetlight Fault Reporting System	Develop an application for citizens to report faulty streetlights using photographs and GPS location.	6	11
76	Village Asset Mapping System	Develop a GIS-enabled or map-based application to document community assets such as schools, hospitals, water tanks, and roads.	6	11
77	Food Waste Reduction & Expiry Management System	Design and develop a web/mobile application to record food items, monitor expiry dates, provide expiry reminders, and maintain food inventory to help reduce food wastage.	6	2, 12
78	Community Hall Booking & Management System	Design and develop a web-based platform to manage community hall bookings, track hall availability, process booking requests, schedule maintenance, and maintain booking records.	6	11
79	Public Infrastructure Asset Monitoring System	Design and develop a web-based platform to maintain records of public infrastructure assets, report maintenance issues, assign maintenance requests, and track their status.	6	9, 11

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher
1	Community Engagement and Social Innovation	Phadke, N. D.	1st	Oxford University Press, New Delhi.
2	Project-Based Learning in Engineering Education	Garg, N. R.	1st	Pearson India Education Services, Noida.

3	Service Learning and Community Projects.	Gupta, A. and P. Singh.	1st	McGraw-Hill Education (India), New Delhi.
4	Practical Guide to Community Development Projects	Wilson, G.	2nd	Routledge, London.

Reference Books:

1. NPTEL courses on Project-Based Learning and Social Innovation.
2. SWAYAM courses on community engagement and sustainability.
3. UN Sustainable Development Goals portal: <https://sdgs.un.org>
4. MyGov India and local civic body portals for community initiatives.
5. YouTube resources on design thinking, social innovation, and community service learning.
6. NGO and government field-action case studies related to sanitation, water, health, education, and environment.

Web links and Video Lectures (e-Resources):

1. NPTEL courses on Engineering Geology (IIT Roorkee, IIT Kharagpur).
2. NPTEL courses on Soil Mechanics and Foundation Engineering (IIT Delhi, IIT Bombay).
3. Virtual Labs – Geotechnical Engineering Virtual Lab (IIT Kanpur): <https://vlab.co.in>
4. Geological Survey of India (GSI) – Maps, reports, and publications: <https://www.gsi.gov.in>
5. YouTube channels: Civil Engineering Essentials, The Engineering Classroom (soil mechanics experiments).
6. American Society of Civil Engineers (ASCE) – Geotechnical resources and standards

Teaching-Learning Process:

Week / Phase	Teaching-Learning Activity	Faculty Role	Student Activity	Output / Evidence
1	Course introduction, objectives, ethics, conduct, and assessment briefing	Explain course scope, rules, rubrics, and expected deliverables	Understand course requirements and form teams	Team list, course plan
2	Community problem identification and topic selection	Guide topic framing and feasibility	Identify local issues through discussion and observation	Shortlisted project topic

3	Stakeholder interaction and preliminary survey	Demonstrate survey methods and stakeholder engagement	Collect initial data from community/users	Survey notes, interview record
4	Problem statement and objective formulation	Review and refine problem statement	Prepare problem statement, scope, and objectives	Approved problem statement
5	Literature/case study review and baseline analysis	Suggest relevant references and examples	Study existing solutions and compare approaches	Baseline analysis summary
6	Project planning and role assignment	Help teams organize tasks, timeline, and responsibilities	Plan activities, divide roles, and prepare schedule	Work plan / Gantt chart
7	Feasibility analysis and solution brainstorming	Check technical feasibility and practicality	Generate possible engineering solutions	Solution alternatives sheet
8	Selection of final solution and design approach	Review final concept and design logic	Finalize concept, methods, and expected outcome	Concept note / design outline
9	Data processing / calculations / sizing / mapping	Support computations and technical review	Analyze data, perform calculations, prepare maps/charts	Technical analysis sheet
10	Prototype / model / audit / DPR / app development	Monitor progress and correct technical issues	Develop the selected output	Working model / draft DPR / map / app
11	Testing, refinement, and implementation planning	Evaluate technical correctness and improvements	Test prototype or validate proposal with users	Test results / revised output
12	Field implementation / demonstration / awareness activity	Facilitate community interaction and documentation	Conduct implementation or demonstration	Photos, attendance, implementation record

13	Documentation of outcomes, feedback, and impact	Review report structure and completeness	Compile findings, stakeholder feedback, and observations	Draft report
14	Presentation preparation and viva practice	Conduct mock presentation and feedback	Prepare slides/poster and rehearse	Presentation deck
15	Final presentation, submission, and reflection	Evaluate performance using rubrics	Present project, submit report, reflect on learning	Final report, presentation, viva

Assessment structure:

A. Continuous Internal Evaluation (CIE) – 50 marks

- Students, in batches of 3–4, shall undertake at least one project (or a combination of two related activities) aiming, as far as possible, at a logical implemented or implementable outcome.
- CIE will be conducted by a departmental committee (HoD/nominee, guide and one senior faculty) using the following rubrics totaling 50 marks:

B. Semester End Examination (SEE) – 50 marks

- The SEE shall be conducted batch-wise by a committee of : one faculty from the same department and one from a different department.

CIE and SEE Rubrics

Criterion	Weight (marks)	Excellent (Full marks)	Good	Fair	Needs Improvement
Problem identification & Relevance to society/industry/community	8	Problem is clearly identified with strong evidence of societal relevance and well-defined scope.	Problem is relevant and scope is clear with adequate supporting evidence.	Problem defined but justification or evidence is weak.	Problem unclear or not relevant; little/no supporting evidence.
Formation of problem statement; Engineering approach, innovation & feasibility	10	Problem statement is precise; approach is sound, innovative and clearly feasible.	Problem statement adequate; approach feasible with minor gaps.	Problem statement partial; approach feasibility is marginal.	Problem statement missing or approach not feasible.

Interaction with stakeholders; Data collection, analysis & interpretation	8	Thorough stakeholder engagement; data collection is comprehensive; analysis is well-interpreted.	Good engagement; data analysis adequate with minor gaps.	Limited engagement; data incomplete and analysis superficial.	Little/no stakeholder contact; insufficient or no data/analysis.
Project documentation; Clarity, organization & problem-solving demonstrated	10	Documentation is complete, well-organized, analytical, and shows strong problem-solving.	Documentation complete and clear with some analytical content.	Documentation on basic with omissions; problem-solving limited.	Documentation missing/poorly organized; no clear problem-solving.
Communication & Presentation skills	6	Presentation is confident, structured, and answers queries fully; visuals effective.	Presentation clear and satisfactory; responds to most queries.	Presentation acceptable but lacks clarity or confidence; weak responses.	Presentation poor or absent; unable to respond.
Contribution & Benefit to society (impact, sustainability)	8	Clear, demonstrable societal benefit and sustainability; realistic path to implementation.	Benefit plausible; sustainability considered with minor gaps.	Limited or unclear societal benefit; sustainability not well addressed.	No evident benefit or sustainability; project not community-oriented.

Semester: III						
PHYSICAL EDUCATION (SPORTS & ATHLETICS)–I						
Course Code	:	25PE1		CIE	:	100 Marks
Credits: L:T:P	:	0:0:1				
Total Hours	:	15 P				
Course Outcomes: At the end of the course, the student will be able to 1. Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness 2. Familiarization of health-related Exercises, Sports for overall growth and development 3. Create a foundation for the professionals in Physical Education and Sports 4. Participate in the competition at regional/state/national/international levels. 5. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle. 6. Understand and practice of Traditional Games						
Module I: Orientation A. Lifestyle B. Health & Wellness C. Pre-Fitness test.						4 Hours
Module II: General Fitness & Components of Fitness A. Warming up (Free Hand exercises) B. Strength–Push-up/Pull-ups C. Speed– 30Mtr Dash						4 Hours
Module III: Specific games (Any one to be selected by the student) 1. Kabaddi–Handtouch, Toe Touch, Thigh Hold, Anklehold and Bonus. 2. Kho-Kho– Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.						16 Hours

Scheme and Assessment for auditing the course and Grades:

Sl.No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes/Assignment–2, each of 20 marks	40
3.	Final presentation/exhibition/Participation In competitions/practical on specific tasks assigned to the students	40
Total		100

Semester III			
Yoga - I			
Course Code	25YOG1	CIE	100 Marks
Course Type	NCMC		
Total Hours	2 hrs/week		
Course Objectives The objectives of this course are to: 1. Introduce students to the origin, history, philosophy, and fundamental concepts of Yoga. 2. Familiarize students with the different schools of Yoga, its aims, objectives, and the importance of prayer in Yogic practice. 3. Develop awareness of the rules, regulations, and safety precautions to be followed during Yogic practices. 4. Enable students to learn and practice Suryanamaskara and selected Yogasanas with proper techniques for improving physical and mental well-being. 5. Promote a healthy life style by encouraging regular Yogic practice, correcting misconceptions about Yoga, and fostering positive health, self-discipline, and overall wellness.			
Introduction of Yoga: Yoga, its origin, history and development. Yoga, its meaning, definitions. Different schools of yoga, Aim and Objectives of yoga, Prayer : importance of prayer Brief introduction of yogic practices for common man to promote positive health, Rules and regulations: Rules to be followed during yogic practices by practitioner Suryanamaskara: Suryanamaskar prayer and its meaning, Need, importance and benefits of Suryanamaskar 12 count, 2 rounds, Misconceptions of yoga: Yoga its misconceptions, Difference between yogic and non yogic practices Different types of Asanas: Asana, Need, importance of Asana. Different types of asana. Asana its meaning by name, technique, precautionary measures and benefits of each asana, Sitting 1. Padmasana, 2. Vajrasana, Standing 1. Vrikshana, 2. Trikonasana, Prone 1. Bhujangasana, 2. Shalabhasana, Supine 1. Uttitadvipadasana, 2. Ardhamahalasana			
Course Outcomes: Upon successful completion of this course, the student will be able to: 1. Explain the origin, history, philosophy, objectives, and different schools of Yoga, along with its role in promoting holistic health and well-being. 2. Understand and apply the rules, regulations, and ethical practices associated with Yogic exercises, including the significance of prayer and Suryanamaskara. 3. Demonstrate the correct techniques of selected Yogasanas, such as sitting, standing, prone, and supine postures, while observing appropriate precautions. 4. Analyze the physical, mental, and therapeutic benefits of Yogic practices and distinguish between authentic Yogic practices and common misconceptions about Yoga. 5. Adopt Yoga as a regular life style practice to enhance physical fitness, mental wellness, discipline, and overall quality of life.			

Suggested Learning Resources: (TextBook/ReferenceBook/Manuals):**Text books:**

1. George Feuerstein: the yoga Tradition (its history, literature, philosophy and practice)
2. Sri Ananda: The complete Book of yoga Harmony of Body and Mind (Orient paper Backs: Vision Books Pvt.Ltd..1982.
3. B.K.Slyenkar: Light on the Yoga sutras of Patanjali (Haper Collins Publications India Pvt.Ltd.New Delhi.)
4. Science of Divinity and Realization of Self Vethathiri Publication,(6-11)WCSC,Erode

Reference books/Manuals:

1. Principles and Practice of Yoga in Health Care,Publisher:Handspring Publishing Limited. ISBN:9781909141209,978190914209
2. BasavaraddiIV: Yoga in School Health, MDNIY NewDelhi. 2009
3. Dr.HR.Nagendra: Yoga Research and application (Vivekanda Kendra Yoga Prakashana Bangalore)
4. Dr.Shirley Telles: Glimpses of Human Body (Vivekanda KendraYoga Prakashana Bangalore).

Web links and Video Lectures (e-Resources):

Search by topics to get the videos

Assessment Structure:

This course is having only **Continuous Internal Assessment** (CIE) marks of 100.

Weightage	Marks
Attendance to all the sessions	20Marks
Practical sessions on Yoga and Its Benefits	40Marks
Two Assignments	40Marks
Total Marks	100

A student shall obtain a minimum of 40% marks or 40 marks out of 100 to qualify in the course.

FOURTH SEMESTER												
Sl. No	Course Category	Course Code	Course Title	Teaching Hours per Semester					Exam Marks			Credits
				L	T	P	TW & SL	TH/S	CIE	SEE	Total	
1.	PCC	25CS401	Design and Analysis of Algorithms	42	0	0	48	90	50	50	100	3
2.	IPCC	25CS402	Microcontroller and Embedded Systems	42	0	28	50	120	50	50	100	4
3.	PCC	25CS403	Database Management Systems	42	0	0	48	90	50	50	100	3
4.	PCC	25CS404	Operating Systems	42	0	0	48	90	50	50	100	3
5.	PCC	25CS405	Discrete Mathematics and Combinatorics	42	0	0	48	90	50	50	100	3
6.	PCCL	25CS406	Algorithms Laboratory	0	0	28	2	30	50	50	100	1
7.	PCCL	25CS407	Database Management Systems Laboratory	0	0	28	2	30	50	50	100	1
8.	AEC	25CS408X	Ability Enhancement Course	0	0	28	2	30	50	50	100	1
9.	BSC	25CS409	Biology for Engineers	14	0	0	16	30	50	50	100	1
10.	SDC	25EVS	Environmental Science Project	0	0	0	30	30	50	50	100	1
11.	AEC	25PT2	Placement Training II	14	0	0	16	30	100	-	100	AUDIT
12.	MC	25NYP1	NSS, YOGA, PE	0	0	0	28	28	100	-	100	AUDIT
13.	MC	25BCM301	Bridge Course Mathematics -I (Non-Credit Mandate Audit Course for Diploma entry students)	14	0	0	14	28	100	-	100	AUDIT
Total							352					21

Ability Enhancement Course		
1	25CS408A	Computer Assembly and Networking
2	25CS408B	Introduction to Power Bi
3	25CS408C	Technical writing using Latex
4	25CS408D	UI/UX Laboratory

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS		
Course Code	25CS401	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	42L+ 16SL+26ABL + 06 EV = 90
CIE	50 Marks		
Course Objective: To develop algorithms using suitable design technique and analyze it.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply appropriate algorithmic strategies to solve computational problems.	1	-
2.	Analyze the efficiency of algorithms using suitable performance measures.	2,11	2
3.	Design efficient algorithms for the given computational problems using appropriate algorithm design techniques.	3,11	2
4.	Implement the optimized solutions for a given problem using suitable algorithmic strategies.	3,11	2
Course Contents:			
MODULE – 1			11 Hrs
Introduction: Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Fundamentals of the Analysis of Algorithm Efficiency: Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples. Brute Force: Selection Sort and Bubble Sort, Sequential Search and String Matching.			
MODULE – 2			10 Hrs
Brute Force(conti...): Depth First and Breadth First Search Divide-and-Conquer: Merge sort, Quick sort Decrease-and-Conquer: Insertion Sort, Topological Sorting, Algorithms for Generating Combinatorial Objects, Binary Search.			
MODULE – 3			11 Hrs
Transform-and—Conquer: Presorting, Heaps and Heapsort. Space and Time Tradeoffs: Sorting by Counting, Input Enhancement in String Matching-Horspool algorithm Dynamic Programming: The knapsack Problem, Warshall's Algorithm, Floyd's Algorithm			
MODULE – 4			10 Hrs
Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees. Coping with the Limitations of Algorithm Power: Backtracking – N Queens, Branch-and-Bound – Assignment Problem, KnapSack Problem			
Text Books : 1. Anany Levitin, Introduction to The Design and Analysis of Algorithms, 3 rd Edition, Pearson Education, 2022 2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, 2 nd Edition, Press 2014.			

1. Cormen T.H., Leiserson C. E., and Rivest R. L., Introduction to Algorithms, 3rd edition, PHI, 2015.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang and Y.T. Tsai, Introduction to the Design and Analysis of Algorithms A Strategic Approach, 1st Edition, Tata McGraw Hill, 2005.

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Self Learning Component	1	14	14
3	Activity Based Learning (ABL)	-	-	28
4	Evaluation of Learning Process		-	6
Total Learning Hours/Semester				90

1. Exhaustive Search
2. Multiplication of large numbers
3. Hashing
4. Dynamic Programming: Computing Binomial Coefficient
5. Branch and Bound : Travelling salesmen problem
6. Back Tracking: Subset-Sum Problem

Activity 2: LeetCode

Evaluation of the Process

- i. ONE badge – 2 marks
- ii. Maximum SIX Badges can be earned : $6 \times 2 = 12$ Marks

Tool		Remarks	Marks
CIE	CIE1	Conducted for 15 marks	15
	CIE2	Conducted for 15 marks	15
Activity Details	Activity - 1	Problem solving test on Self Learning	8
	Activity - 2	LeetCode participation	12
Total			50

[illegible]

[illegible]

Course Title	MICROCONTROLLER AND EMBEDDED SYSTEMS				
Course Code	25CS402	L-T-P-C	(3-0-2)4		
Exam Hrs.	3	Hours/Week	5		
CIE	50 Marks	Total Hours	42L+28P+50ABL =120		
SEE	50 Marks				
Course Objective: To develop programs for microcontroller based embedded systems.					
Course Outcomes(COs):Upon completion of the course, students shall be able to:					
#	Course Outcomes	Mapping to POs	Mapping to PSOs		
1.	Apply the concepts of RISC philosophy and ARM processor fundamentals to illustrate performance enhancement in ARM processors.	1	-		
2.	Analyze the given assembly language code for its correctness and output	2	-		
3.	Develop assembly code for the given problem	3	-		
4.	Develop ARM based programs using IDE for a given problem with/without external hardware devices	3,5	1		
Course Contents:					
MODULE – 1			11 Hrs		
ARM Systems: The RISC Design Philosophy, The ARM Design Philosophy, ARM based Embedded System Hardware and Software. ARM Processor Fundamentals : ARM core data flow model, Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts and the Vector Table, Core Extensions					
MODULE – 2			11 Hrs		
Introduction to the ARM Instruction Set: Data Processing Instructions-move, barrel shifter, arithmetic, logical, comparison, multiply. Branch Instructions, Load-store instructions-single register transfer, single register load-store addressing modes.					
MODULE – 3			10 Hrs		
Multiple register transfer, stack operations, and swap instruction, Program Status Register Instructions, Loading Constants, and conditional execution. Efficient C Programming: Overview of C Compilers and Optimization, Basic C Data Types, C Looping Structures, Register Allocation					
MODULE – 4			10 Hrs		
Introduction to ARM7 LPC2148 Microcontroller: Introduction, Features of the LPC 214X Family, Internal Block Diagram of LPC 2148, LPC 2148 GPIO. Interfacing: LED interfacing, 7 segment LED display interfacing, stepper motor interfacing, LCD interfacing, Keyboard interfacing and DAC interfacing.					
Pre-requisite: Number system, C Programming, Computer organization					
Text Books					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	ARM system developers guide(1.1 to 1.4, 2.1 to 2.5.1, 3.1 to 3.3, 3.5 to 3.6 (Excluding 3.5.1, 3.5.2), 3.8, 5.1 to 5.4)	Andrew N Sloss, Dominic Symes and Chris Wright	1st	Elsevier, Morgan Kaufman	2004
2.	Hardware interfacing Manual	Shashidhara H V		Malnad College of Engineering, Hassan	
Reference Books:					

1.	The Insider's Guide to the ARM7 Based Microcontrollers Hitex Ltd	Hitex Ltd	1 st	Hitex (UK) Ltd.	2005
2.	ARM System-on-Chip Architecture	Steve Furber	2 nd	Pearson	2015

EBOOKS/MOOC:

<https://nptel.ac.in/courses/106105193>

https://shankarrajabopal.github.io/textbooks/Text_Book_ARM_System_Developer's_Guide.pdf

Online Courses and Video Lectures:

<https://www.udemy.com/course/arm-instruction-set/>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	2	14	28
3.	Self-Study Hours-Self Learning	-	-	28
4.	Evaluation of Learning Process	-	-	22
Total Learning Hours/Semester				120

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 50 marks(Module 1& 2) & reduced to 15 marks	15
	CIE2	Conducted for 50 marks(Module 3 & 4) & reduced to 15 marks	15
Activity Details	Activity 1	Continuous Evaluation and Laboratory CIE	20
Total Marks			50

Integrated Laboratory Component (28 Hours)

PART- A

1.	Develop an ALP to determine the largest element in an array.
2.	To illustrate the working of lookup table in ARM processor, find the square of a number (1 to 10) stored in a look-up table.
3.	Develop an ALP to compute the factorial of a given number and store the result in memory.
4.	Write an ALP to add an array of 16 bit numbers and store the 32-bit result in memory.
5.	Write an ALP to count the number of ones and zeros in N words stored in consecutive memory locations.
6.	Write an ALP to search for a given number in a set of 32-bit numbers, using linear search algorithm.
7.	Develop an ALP to generate the Fibonacci series for a given number of terms.
8.	Develop a Logic Controller Interface to count customers and reset the counter to zero through down counting.
9.	Implement a 7-segment display interface to display the messages "FIRE" and "HELP" alternately.
10.	Write a program to control the rotation of a stepper motor in clockwise or counter-clockwise direction for a given number of steps.

PART- B (Open-Ended Experiments)

1.	Develop an ARM-based solution to perform the required arithmetic and logical operations for a given application.
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2.	Develop an ARM program to implement the required decision-making process for a real-world application.
3.	Develop an ARM-based application to efficiently access and manipulate data stored in memory using appropriate instructions.
4.	Develop an ARM program to manage multiple data values efficiently for a specified application.
5.	Develop an ARM-based embedded solution to automate a simple real-world task by selecting appropriate instructions and program flow.
6.	Develop an optimized C program for an ARM-based embedded system to improve the performance of a given application.
7.	Develop an efficient C solution for an ARM-based application by minimizing loop execution overhead .
8.	Develop an embedded monitoring system that displays the status of a real-world process using LEDs .
9.	Develop an embedded motion control system using a stepper motor to achieve the required movement for a given application.
10.	Develop a signal generation system using the DAC interface to produce the required analog waveform.

Self-Learning (28 Hours)

1.	Comparison between Microprocessor and Microcontroller.
2.	History of the ARM processor, ARM processor families.
3.	Real world applications of ARM based embedded systems.
4.	Number systems: Decimal, Binary and Hexadecimal.
5.	Number systems: Conversions between Decimal, Binary and Hexadecimal numbers.
6.	Pipeline hazards.
7.	Conversion of C code into assembly code: Arithmetic and Logical operations.
8.	Conversion of C code into assembly code: Branching concepts.
9.	Conversion of C code into assembly code: Load-Store concepts.
10.	Assembly programs on array: Vector addition and subtraction.
11.	Assembly program to transfer N blocks of data from source address location to destination address location, considering the case of with and without overlapping.
12.	Application of program status register instructions: Masking/unmasking interrupts, set/reset conditional flags.
13.	Implementation of conditional execution.
14.	Find the hexadecimal codes, to display a given message on seven segment LED display.

Evaluation of Learning Process

Type of Evaluation	Hours
CIE (1 and 2)	3
Semester End Exam	3
Total	6

Course Articulation matrix

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

Course Title		DATABASE MANAGEMENT SYSTEMS			
Course Code	25CS403	(L-T-P) C		(3-0-0) 3	
Exam Hrs.	3	Hours/Week		3	
CIE	50 Marks	Total Hours		42L+14SL+27ABL+7EV=90	
SEE	50 Marks				
Course Objective: Design a database and write SQL queries.					
Course Outcomes (COs): Upon completion of the course, students shall be able to					
#	Course Outcomes			Mapping to POs	Mapping to PSOs
1.	Apply the fundamental concepts of database architecture and relational data models in database design.			1	-
2.	Analyze a given scenario to its correctness and use appropriate database technique			2	-
3.	Design and demonstrate conceptual models, query and normalization principles.			3	1
4.	Conduct the experiment and demonstrate the same using modern tool for specified problem scenarios			3, 5, 8, 9	1
Course Contents:					
MODULE – 1					10 Hrs
Introduction: Introduction; An example; Characteristics of Database approach; Actors on the screen; Data models, schemas and instances; Three schema architecture and data independence; The database system environment; Centralized and client-server architectures; Entity Relationship Model: Using High-Level Conceptual Data Models for Database Design; An sample Database Application; Entity Types, Entity Sets, Attributes and Keys. Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; ER Diagrams, Naming Conventions and Design Issues.					
MODULE – 2					11 Hrs
Relational Model and Relational Algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN-variations of JOIN, OUTER JOIN operations					
MODULE – 3					11 Hrs
SQL: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Basic Retrieval queries in SQL; Insert, Delete and Update statements in SQL; Additional features of SQL, More complex SQL Retrieval Queries; Views; Schema Change Statements in SQL.					
MODULE – 4					10 Hrs
Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys-1NF, 2NF, 3NF, Boyce-Codd Normal Form. Multi-valued Dependencies and Fourth Normal Form; The ACID Properties, Concurrency control techniques: Two- Phase Locking Techniques for Concurrency control; Concurrency Control Based on Timestamp Ordering					
Pre-requisite (If any) - Computer Science Fundamentals					
Text Books					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Database Systems	Elmasri and Navathe	7th	Pearson	2015
2.	Database Management Systems	Raghu Ramakrishnan and Johannes Gehrke	3rd	McGraw-Hill	2007
Reference Books:					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Database System Concepts	Silberschatz, Korth and Sudharshan	5th	Mc-GrawHill	2006
2.	An Introduction to Database Systems	C.J.Date, A.Kannan, S.Swamynatham	8th	Pearson education	2006
EBOOKS/MOOC:					
1. http://nptel.ac.in/courses/106106093					

2. <https://www.edx.org/course/database-systems-concepts-design-gtx-cs6400x>

Online Courses and Video Lectures:

Infosys Springboard course/ MOOC course

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Student Study Hours – Self Learning	1	14	14
3.	Activity Based Learning (ABL1 & ABL2)			27
4.	Evaluation of Learning Process			07
Total Learning Hours / Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks		Marks
CIE	CIE1	Conducted for 50 marks and reduced to 15 marks	15
	CIE2	Conducted for 50 marks and reduced to 15 marks	15
Activity Details	Activity	Activity Based Learning	20
Total Marks			50

Self-Learning

- Use DBDiagram.io or Lucidchart to practice drawing ER diagrams for real-world scenarios
- Design a Mini Database – Model and implement a real-world system with proper keys and constraints.
- Practice identifying and correcting schema anomalies through normalization up to 4NF using functional and multivalued dependencies

Activity Based Learning

ABL : Activity 1 details

Selecting a real-world scenario (e.g., Hospital Management, Library System, Online Store, or University Course Registration), analyzing its requirements, and designing an Entity-Relationship (ER) diagram to visually represent the data model and formulate and execute queries in SQL for a given database application to retrieve and manipulate data based on specified requirements.

Type of Evaluation

Type of Evaluation	Hours
CIE 1, 2	3
Activity presentation	1
SEE	3
Total	7

Course Articulation matrix

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

Course Title		OPERATING SYSTEMS			
Course Code	25CS404	(L-T-P) C	(3-0-0)3		
Exam Hrs.	3	Hours/Week	3		
CIE	50 Marks	Total Hours	42L+28ABL+14SL +6EV=90		
SEE	50 Marks				
Course Objective: Understand the role of Operating system in managing computer resources.					
Course Outcomes (COs): Upon completion of the course, students shall be able to:					
#	Course Outcomes	Mapping to POs	Mapping to PSOs		
1.	Apply operating system concepts, system calls, process management, thread management, and CPU scheduling algorithms to solve computing problems.	1	-		
2.	Analyse process scheduling, process synchronization, deadlock handling, memory management, virtual memory management, and disk scheduling techniques	2	-		
3.	Design solutions for process synchronization, deadlock prevention, memory allocation, and virtual memory management using appropriate operating system algorithms and techniques.	3	-		
4.	Work collaboratively and demonstrate the operating system concepts and algorithms and its applications through clear documentation and presentation	5, 8, 9, 11	-		
Course Contents:					
MODULE – 1			11 Hrs		
Introduction to Operating Systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system. Operating System Services; System calls; Types of system calls; System programs.					
MODULE – 2			11 Hrs		
Process Management: Process concept; Process scheduling; Operations on processes; Inter- process communication, Threads: Overview; Multithreading models; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms.					
MODULE – 3			10 Hrs		
Process Synchronization: Synchronization: The Critical section problem; Peterson’s solution; Synchronization hardware; Semaphores; Classical problems of synchronization. Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.					
MODULE – 4			10 Hrs		
Memory Management: Main Memory: Background; Swapping; Contiguous memory allocation; Paging; Segmentation. Virtual Memory Management: Background; Demand paging; Page replacement. Mass-Storage Structures: Disk structure; Disk attachment; Disk scheduling.					
Pre-requisite: Programming Fundamentals in C programming, Data Structures, Computer Organization and Architecture					
Text Books					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Operating System Principles	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	9 th	Wiley-India	2012
2.	Operating Systems Internals and Design Principles	William Stallings	9 th	Pearson	2018
Reference Books:					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Operating systems - A concept based Approach	D.M. Dhamdhare	3 rd	Tata McGraw-Hill	2009
2.	Operating Systems	P.C.P. Bhatt	2 nd	PH	2006

3.	Operating systems	Harvey M Deital	3 rd	Pearson Education	2004
EBOOKS/MOOC:					
1. https://drive.uqu.edu.sa/_/mskhayat/files/MySubjects/2017SS%20Operating%20Systems/Abraham%20Silberschatz-Operating%20System%20Concepts%20(9th,2012_12).pdf					
2. https://api.pageplace.de/preview/DT0400.9781292214306_A37747502/preview-9781292214306_A37747502.pdf					
Online Courses and Video Lectures:					
Sl. No.	Course Name	Course offered by	Year	URL	
1.	Introduction to Operating System	Coursera	2026	https://www.coursera.org/learn/bits-operating-systems#modules	
2.	Real time Operating System	NPTEL	2026	https://onlinecourses.nptel.ac.in/noc26_cs47/preview	
Teaching -Learning– Evaluation Scheme:					
Sl. No	Teaching and Learning Method		No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning		3	14	42
2.	Activity Based Learning		-	-	28
3.	Self-Learning		1	14	14
4.	Evaluation of Learning Process		-	-	6
Total Learning Hours / Semester					90
Proposed Assessment Plan (for 50 marks of CIE):					
Tool		Remarks			Marks
CIE	CIE 1	Conducted for 50 marks & reduced to 15 marks			15
	CIE 2	Conducted for 50 marks & reduced to 15 marks			15
Activity Details		Activity	Execution of programs using C programming listed in ABL. Report on self-learning concepts		20
Total Marks					50
Activity Based Learning (28 Hours)					
1.	Write programs using the I/O system calls of UNIX/LINUX operating system.				
2.	Write a C program simulate the following CPU scheduling algorithms: a) FCFS b) SJF c) Round Robin d) Priority				
3.	Write a C program to simulate producer-consumer problem using semaphores.				
4.	Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.				
5.	Write a C program to simulate the following contiguous memory allocation Techniques: a) Worst Fit b) Best Fit c) First Fit				
6.	Write a C program to simulate page replacement algorithms: a) FIFO b) LRU				
7.	Write a C program to simulate the following memory segment techniques a) Paging b) Segmentation				
8.	Write a C program to simulate SCAN disk scheduling algorithm.				
Self-Learning (14 Hours)					
1.	Explore Linux/UNIX commands and shell scripting through hands-on practice.				
2.	Explore process creation and communication using small programs (fork, pipes).				
3.	Use system monitoring tools (top, ps, vmstat) to observe process and memory behavior.				
4.	Study real-world OS case studies (Linux, Windows, Android) and compare their features.				
Evaluation of Learning Process (6 Hours)					
Type of Evaluation					Hours
Test (1 and 2)					3
Semester End Exam					3
Total					6

Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	2	2	-	3	-	-

Course Title	DISCRETE MATHEMATICS AND COMBINATORICS				
Course Code	25CS405	(L-T-P) C	(3-0-0)3		
Exam Hrs.	3	Hours/Week	3		
CIE	50 Marks	Total Hours	42L+ 42ABL+06EV=90		
SEE	50 Marks				
Course Objective: To understand mathematical notation, logic, number theory, combinatorics, group theory, and coding theory. It develops analytical thinking, logical reasoning, and creative problem-solving skills essential for mathematics, computer science, and engineering applications. Understand the fundamentals of graph theory and combinatory.					
Course Outcomes (COs): Upon completion of the course, students shall be able to:					
#	Course Outcomes	Mapping to POs	Mapping to PSOs		
1.	Apply the concepts of mathematical logic, relations, functions, graph theory, matching theory, coding theory, and the principle of inclusion-exclusion in solving computational and computer science problems.	1	-		
2.	Analyze mathematical structures, relations, functions graph-theoretic models, coding techniques, and combinatorial principles to evaluate and solve computer science problems.	2	-		
3.	Design efficient solutions and computational models using mathematical structures, relations, functions, graph-theoretic concepts, coding techniques, and combinatorial principles for computer science problems.	3	-		
4.	Develop and implement solutions for real-world computational problems using discrete mathematical structures, graph theory, coding theory, and combinatorial techniques through MATLAB/Python programming.	5, 8, 9, 11	1		
Course Contents:					
MODULE – 1				11 Hrs	
Fundamentals of Logic: Basic logic connectives and truth tables. Logical equivalence and Tautologies. Statement of laws of logic. Logic implication - Rules of inference theory. Application of switching network. Relation: Cartesian Product of Sets, Relations, Zero-one Matrix, Directed graph, Self-study: Set theory – set operations, Venn diagram, Inclusion Exclusion principle.					
MODULE – 2				10 Hrs	
Relation (contd...): Properties of Relation, Equivalence Relation, Partially ordered sets, Hasse diagram, Lattice. Functions: Ceiling function, Floor function, Functions, Types of Functions, Properties of Functions, Composition of Functions, and Inverse Functions Self-study: Quantifiers					
MODULE – 3				11 Hrs	
Coding theory: Elements of coding theory, the humming matrix, the parity – check and Generator matrices, Group codes: Decoding with coset leaders. Hamming matrices. Planar Graphs and Colouring: Planar and non-planar graphs, Euler’s Formula, Graph coloring, chromatic number, and chromatic polynomials. Self-study : Group theory: Examples and elementary properties, Detection of planarity, Dual of a planar graph					
MODULE – 4				10 Hrs	
Matching: Matching Theory. The Principles of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, generalizations of the principle, derangements, Rook Polynomials, Arrangements with forbidden Positions. Self-study : The Rule of Sum and Product, Permutations, Combinations, The Binomial Theorem, Optimization: Cut-sets, Edge connectivity, Vertex connectivity					
Pre-requisite: Data Structures, Mathematics					
Text Books					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Discrete and Combinatorial Mathematics	R C Grimaldi	5th	Pearson’s publications	2007
2.	Graph Theory and Combinatorics	Dr. D.S. Chandrashekar	4th	Prism	2012

Reference Books:					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Discrete Mathematical Structures	D. S. Malik & M. K. Sen	1st	Thomson’s Publications	2006
2.	Graph Theory with applications to Engineering and Computer Science	Narsing Deo		PHI Publications	
EBOOKS/MOOC:					
1. https://onlinecourses.nptel.ac.in/noc22_cs33/preview					
2. https://www.coursera.org/specializations/discrete-mathematics					
3. http://nptel.ac.in/courses/111106050/					
4. http://nptel.ac.in/courses/106108051/					
Online Courses and Video Lectures:					
1. https://www.youtube.com/watch?v=UwYJUKVc-Hs					
2. https://www.youtube.com/watch?v=FMh8qNV3PHk					
Teaching -Learning– Evaluation Scheme:					
Sl. No	Teaching and Learning Method		No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning		3	14	42
2.	Activity Based Learning (ABL)		-	-	42
3.	Evaluation of Learning Process		-	-	06
	Total Learning Hours/Semester			42L+ 42ABL+06EV=90	
Proposed Assessment Plan (for 50 marks of CIE):					
Tool	Remarks				Marks
CIE	CIE1	Conducted for 50 marks & reduced to 15 marks (Module 1 & Module 2)			15
	CIE2	Conducted for 50 marks & reduced to 15 marks (Module 1 & Module 2)			15
Activity Details	Activity 1	ABL-1			10
	Activity 2	ABL-2			10
Total Marks					50
Activity Based Learning (42 Hours)					
ABL-1					30 hrs
1.	Problems on logic connectives and Logical equivalence				3
2.	Problems on laws of logic				3
3.	Problems on Logic implication				3
4.	Problems on Relation,				3
5.	Problems on Hasse diagram and Lattice				3
6.	Problems on Functions and relations				3
7.	Problems on Graph theory				3
8.	Problems on planar graph and colorings				3
9.	Problems on matching				3
10.	Problems on Principles of Inclusion and Exclusion				3
ABL-2					
1.	Develop any of the above problem (ABL-1) using MATLAB/Python, for the real world problems.				12
Evaluation of Learning Process (6 Hours)					
Type of Evaluation					Hours
Test (1 and 2)					3
Semester End Exam					3
Total					6

Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2		-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	3	3	-	3	2	-

Course Title		ALGORITHMS LABORATORY	
Course Code	25CS406	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	CIE	50 Marks
		Total Hours	28P + 2 EV= 30
Course Objective: To demonstrate various algorithmic design techniques.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Demonstrate various algorithm design strategies for various problems	3, 5,11	2
2.	Document the executed algorithms	9,11	-
Course Contents:			
PART-A Programs			
1.	a) Generating consecutive primes using Sieve Eratosthenes algorithm b) Print all the nodes reachable from a given starting node in a digraph using BFS and DFS method.		
2.	Students in a department need to be selected for a high jump competition based on their height (integervalue only). Sort the heights of students using Quick sort and find the time required for the Sorting.		
3.	Sort a given set of elements using the Heap sort method		
4.	Implement Horspool algorithm for String Matching.		
5.	Consider N cities. The shortest path between every pair of cities needs to be determined. Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem. Also find transitive closure by implementing Warshall's algorithm		
6.	There are N different routes from hostel to college. Each route incurs some cost. Find the minimum cost route to reach the college from hostel using Prim's algorithm.		
7.	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.		
8.	Consider the distance between Hassan and N different cities. Every city can be reached from Hassan directly or by using intermediate cities whichever costs less. Find the shortest distance from Hassan to other cities using Dijkstra's algorithm.		
9.	Consider the problem having weights and profits are: Weights: {3, 4, 6, 5} Profits: {2, 3, 1, 4} The weight of the knapsack is 8 kg. Find the optimal set of items to include in the knapsack using dynamic programming.		
10.	Implement N-Queens problem applying backtracking		
PART-B : Open ended Programs			
1.	Apply the brute force technique to solve real-world computational problems.		
2.	Implement divide-and-conquer algorithms for real-world applications and analyze their performance		
3.	Implement decrease-and-conquer algorithms for practical problems and compare their efficiency with other sorting techniques.		
4.	Apply transform-and-conquer algorithms to solve computational problems and evaluate their performance.		
5.	Implement string matching algorithms for real-world text searching and pattern matching applications.		
6.	Develop optimal solutions for optimization problems using dynamic programming.		
7.	Apply greedy algorithms to solve optimization and minimum-cost problems.		

8.	Implement backtracking algorithms to solve constraint satisfaction and combinatorial problems.												
Proposed Assessment Plan (for 50 marks of CIE):													
Tool				Remarks								Marks	
CIE				Laboratory CIE								20	
Continuous Evaluation				Conduction of experiments								30	
Total												50	
Teaching - Learning – Evaluation Scheme													
Sl. No		Teaching - Learning Method						No. of Hours/ Week		No. of Weeks		Hours/ Semester	
1.		Execution of laboratory programs						2		14		28	
2.		Evaluation of Learning Process										2	
Total Learning Hours / Semester												30	
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	3	-	3	-	-	-	-	-	3	-	3
CO2	-	-	-	-	-	-	-	-	3	-	3	-	-

Course Title	DATABASE MANAGEMENT SYSTEMS LABORATORY		
Course Code	25CS407	(L-T-P) C	(0-0-2) 1
Exam Hrs.	3	Hours/Week	2
CIE	50 Marks	Total Hours	28P + 2EV=30
SEE	50 Marks		

Course Objective: Design a database and write SQL queries.

Course Outcomes (COs): Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply database concepts for a given problem.	1	-
2.	Design SQL queries and conceptual data models for database applications.	3	-
3.	Demonstrate SQL commands to create, manipulate and query data in a database.	3	1

Course Contents:

PART A

- Consider the following relation schema:
 SAILORS (Sid: integer, Sname: string, Rating: integer, Age: real)
 BOATS (Bid: integer, Bname: string, Color: string)
 RESERVES (sid: integer, bid: integer, Day: date)
 Create above tables by specifying primary key, foreign key and other suitable constraints.
 Insert atleast 5 tuples to each created table.
 Design a database to satisfy the above requirements and answer following queries
 - Find all sailors with a rating above 9.
 - Find the names of sailors who have reserved boat number 103.
 - Find the names of sailors who have reserved a red boat
 - Find the names of sailors who have reserved a red or a green boat
- Consider the following schema:
 EMPLOYEE (Ename, Ssn, Bdate, Sex, Address, salary, Mgrssn, Dno)
 DEPARTMENT (Dname, Dnumber, Mgrssn, Mgr_start_date)
 PROJECT (Pname, Pnumber, Plocation, Dnum)
 WORKS_ON (Essn, Pno, Hours)
 DEPENDENT (Essn, Dependent_name, Sex)
 Create above tables by specifying primary key, foreign key and other suitable constraints.
 Insert atleast 5 tuples to each created table.
 - Retrieve the name and address of all employees who work for the "specified" department.
 - For each employee, retrieve the employee's name and the name of his or her immediate supervisor
 - Find the sum of all salaries of all employees
 - For each department, retrieve the department number, the number of employees in the department and their average salary.
- Consider the database of student enrollment in courses and books adopted for each course.
 - Demonstrate how you add a new text book to the database and make this book be adopted by some department.
 - Produce a list of text books (include course #, book_isbn, book-title) in the alphabetical order for courses offered by the cs department that use more than 2 books.

- iii. List the department that has adopted books published by specific publisher.
4. Consider the details maintained by a book dealer. Create the tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation.
 - i. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2015.
 - ii. Find the author of the book which has maximum sales.
 - iii. Demonstrate how you increase the price of books published by a specific publisher by 10%.
5. Design a movie parlour database and solve the following queries as outlined below using SQL.
 - i. List only movies in the Children category with a review rate of more than 8 and sort according to movie title.
 - ii. List all the movies with a certification of "U" or "B" in the Video table.
 - iii. List the titles of all movies directed by 'Hitchcock'
 - iv. Update rating of all movies directed by 'Steven Spielberg' to 8.
6. Consider the following database for a banking enterprise

BRANCH (branchname: String, branchcity: String, assets: real)

ACCOUNTS (accno: int, branchname: String, balance: real)

DEPOSITOR (customername: String, customerstreet: String, customercity: String)

LOAN (loannumber: int, branchname: String, amount: real)

BORROWER (customername: String, loannumber: int)

Create the above tables by properly specifying the primary keys and the foreign keys. Enter atleast five tuples for each relation.

 - i. Find all the customers who have at least two accounts at the Main branch.
 - ii. Find all the customers who have an account at all the branches located in a specific city.
 - iii. Demonstrate how you delete all account tuples at every branch located in a specific city.
7. Consider the Insurance database. Create the tables by properly specifying the primary keys and the foreign keys, Enter at least five tuples for each relation.
 - i. Demonstrate how you i. Update the damage amount for the car with a specific regno in accident with report number 10 to 50000
 - ii. Add a new accident to the database.
 - iii. Find the total number of people who owned cars that were involved in accidents in 2024.
 - iv. Find the number of accidents in which cars belonging to a specific model were involved.
8. Suppose a movie_studio has several film crews. The crews might be designated by a given studio as crew1, crew 2, and so on. However, other studios might use the same designations for crews, so the attribute crew_nuber is not a key for crews. Movie_studio holds the information like name, branch and several locations. Each crew holds information like sector and strength.
 - i. Establish the database by normalizing up to 3NF and considering all schema level constraints
 - ii. Write SQL insertion query to insert few tuples to all the relations
 - iii. List all movie studios which are not used a single crews.
 - iv. Retrieve the movie studio which uses highest strength crew.
 - v. Write a procedure to retrieve all crews used by specific studio.

9. Design a relational database for a real estate agency. It should store information about houses for sale, seller information, Buyer information, agents information (who can act on behalf of either the buyer or the seller), and the sale of houses.

Answer the following queries in SQL.

- What are the ids, addresses, asking_price, and selling_price of all houses that sold for less than the asking price?
- What are names of all of (prospective) buyers who have not bought a house? Each name should appear only once.
- Find the addresses and asking prices of all houses that have at least 3 bedrooms and two bathrooms that have not sold. Each address, asking price pair should appear only once

10. Create the database for Hospital Management System by designing the required tables with appropriate Primary Keys and Foreign Keys. Entities: Doctor, Patient, Department, Appointment, Treatment.

- List patients treated by a specific doctor.
- Find doctors who have no appointments.
- Display patients admitted in a particular department.
- Find the doctor with the highest number of patients.
- Count appointments department-wise.

PART B

- Design an ER diagram for the DBMS. Clearly identify the entities, attributes, primary keys, and relationships (including cardinalities). Use appropriate renaming/aliases where necessary to avoid ambiguity in entity names.
- Demonstrate the use of Data Definition Language (DDL) commands along with constraints (PRIMARY KEY, FOREIGN KEY, UNIQUE, NOT NULL, CHECK).
- Demonstrate the use of Data Manipulation Language (DML) commands — INSERT, UPDATE, and DELETE.
- Retrieve the information from any database using a nested subquery in SQL
- Demonstrate the use of the **EXISTS** function by retrieving relevant information from a database in SQL.
- Demonstrate the use of the ALL operator along with column renaming (AS) in SQL.
- Demonstrate the use of joined tables in SQL.
- Demonstrate the use of an outer join in SQL (LEFT, RIGHT, and FULL).
- Demonstrate the use of the GROUP BY clause in SQL.
- Demonstrate the use of aggregate functions in SQL by writing queries that calculate totals, averages, minimums, maximums, or counts from a database.

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	2	14	28
2.	Evaluation of Learning Process			02
Total Learning Hours / Semester				30

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Evaluation	Continuous Evaluation in every lab session and Laboratory Record.	30
Laboratory CIE	Conducted for 50 marks and scaled down to 20	20
Total Marks		50

Course Articulation matrix

[illegible]

Course Title	COMPUTER ASSEMBLY AND NETWORKING		
Course Code	25CS408A	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	02
CIE	50 Marks	Total Hours	28P + 2EV = 30
SEE	50 Marks		
Course Objective: Acquire hands on experience on computer assembly and disassembly, trouble shooting and computer networking			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply computer hardware, networking, and operating system concepts to assemble, configure, troubleshoot, and maintain computer systems and local area networks.	1, 5, 11	1, 2
2.	Develop and implement networking solutions involving wired/wireless networks, routing, client-server configuration, and routing protocols, while effectively documenting laboratory experiments and project activities	3, 5, 8, 9 11	1, 2
Course Contents:			
PART A			
Computer assembly and disassembly: Open the case, Install the power supply, Attach the components to the motherboard and install the motherboard, install internal drives, connect all internal cables, install motherboard power connections, connect external cables to the computer, Boot the computer for the first time. Computer Disassembly: Unplugging, Open the case, disconnect all the connectors, Remove the fan, Remove the power supply, Removing HDD and optical drive, Remove RAM (random access memory), modules, remove expansion cards, remove motherboard, Reassemble the components. Troubleshooting: Diagnose and troubleshooting microcomputer/computer systems hardware and software and other peripheral equipment: Approaches to solve a PC problem, troubleshooting a failed boot before the OS is loaded, different approaches to installing and supporting I/O device, managing faulty components. Troubleshooting printer and scanner problems, troubleshooting hard drive problems. Network cables assembling and testing: This lab introduces three types of cabling, i.e. twisted pairs, coaxial cable, and fiber optic. Students assemble connectors to a twisted pair cable using crimping tool, and then they test the cable to ensure properly wired connections. This is important because many of the network installation problems are related to cable errors. Network cards installation and test: This lab shows how to install and configure the network card into a PC expansion slot of a client computer. Connect the client computer to the network. Install the cable and document all network connections on a classroom LAN network. LAN configuration: Once the network operating system and the physical hardware are installed and configured, shares must be set up on the workstations. The lab introduces how to locate the network configuration screen used with Windows XP and configure a workstation with a unique computer name and configure a hub with an IP address. Each workstation becomes a client for Microsoft Networks, and File and Print Sharing is enabled. The basic elements will be in place to share files between workstations on the LAN. In this procedure students examine the user-level access control, that is, access is granted based upon access privileges granted to a single user or a group of users. Another lab activity is the configuration of a client computer for print sharing. Wireless Networks: In this lab students will install and configure the TP-Link Wireless Access point, which allows laptops and other mobile computer systems wireless access to a network and perform a link test to assess the performance of the RF link. Also, students learn how to implement a strong network security by changing the Service Set Identifier (SSID), and establish			

a strong Wi-Fi Protected Access (WPA) passphrase on the router or access point. Then configure all the wireless computers and devices on the network to associate with the SSID of WPA-enabled router or access point using the same WPA passphrase.

7. **Router configuration:** This lab introduces the concepts of IP forwarding and routing between IP networks. The lab exercise shows how to set up a Windows PC and a TP-Link router as an IP router and reveals the similarities of IP forwarding and routing tables on a Windows PC and a TP-Link router. Students learn how to interpret and edit routing-table entries in a network with multiple IP networks and IP routers.
8. **Client-Server Network Configuration:** Students are introduced to the installation of Windows Server tools on a Windows Professional workstation and set up a user account on the Windows server. Also create and manage networked groups and manage the security policies of users and the network.
9. **Routing Information Protocol:** The lab explores a routing protocol based on the distance-vector algorithm using network simulator. The goal of the lab is to configure and analyze the performance of the Routing Information Protocol (RIP) model. Here students study how RIP provides a distributed, dynamic way to solve the problem of finding the lowest-cost path in the presence of link and node failures and changing edge costs. A lab exercise with the routing protocol RIP explores the analysis of the routing tables generated in the routers based on distance-vector algorithm, and how RIP is affected by link failures.

PART B (Open end Problems)

1 Build and Upgrade a Desktop Computer System

Tasks

- a) Identify the specifications and compatibility of the following hardware components:
 - a. Motherboard
 - b. Processor (CPU)
 - c. RAM
 - d. Power Supply Unit (PSU)
 - e. Storage Device (SSD/HDD)
 - f. Graphics Card (if available)
 - g. Cooling Fan
- b) Assemble the desktop computer by:
 - a. Installing the processor and CPU cooler.
 - b. Installing RAM modules.
 - c. Mounting the motherboard inside the cabinet.
 - d. Installing the power supply.
 - e. Installing storage devices.
 - f. Connecting power and data cables.
 - g. Connecting front-panel connectors and peripheral devices.
- c) Power on the computer and verify:
 - a. Successful POST (Power-On Self-Test).
 - b. Detection of installed hardware in BIOS/UEFI.
 - c. Proper functioning of keyboard, mouse, and display.
- d) Perform one or more hardware upgrades, such as:
 - a. Adding additional RAM.
 - b. Replacing HDD with SSD.
 - c. Installing a graphics card.
 - d. Replacing the power supply with a higher-capacity unit.
- e) Test the upgraded system and compare its configuration with the original setup.
- f) Prepare a report describing:
 - a. Hardware components used.
 - b. Installation procedure.
 - c. Compatibility considerations.

	d. Challenges encountered. e. Performance improvements after the upgrade.
2	System Health Assessment and Maintenance of a Desktop Computer Tasks a) Inspect a desktop computer and record its hardware and software configuration, including: a. Processor b. RAM c. Storage Device d. Operating System e. Connected Peripherals b) Evaluate the system for common operational issues by checking: a. Boot performance b. Storage utilization and disk health c. Device Manager for hardware conflicts d. System logs and error messages e. Printer and scanner connectivity f. Network connectivity c) Perform maintenance activities such as: a. Updating device drivers. b. Cleaning temporary files and optimizing storage. c. Checking disk integrity and file system errors. d. Scanning the system for malware or security threats. e. Configuring or reinstalling peripheral devices, if necessary. d) Identify and resolve at least three different system issues, which may include: a. Slow system performance. b. Peripheral device not detected. c. Driver-related issues. d. Storage errors. e. Printer or scanner communication problems. f. Network configuration problems. e) Verify that all identified issues have been resolved and evaluate the overall system performance after maintenance. f) Prepare a maintenance report documenting: a. Issues identified. b. Diagnostic methods used. c. Corrective actions performed. d. System status before and after maintenance. e. Recommendations for preventive maintenance.
3	Design, Fabrication, and Validation of an Ethernet LAN Cable Tasks a) Study the specifications and applications of different network transmission media: a. Unshielded Twisted Pair (UTP) b. Shielded Twisted Pair (STP) c. Coaxial Cable d. Fiber Optic Cable b) Select an appropriate cable type for the given networking scenario and justify your choice based on factors such as: a. Distance b. Cost c. Bandwidth d. Installation environment c) Fabricate an Ethernet cable by:

	a. Measuring and cutting the cable. b. Stripping the cable jacket. c. Arranging wires according to the T568A or T568B wiring standard. d. Crimping RJ-45 connectors using a crimping tool. d) Test the fabricated cable using a LAN cable tester and verify: a. Pin-to-pin continuity. b. Correct wiring sequence. c. Absence of open, short, crossed, or reversed wire connections. e) Record the test results and identify any faults detected during testing. If faults are found, reconstruct the cable and repeat the testing process. f) Prepare a report including: a. Cable type selected. b. Wiring standard followed. c. Test observations. d. Errors encountered and corrective actions taken. e. Recommended applications for the fabricated cable.
4	LAN Interface Configuration and Network Connectivity Verification Tasks a) Study the specifications and features of different types of Network Interface Cards (NICs), including: a. Wired Ethernet NIC b. Wireless NIC c. PCI/PCIe Network Adapters d. USB Network Adapters b) Select an appropriate NIC based on the given networking requirements and justify your choice. c) Install the selected NIC in a desktop computer (or verify the installation of an existing NIC) and ensure that the operating system detects the device correctly. d) Configure the network interface by: a. Assigning an IP address (Static or Dynamic). b. Configuring the subnet mask, default gateway, and DNS server. c. Verifying the network adapter settings. e) Connect the computer to a LAN using the appropriate network medium and verify connectivity by: a. Testing communication with other computers using network diagnostic tools. b. Verifying Internet connectivity (if available). c. Checking network status and adapter information. f) Prepare a network documentation report that includes: a. Network topology used. b. IP addressing scheme. c. Connected devices. d. NIC specifications. e. Test results and observations.
5	Design and Configure a Secure Small Office Local Area Network (LAN) Tasks a) Design a small LAN consisting of at least three client computers and one networking device (switch/router). b) Configure each client computer by: a. Assigning a unique computer name. b. Configuring static or dynamic IP addressing. c. Verifying network connectivity between all systems. c) Configure the networking device with appropriate network settings, including:

	a. IP address. b. Subnet mask. c. Default gateway (if required). d) Enable and configure the following network services: a. File sharing. b. Printer sharing. c. Network discovery. e) Create multiple user accounts (or user groups) and configure access permissions to shared folders by: a. Allowing read-only access for one group. b. Allowing read/write access for another group. c. Restricting unauthorized access to sensitive resources. f) Verify the network by: a. Accessing shared folders from different client computers. b. Printing a test page through the shared printer. c. Testing communication between all devices. g) Prepare a report including: a. Network topology diagram. b. IP addressing scheme. c. Shared resources. d. User access permissions. e. Test results and observations.
6	Design and Secure a Wireless Campus Network Tasks a) Study the features and specifications of wireless networking devices, including: a. Wireless Access Point (AP) b. Wireless Router c. Wireless Network Interface Card (NIC) b) Install and configure a wireless access point (or wireless router) by: a. Assigning an appropriate IP address. b. Configuring the wireless network parameters. c. Setting up Internet/LAN connectivity. c) Configure the wireless network by: a. Assigning a meaningful SSID. b. Selecting an appropriate wireless channel. c. Configuring WPA2/WPA3 Personal security with a strong passphrase. d. Disabling insecure or unnecessary wireless features, if applicable. d) Connect multiple wireless devices (laptops, smartphones, or tablets) to the configured wireless network and verify successful connectivity. e) Evaluate the wireless network by: a. Measuring signal strength at different locations. b. Performing connectivity tests (e.g., ping). c. Recording network speed or throughput using suitable tools. d. Identifying areas with weak wireless coverage. f) Prepare a report that includes: a. Wireless network configuration details. b. Security settings implemented. c. Performance measurements. d. Coverage observations. e. Recommendations for improving wireless network performance and security.
7	Design and Configure a Multi-Network Routing Environment Tasks

	a) Design a network topology consisting of: a. One router b. At least three different IP subnets c. One switch for each subnet d. Multiple client computers b) Assign suitable IP addressing schemes for each subnet and document the network plan. c) Configure the router by: a. Assigning IP addresses to router interfaces. b. Enabling routing between the configured networks. c. Verifying interface status. d) Configure the client computers by: a. Assigning IP addresses. b. Configuring subnet masks. c. Setting the appropriate default gateway. e) Verify communication between devices located in different networks using network diagnostic tools such as: a. ping b. tracert/traceroute c. ipconfig/ifconfig f) Examine the routing table of the router and explain how routing decisions are made for packets traveling between different networks. g) Prepare a report containing: a. Network topology diagram. b. IP addressing scheme. c. Router configuration summary. d. Routing table observations. e. Connectivity test results. f. Challenges encountered and their solutions.
8	Design and Manage a Secure Client–Server Network Environment Tasks a) Install and configure a Windows Server (physical or virtual machine) and assign appropriate network settings. b) Configure one or more client computers to communicate with the server by: a. Assigning suitable IP addresses. b. Verifying network connectivity. c. Joining the client computers to the server environment (if applicable). c) Create organizational user accounts representing different departments (e.g., HR, Finance, and IT). d) Create user groups and assign users to appropriate groups based on their roles and responsibilities. e) Configure shared folders on the server and assign different permission levels, such as: a. Read-only access. b. Read/Write access. c. Full Control for administrators. f) Implement basic security policies, such as: a. Password complexity requirements. b. Account lockout policy. c. User login restrictions. d. Audit logging for user activities. g) Verify that users can access only the resources permitted by their assigned roles and document the test results. h) Prepare a report including:

	a. Network architecture. b. User and group structure. c. Resource-sharing configuration. d. Security policies implemented. e. Validation results and recommendations.				
9	Dynamic Routing Configuration and Performance Evaluation Using RIP Tasks a) Design a network topology using a network simulation tool (e.g., Cisco Packet Tracer or GNS3) consisting of: a. At least three routers. b. Multiple LAN segments. c. Client computers connected to each LAN. b) Assign suitable IP addresses to all router interfaces and end devices, and document the addressing scheme. c) Configure RIP Version 2 (RIPv2) on all routers to enable dynamic routing between the networks. d) Verify network connectivity by: a. Testing communication between devices in different networks. b. Examining routing tables on each router. c. Confirming that routes are learned dynamically. e) Simulate one or more network changes, such as: a. Link failure between two routers. b. Router shutdown. c. Addition of a new subnet. f) Observe and analyze: a. Updates to the routing tables. b. Route convergence time. c. Network connectivity before and after the topology change. d. Recovery of communication after the network stabilizes. g) Prepare a report containing: a. Network topology. b. IP addressing plan. c. RIP configuration details. d. Routing table analysis. e. Observations on convergence and fault recovery. f. Recommendations for improving network reliability.				
Pre-requisite (If any): Fundamental of Computer Components					
Text Books					
Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Data and Communications and Networking	Behrouz A Forouzan	5 th Indian	McGraw Hill,	2013
2.	Computer-Networks	Andrew S. Tanenbaum and David J. Wetherall	5 th Indian	Pearson Education	2012
EBOOKS/MOOC:					
Online Courses and Video Lectures:					
Teaching -Learning– Evaluation Scheme:					
Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester	
1.	Laboratory Teaching	2	14	28	

2.	Evaluation of Learning Process						-	-	2				
Total Learning Hours / Semester									30				
Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks							Marks				
CIE		Laboratory CIE - conducted for 50 marks and scaled down to 20							20				
Continuous Evaluation		Continuous Evaluation in every lab session by the Course Coordinator							30				
Total Marks									50				
Evaluation of Learning Process													
Conducting Lab CIE for the listed program Part A & Open-ended question not done in regular lab sessions under PART-B													
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	1	2	2
CO2	-	-	3	-	3	-	-	3	3	-	2	2	2

Course Title	INTRODUCTION TO POWER BI		
Course Code	25CS408B	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	02
CIE	50 Marks	Total Hours	28P + 2EV = 30
SEE	50 Marks		
Course Objective: To learn and Practice Programming techniques using Microsoft Power BI.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply Power BI tools and data transformation techniques to import, clean, transform, model, and manage data from multiple sources for business analytics.	1, 5, 11	1, 2
2.	Develop interactive dashboards and business intelligence reports using Power BI visualizations, relationships, DAX features, and advanced reporting techniques, while effectively documenting laboratory experiments and project activities.	3, 5, 8, 9 11	1, 2
Course Contents:			
Practice Programs: (Self Learning)			
1. Installation of Power BI 2. Building Blocks and Components of Power BI 3. Overview of GU 4. Introduction to Power Query Editor			
PART A			
1. You have a dataset in an Excel file named SalesData.xlsx with the following columns: Date, Product, Quantity, and Price. You want to: - Import the data. - Filter out rows where the Quantity is less than 10. - Remove duplicate rows. - Add a new column TotalSales which is the product of Quantity and Price.			
2. ABC Retailers deals with various data sources and formats, leading to inconsistencies and errors the data. To derive meaningful insights, the data must be transformed and prepared using Power BI. This includes establishing appropriate data types, replacing erroneous values, handling nulls and errors, performing pivoting and un-pivoting operations, merging and appending queries, and importing data from folders.			
3. ABC Retailers needs to perform advanced data transformations to derive more meaningful insights from their data. This involves creating custom columns, conditional columns, summarizing data with group by, managing queries, and optimizing report performance by enabling/disabling load and report refresh options.			
4. ABC Corporation has a diverse dataset comprising sales transactions, product details, customer information, and category classifications. The company seeks to utilize Power BI to establish and manage relationships between these datasets to facilitate comprehensive data analysis and reporting.			
5. XYZ Corporation is leveraging Power BI to analyze their sales and customer data. They need to understand how to configure cross-filter directions and effectively manage relationships between their datasets to enhance data analysis capabilities.			
6. ABC Corporation is looking to enhance its data analysis capabilities using Power BI. Employee's need comprehensive training on understanding various visualization types, utilizing the Format tab effectively, and mastering the creation of tables and bar charts for insightful reporting.			
7. XYZ Corporation aims to enhance its data analysis capabilities by leveraging Power BI for insightful data visualization. Employees need training on creating and customizing Clustered Column Charts, Matrix Visuals, Pie Charts, and Donut Charts to effectively present data and			

derive actionable insights.

8. XYZ Corporation is leveraging Power BI to analyze sales and operational data. Employees need training on creating Clustered Column charts, applying Conditional Formatting, and understanding various types of Filters in Power BI to enhance data visualization and analysis capabilities.
9. ABC Corporation is enhancing its data analytics capabilities using Power BI. Employees require training on utilizing Slicers, managing Edit Interactions, creating Bookmarks, and implementing Drill Down and Drill Through features to optimize data exploration and reporting.
10. XYZ Corporation is adopting Power BI for enhanced data visualization and analytics. Employees need training on using Tooltips, creating interactive Buttons, incorporating KPI Cards, generating Waterfall Charts, and integrating Custom Visuals to develop compelling and actionable reports.

PART B (Open end Problems)

1	Data Preparation and Sales Performance Analysis Using Power BI Tasks a) Import the RetailStoreData.xlsx dataset into Power BI Desktop. b) Perform the following data transformation operations: a. Remove records where Units Sold is less than 5. b. Remove duplicate records based on Invoice Date, Product Category, and Salesperson. c. Rename column headers wherever necessary to improve readability. d. Replace any missing or null values with appropriate default values. c) Create the following calculated columns: a. Sales Amount = Units Sold × Unit Price b. Discount Category based on Sales Amount (Low, Medium, High) using suitable conditions. d) Verify the transformed dataset and ensure all changes are correctly applied. e) Load the cleaned dataset into the Power BI data model. f) Prepare a report summarizing: a. Data cleaning operations performed. b. New calculated columns created. c. Number of records before and after transformation. d. Observations on the quality of the dataset.
2	Data Integration and Transformation for Healthcare Analytics Using Power BI Tasks a) Import datasets from multiple sources, including: a. Excel workbook(s) b. CSV file(s) c. A folder containing monthly patient records b) Perform the following data transformation operations: a. Assign appropriate data types to all columns. b. Replace invalid or inconsistent values with standardized values. c. Identify and handle null values and data errors. d. Rename and format column headers for consistency. c) Perform data reshaping operations by: a. Pivoting selected columns to create summary tables. b. Unpivoting data to normalize the dataset for analysis. d) Integrate the datasets by: a. Merging related tables using a common field (e.g., Patient ID). b. Appending multiple monthly datasets into a single consolidated table. e) Validate the transformed dataset by checking: a. Data completeness.

	b. Duplicate records. c. Data consistency across merged sources. f) Load the final dataset into the Power BI data model and prepare a report describing: a. Data sources used. b. Transformation steps performed. c. Data integration techniques applied. d. Challenges encountered and solutions implemented.
3	Customer Feedback Data Analysis and Optimization Using Power BI Tasks a) Import the Customer Feedback dataset into Power BI Desktop. b) Perform advanced data transformation by: a. Creating custom columns to calculate metrics such as Customer Satisfaction Score or Response Time Category. b. Creating conditional columns to classify feedback into categories such as <i>Excellent</i>, <i>Good</i>, <i>Average</i>, and <i>Poor</i> based on predefined criteria. c. Formatting and standardizing the dataset for consistency. c) Summarize the data using Group By to obtain insights such as: a. Total feedback received by service center. b. Average satisfaction score by region. c. Number of complaints by category. d) Manage Power Query operations by: a. Renaming and organizing queries. b. Creating reference or duplicate queries where appropriate. c. Combining transformation steps for better readability and maintenance. e) Optimize the Power BI project by: a. Enabling or disabling query load for intermediate queries. b. Configuring report refresh options. c. Verifying that only the required tables are loaded into the data model. f) Load the transformed data into Power BI and prepare a report documenting: a. Transformations performed. b. Custom and conditional columns created. c. Summary statistics generated. d. Performance optimization techniques applied. e. Observations and recommendations.
4	Designing a Data Model for Hospital Management Analytics Using Power BI Tasks a) Import the following datasets into Power BI Desktop: a. Patient Details b. Doctor Details c. Appointment Records d. Treatment Records e. Department Details b) Examine the datasets and identify: a. Primary keys. b. Foreign keys. c. Common attributes that can be used to establish relationships. c) Create an optimized data model by: a. Defining one-to-one, one-to-many, or many-to-many relationships where appropriate. b. Configuring cross-filter directions. c. Verifying relationship cardinality. d) Validate the data model by creating sample visualizations such as: a. Number of patients treated by each department.

	b. Total appointments handled by each doctor. c. Monthly treatment statistics. d. Department-wise patient distribution. e) Identify and resolve issues such as: a. Ambiguous relationships. b. Circular dependencies. c. Duplicate keys or missing relationships. f) Prepare a report describing: a. Dataset structure. b. Relationships established. c. Data model design. d. Challenges encountered and their resolutions. e. Advantages of the implemented data model for analytics.
5	University Academic Data Modeling and Filter Propagation Using Power BI Tasks a) Import the following datasets into Power BI Desktop: a. Student Details b. Course Details c. Faculty Details d. Department Details e. Enrollment Records b) Examine the datasets and identify: a. Primary keys and foreign keys. b. Appropriate relationships between tables. c. Fact and dimension tables. c) Create the data model by: a. Establishing suitable relationships between all tables. b. Configuring relationship cardinality. c. Selecting appropriate cross-filter directions (Single or Both) based on reporting requirements. d) Analyze the impact of different cross-filter directions by creating reports such as: a. Department-wise student enrollment. b. Faculty-wise course allocation. c. Course enrollment by semester. d. Student distribution across departments. e) Modify the relationship settings and observe how report results change with different cross-filter configurations. f) Identify and resolve issues such as: a. Ambiguous filter paths. b. Inactive relationships. c. Incorrect aggregation due to improper filter propagation. g) Prepare a report including: a. Data model diagram. b. Relationship configuration. c. Cross-filter settings used. d. Observations before and after modifying filter directions. e. Recommendations for designing efficient Power BI data models.
6	Interactive Dashboard Design for Library Management Using Power BI Tasks a) Import the Library Management dataset into Power BI Desktop. b) Explore the dataset and identify suitable fields for analysis, such as: a. Book Category

	b. Member Type c. Issue Date d. Return Date e. Fine Amount f. Number of Books Issued c) Create the following visualizations: a. Table showing book issue details. b. Clustered Bar Chart displaying the number of books issued by category. c. Column Chart showing monthly book issue trends. d. Pie or Donut Chart representing the distribution of members by type. e. Card Visual displaying total books issued and total fine collected. d) Use the Format pane to customize the dashboard by: a. Adding meaningful titles. b. Changing colors and themes. c. Formatting labels, legends, and axes. d. Applying data labels and tooltips. e. Aligning and resizing visuals for improved readability. e) Add interactive features such as: a. Slicers for Book Category and Member Type. b. Filters for Issue Date. c. Cross-filtering between visualizations. f) Evaluate the dashboard and prepare a report describing: a. Visualizations created. b. Formatting techniques applied. c. Interactive features implemented. d. Key insights obtained from the dashboard.
7	Business Performance Visualization Using Power BI Tasks a) Import the Manufacturing Performance dataset into Power BI Desktop. b) Explore the dataset and identify suitable fields for visualization, such as: a. Factory Location b. Product Category c. Monthly Production d. Production Cost e. Units Manufactured c) Create the following visualizations: a. Clustered Column Chart to compare monthly production across factory locations. b. Matrix Visual to summarize production units by factory and product category. c. Pie Chart to display the percentage contribution of each product category to total production. d. Donut Chart to represent the distribution of production cost among different factories. d) Customize each visualization using the Format pane by: a. Adding descriptive titles and subtitles. b. Formatting data labels, legends, and axes. c. Applying suitable themes, colors, and fonts. d. Configuring tooltips for additional information. e. Sorting data to improve readability. e) Enhance the report by adding: a. Slicers for Factory Location, Product Category, and Month. b. Visual-level, page-level, and report-level filters. c. Cross-filtering and cross-highlighting between visuals.

	f) Analyze the dashboard and identify: a. Factory with the highest production. b. Product category contributing the largest share of production. c. Factory incurring the highest production cost. d. Monthly production trends and performance variations. g) Prepare a report documenting: a. Visualizations created. b. Formatting and customization techniques applied. c. Interactive features implemented. d. Business insights derived from the dashboard.
8	Financial Performance Dashboard Using Power BI Tasks a) Import the Financial Performance dataset into Power BI Desktop. b) Explore the dataset and identify suitable fields for analysis, such as: a. Branch Name b. Region c. Revenue d. Operating Expense e. Profit f. Number of Customer Accounts g. Loan Amount c) Create the following visualizations: a. Clustered Column Chart to compare branch-wise revenue or profit. b. Table or Matrix Visual to summarize financial performance by region and branch. c. Card Visuals to display Total Revenue, Total Profit, and Total Customers. d) Apply Conditional Formatting to: a. Highlight branches with profits above or below a specified threshold. b. Color-code revenue or profit values using data bars, icons, or background colors. c. Emphasize top-performing and underperforming branches in tables or matrices. e) Implement different types of Filters in Power BI: a. Visual-level Filters to display selected branches or regions. b. Page-level Filters to analyze a specific financial year or region. c. Report-level Filters to apply organization-wide filtering criteria. d. Add Slicers for Region, Branch, and Financial Year to enable interactive analysis. f) Analyze the dashboard to identify: a. Branch with the highest and lowest profit. b. Region generating the highest revenue. c. Branches with operating expenses exceeding a specified limit. d. Overall financial performance trends. g) Prepare a report documenting: a. Visualizations created. b. Conditional formatting rules applied. c. Types of filters implemented and their purpose. d. Business insights obtained from the dashboard. e. Recommendations for improving financial performance.
9	Interactive Student Performance Analytics Dashboard Using Power BI Tasks a) Import the Student Academic Performance dataset into Power BI Desktop. b) Design an interactive dashboard containing visualizations such as: a. Clustered Column Chart showing department-wise average marks. b. Line Chart displaying semester-wise performance trends. c. Matrix Visual summarizing student results by department and semester.

	d. Card Visuals showing total students, average attendance, and pass percentage. c) Add Slicers to enable filtering based on: a. Department b. Semester c. Course d. Academic Year d) Configure Edit Interactions so that selected visuals appropriately filter, highlight, or ignore other visuals based on analytical requirements. e) Create Bookmarks to provide different report views, such as: a. Overall Academic Performance b. Department-wise Analysis c. Attendance Analysis d. Examination Performance f) Implement Drill Down functionality to allow users to navigate through hierarchical data, for example: a. Academic Year → Semester → Department → Student g) Configure Drill Through pages that display detailed information for a selected student or department, including: a. Attendance percentage b. Subject-wise marks c. Overall grade d. Performance trends h) Test the dashboard and evaluate: a. Navigation efficiency. b. Accuracy of filtering and interactions. c. User experience during data exploration. i) Prepare a report documenting: a. Dashboard layout and design. b. Slicers and interaction settings used. c. Bookmarks created. d. Drill Down and Drill Through implementation. e. Key academic insights derived from the dashboard.
10	Hospital Performance Monitoring Dashboard Using Power BI Tasks a) Import the Hospital Management dataset into Power BI Desktop. b) Create KPI Cards to display key performance indicators such as: a. Total Patients Admitted b. Total Discharges c. Average Bed Occupancy Rate d. Total Treatment Revenue e. Average Patient Stay Duration c) Develop the following visualizations: a. Waterfall Chart showing monthly changes in hospital revenue or patient admissions. b. Column/Bar Chart comparing department-wise patient count. c. Line Chart displaying monthly admission trends. d) Enhance report usability by configuring Tooltips that display additional information when users hover over visual elements, such as: a. Doctor details b. Department statistics c. Monthly treatment summaries e) Add Buttons for report navigation, including:

	a. Home Page b. Department Analysis c. Revenue Analysis d. Patient Statistics e. Reset Filters f) Incorporate at least one Custom Visual (downloaded from AppSource), such as: a. Hierarchy Chart b. Word Cloud c. Bullet Chart d. Gantt Chart e. Sankey Diagram g) Test the dashboard by: a. Navigating between report pages using buttons. b. Verifying tooltip functionality. c. Evaluating KPI indicators and custom visual interactions. d. Ensuring the dashboard provides meaningful analytical insights. h) Prepare a report documenting: a. Dashboard design and layout. b. KPI Cards created. c. Tooltip and button configurations. d. Custom visual used and its purpose. e. Business insights derived from the dashboard. f. Recommendations for improving hospital operations.				
Pre-requisite (If any): Fundamental of Python Programming					
Text Books					
Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Introducing Microsoft Power BI	Alberto Ferrari and Marco Russo	1 st	Microsoft Press	2016
2.	Mastering Microsoft Power BI	Brett Powell	1 st	Packt	2018
EBOOKS/MOOC:					
https://www.coursera.org/professional-certificates/microsoft-power-bi-data-analyst					
Online Courses and Video Lectures:					
https://www.youtube.com/@MicrosoftPowerBI					
Teaching -Learning– Evaluation Scheme:					
Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester	
1.	Laboratory Teaching	2	14	28	
2.	Evaluation of Learning Process	-	-	2	
Total Learning Hours / Semester				30	
Proposed Assessment Plan (for 50 marks of CIE):					
Tool	Remarks			Marks	
CIE	Laboratory CIE - conducted for 50 marks and scaled down to 20			20	
Continuous Evaluation	Continuous Evaluation in every lab session by the Course Coordinator			30	
Total Marks				50	
Evaluation of Learning Process					
Conducting Lab CIE for the listed program Part A & Open-ended question not done in regular lab sessions under PART-B					

Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	1	2	2
CO2	-	-	3	-	3	-	-	3	3	-	2	2	2

Course Title	TECHNICAL WRITING USING LATEX		
Course Code	25CS408C	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
CIE	50 Marks	Total Hours	28L+2EV = 30
SEE	50 Marks		

Course Objective: To prepare a LaTeX document.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply LaTeX commands, environments, and document formatting techniques to prepare structured technical documents incorporating text, tables, equations, figures, citations, algorithms, and diagrams.	1, 5, 11	1, 2
2.	Develop professional technical documents and project reports using LaTeX by integrating advanced features such as references, TikZ diagrams, algorithms, and customized layouts, while maintaining laboratory records and project documentation.	3, 5, 8, 9, 11	1, 2

Course Contents:

PART A

1.	Design an Introduction chapter with two sections, each containing a subsection with the relevant information, and include a header [title of document] and a footer [institute name, page number].																															
2.	Create a document that displays the sample Abstract and Summary consists of relevant information.																															
3.	Develop a LaTeX script to create a simple title page of the MCE project Report [Use suitable Logos and text formatting].																															
4.	Develop a LaTeX script to create the Certificate Page of the Report [Use suitable commands to leave the blank spaces for user entry]																															
5.	Develop a LaTeX script to create a document that contains the following table with proper labels.																															
<table><tr><th rowspan="2">Sl No.</th><th rowspan="2">USN</th><th rowspan="2">Student Name</th><th colspan="3">Marks</th></tr><tr><th>Subject 1</th><th>Subject 2</th><th>Subject 3</th></tr><tr><td>1</td><td>4MC23XX001</td><td>Name 1</td><td>70</td><td>80</td><td>85</td></tr><tr><td>2</td><td>4MC23XX002</td><td>Name 2</td><td>80</td><td>84</td><td>90</td></tr><tr><td>3</td><td>4MC23XX003</td><td>Name 3</td><td>88</td><td>98</td><td>50</td></tr></table>						Sl No.	USN	Student Name	Marks			Subject 1	Subject 2	Subject 3	1	4MC23XX001	Name 1	70	80	85	2	4MC23XX002	Name 2	80	84	90	3	4MC23XX003	Name 3	88	98	50
Sl No.	USN	Student Name	Marks																													
			Subject 1	Subject 2	Subject 3																											
1	4MC23XX001	Name 1	70	80	85																											
2	4MC23XX002	Name 2	80	84	90																											
3	4MC23XX003	Name 3	88	98	50																											
6.	Develop a LaTeX script to include the side-by-side graphics/pictures/figures in the document by using the subgraph concept																															
7.	Develop a LaTeX script to create a document that consists of the following two mathematical equations $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$= \frac{-2 \pm \sqrt{2^2 - 4 \cdot (1) \cdot (-8)}}{2 \cdot 1}$$= \frac{-2 \pm \sqrt{4+32}}{2}$ $\varphi_{\sigma}^{\lambda} A_t = \sum_{\pi \in C_t} \text{sgn}(\pi) \varphi_{\sigma}^{\lambda} \varphi_{\pi}^{\lambda}$$= \sum_{\tau \in C_{\sigma t}} \text{sgn}(\sigma^{-1} \tau \sigma) \varphi_{\sigma}^{\lambda} \varphi_{\sigma^{-1} \tau \sigma}^{\lambda}$$= A_{\sigma t} \varphi_{\sigma}^{\lambda}$																															
8.	Develop a LaTeX script to demonstrate the presentation of Numbered theorems, definitions, corollaries, and lemmas in the document																															
9.	Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section																															

10.	Develop a LaTeX script to design a simple tree diagram or hierarchical structure in the document with appropriate labels using the Tikz library
11.	Develop a LaTeX script to present an algorithm in the document using algorithm/algorithmic/algorithm2e library
12.	Develop a LaTeX script to create a simple report and article by using suitable commands and formats of user choice.
PART B (Open end Problems)	
1	Design a Professional Technical Report Using LaTeX Tasks - Create a new LaTeX document using an appropriate document class (e.g., report or article). - Design a professional title page containing: - Report Title - Author Name - Department/Organization - Date - Create a Chapter titled "Project Overview" containing: Section 1: Project Background Subsection: Problem Statement Section 2: Project Objectives Subsection: Expected Outcomes - Configure page formatting to include: - A Header displaying the Title of the Document. - A Footer displaying the Institute Name and Page Number. - Appropriate page margins and page numbering. - Insert: - Table of Contents. - Page breaks where necessary. - Proper text alignment and paragraph formatting. - Compile the document and verify that: - The chapter hierarchy is displayed correctly. - Headers and footers appear on every page. - Page numbers are correctly formatted. - The Table of Contents is automatically generated. - Prepare a report describing: - LaTeX packages used. - Document structure adopted. - Header and footer customization techniques. - Challenges encountered and their solutions.
2	Develop a Professional Research Paper Front Matter Using LaTeX Tasks - Create a new LaTeX document using an appropriate document class (e.g., article). - Design a title page containing: - Research Paper Title - Author Name(s) - Department - Institution - Date - Create an Abstract section that briefly describes: - Problem addressed - Objectives - Methodology

	d. Expected outcomes d) Develop a Conclusion section that summarizes: a. Major findings b. Benefits of the proposed work c. Future scope of the project e) Apply appropriate formatting by: a. Using suitable fonts and spacing. b. Aligning headings consistently. c. Including page numbering. d. Adding headers and footers if required. f) Compile the document and verify: a. Proper formatting of all sections. b. Error-free compilation. c. Professional presentation suitable for publication. g) Prepare a report explaining: a. LaTeX commands and environments used. b. Formatting techniques applied. c. Challenges encountered and solutions adopted.
3	Design a Professional Cover Page Template for a Technical Report Using LaTeX Tasks a) Create a new LaTeX document using an appropriate document class. b) Design a professional cover page that includes the following: a. Report Title b. Student Name(s) c. USN/Registration Number d. Department Name e. Institution Name f. Academic Year g. Guide/Supervisor Name c) Insert appropriate institutional and departmental logos with proper alignment and scaling. d) Apply suitable text formatting by: a. Using different font sizes and styles. b. Applying bold, italics, and capitalization where appropriate. c. Aligning text symmetrically for professional presentation. e) Customize the page layout by: a. Setting appropriate margins. b. Adjusting spacing between elements. c. Center-aligning important content. d. Removing page numbering from the cover page. f) Compile the document and verify: a. Proper placement of logos. b. Correct formatting and alignment. c. Professional appearance suitable for academic submission. g) Prepare a brief report describing: a. LaTeX packages used. b. Formatting techniques adopted. c. Design choices made for the cover page. d. Challenges encountered and their solutions.
4	Design a Professional Declaration and Approval Page Template Using LaTeX Tasks a) Create a new LaTeX document using an appropriate document class. b) Design a Declaration and Approval Page containing the following placeholders:

	a. Project Title b. Student Name(s) c. Registration Number(s) d. Department Name e. Institution Name f. Academic Year c) Create blank spaces for user input using suitable LaTeX commands for: a. Guide/Supervisor Name and Signature b. Head of Department Name and Signature c. Internal Examiner Name and Signature d. External Examiner Name and Signature e. Date f. Place d) Apply professional formatting by: a. Aligning text and signature blocks appropriately. b. Using suitable font sizes, spacing, and page margins. c. Centering important headings. d. Ensuring balanced whitespace for handwritten entries. e) Customize the page by: a. Adding institutional logo(s) if required. b. Removing page numbering from the approval page. c. Maintaining consistency with the report formatting. f) Compile the document and verify: a. Proper alignment of placeholders. b. Adequate blank space for manual entries. c. Professional appearance suitable for official academic documentation. g) Prepare a report describing: a. LaTeX commands used for spacing and formatting. b. Techniques adopted for creating reusable templates. c. Challenges encountered and improvements suggested.
5	Design and Format Academic Result Tables Using LaTeX Tasks a) Create a new LaTeX document using an appropriate document class. b) Design a student result table containing the following fields: a. Student ID b. Student Name c. Department d. Semester e. Marks obtained in multiple subjects f. Total Marks g. Percentage h. Grade c) Format the table using suitable LaTeX features by: a. Creating merged row and column headings where necessary. b. Aligning numerical and textual data appropriately. c. Applying horizontal and vertical rules for readability. d. Using professional table formatting packages (if required). d) Add the following to the table: a. A descriptive caption. b. A label for cross-referencing within the document. c. Proper column alignment and spacing. e) Insert explanatory text before and after the table referring to it using the assigned label.

	f) Compile the document and verify: a. Proper table alignment. b. Correct placement of caption and label. c. Error-free compilation. d. Professional appearance suitable for academic documentation. g) Prepare a brief report describing: a. LaTeX environments and packages used. b. Table formatting techniques adopted. c. Challenges encountered and improvements made.
6	Comparative Visualization of Scientific Images Using LaTeX Tasks a) Create a new LaTeX document using an appropriate document class. b) Insert at least three related images (e.g., satellite images, machine components, medical scans, architectural designs, or product prototypes). c) Arrange the images in a side-by-side layout using suitable LaTeX environments such as the subcaption package. d) Provide: a. Individual captions for each image. b. A common caption for the complete figure. c. Appropriate labels for each subfigure and the overall figure. e) Reference the figures within the document using cross-referencing commands and describe the comparison between the images. f) Apply suitable formatting by: a. Adjusting image size and spacing. b. Aligning images uniformly. c. Maintaining proper page layout and margins. d. Ensuring the figures appear at appropriate locations in the document. g) Compile the document and verify: a. Correct placement of all images. b. Proper numbering of figures and subfigures. c. Accurate cross-references. d. Professional appearance suitable for technical publications. h) Prepare a report describing: a. LaTeX packages used. b. Figure placement techniques adopted. c. Methods used for creating subfigures. d. Challenges encountered and their solutions.
7	Mathematical Equation Formatting and Scientific Documentation Using LaTeX Tasks a) Create a new LaTeX document using an appropriate document class. b) Insert at least two mathematical equations from any engineering, science, or mathematics application (e.g., physics, statistics, machine learning, signal processing, or calculus). c) Format the equations by: a. Displaying them in a centered mathematical environment. b. Assigning automatic equation numbers. c. Aligning multi-line equations where necessary. d. Using appropriate mathematical symbols, superscripts, subscripts, fractions, matrices, and summation notation. d) Assign labels to each equation and reference them within the document using cross-referencing commands. e) Include explanatory text describing: a. The purpose of each equation.

	b. The meaning of important variables and constants used. f) Compile the document and verify: a. Correct equation numbering. b. Proper alignment and formatting. c. Accurate cross-references. d. Error-free compilation. g) Prepare a report describing: a. Mathematical environments and packages used. b. Equation formatting techniques adopted. c. Challenges encountered and their solutions.
8	Create a Mathematical Reference Guide Using Theorem Environments in LaTeX Tasks a) Create a new LaTeX document using an appropriate document class. b) Configure theorem environments using suitable LaTeX packages (e.g., amsthm). c) Design a document that includes the following numbered environments: a. Definition b. Theorem c. Lemma d. Corollary d) For each environment: a. Write an appropriate mathematical statement from any topic such as Algebra, Calculus, Graph Theory, Number Theory, or Probability. b. Ensure automatic numbering is enabled. c. Maintain consistent formatting throughout the document. e) Add a Proof environment for at least one theorem and conclude it using the appropriate proof-ending symbol. f) Create cross-references to the theorem, lemma, definition, and corollary within the document using labels and references. g) Apply professional document formatting by: a. Creating appropriate section headings. b. Including a title and table of contents. c. Using consistent fonts, spacing, and margins. h) Compile the document and verify: a. Correct numbering of all theorem environments. b. Proper formatting of proofs. c. Accurate cross-references. d. Error-free compilation. i) Prepare a report describing: a. Packages and environments used. b. Numbering and referencing techniques. c. Formatting methods adopted. d. Challenges encountered and their solutions.
9	Prepare a Literature Review with Bibliographic References Using LaTeX Tasks a) Create a new LaTeX document using an appropriate document class (e.g., article). b) Select a technical topic of your choice and write two well-structured paragraphs (approximately 150–200 words each) describing: a. Background of the selected topic. b. Recent developments, applications, or challenges. c) Insert at least 10 in-text citations from relevant research papers, books, conference proceedings, or online academic resources using appropriate citation commands. d) Create a bibliography using either:

	a. BibTeX, or b. The thebibliography environment. e) Ensure that: a. Every citation in the text appears in the reference list. b. References follow a consistent citation style (IEEE, APA, ACM, etc.). c. Citations are properly numbered or formatted according to the selected style. f) Apply suitable document formatting by: a. Adding a title, author, and date. b. Creating appropriate section headings. c. Using professional page layout and spacing. g) Compile the document and verify: a. All citations are correctly linked to the references. b. The bibliography is generated without errors. c. The document follows academic writing standards. h) Prepare a report describing: a. Citation and bibliography packages used. b. Bibliography management technique adopted. c. Citation style selected. d. Challenges encountered and solutions implemented.
10	Design a Hierarchical Organizational Structure Using TikZ in LaTeX Tasks a) Create a new LaTeX document using an appropriate document class. b) Import the necessary packages to support TikZ graphics and hierarchical tree structures. c) Design a hierarchical diagram representing any one of the following systems: a. Organizational Structure of a Company b. University Administrative Hierarchy c. File System Directory Structure d. Decision Tree for Product Selection e. Family Tree f. Software Module Hierarchy d) Create a tree with at least four levels consisting of: a. One root node. b. Multiple parent and child nodes. c. Appropriate labels for each node. e) Format the diagram by: a. Using different node shapes (rectangle, circle, ellipse, etc.). b. Applying colors, borders, and text styles. c. Adjusting spacing between nodes for improved readability. d. Drawing connecting branches with suitable arrow styles. f) Add: a. A figure caption. b. A figure label for cross-referencing. c. A brief description explaining the hierarchy represented. g) Compile the document and verify: a. Correct rendering of the TikZ diagram. b. Proper alignment and spacing. c. Error-free compilation. d. Professional appearance suitable for technical documentation. h) Prepare a report describing: a. TikZ libraries and commands used. b. Node and edge customization techniques. c. Challenges encountered and improvements made.

11	Design and Present a Computational Algorithm Using LaTeX Tasks a) Create a new LaTeX document using an appropriate document class. b) Import the required package(s) to create algorithms (e.g., algorithm, algorithmic, or algorithm2e). c) Select a real-world computational problem, such as: a. Searching for a record in a database. b. Scheduling tasks based on priority. c. Finding the shortest path in a network. d. Sorting customer transactions. e. Detecting duplicate records. f. Resource allocation in a cloud environment. d) Write the algorithm using an appropriate algorithm environment by including: a. Input(s) b. Output(s) c. Variable declarations (if required) d. Conditional statements e. Iterative constructs (loops) f. Comments explaining important steps e) Add: a. An appropriate algorithm title (caption). b. Automatic algorithm numbering. c. A label for cross-referencing within the document. f) Include a brief explanation before and after the algorithm describing: a. The problem being solved. b. The logic and workflow of the algorithm. c. The expected output. g) Compile the document and verify: a. Proper formatting of the algorithm. b. Correct numbering and caption. c. Accurate cross-references. d. Error-free compilation. h) Prepare a report describing: a. LaTeX packages used. b. Algorithm environment selected. c. Formatting techniques adopted. d. Challenges encountered and their solutions.
12	Design a Multi-Format Technical Document Using LaTeX Tasks a) Create two LaTeX documents using: a. The report document class. b. The article document class. b) Select a common technical topic (e.g., Artificial Intelligence, Cybersecurity, Smart Cities, Renewable Energy, Internet of Things, etc.). c) Design the Report document with the following components: a. Title Page b. Table of Contents c. Chapters d. Sections and Subsections e. Figures and Tables (optional) f. References d) Design the Article document with the following components:

	a. Title b. Author Details c. Abstract d. Sections and Subsections e. Conclusion f. References e) Apply suitable formatting by: a. Selecting appropriate fonts and spacing. b. Setting page margins. c. Customizing headers and footers. d. Adding page numbering. e. Using appropriate heading styles. f) Compare the two document formats by analyzing: a. Structural differences. b. Formatting differences. c. Suitable applications for each document class. d. Advantages and limitations of each format. g) Compile both documents and verify: a. Error-free compilation. b. Proper formatting and page layout. c. Correct numbering of sections, figures, and tables. d. Professional presentation suitable for academic and industrial documentation. h) Prepare a report documenting: a. Document classes used. b. Formatting commands and packages applied. c. Observations from the comparison. d. Recommendations for selecting document classes in different scenarios.
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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Laboratory CIE - conducted for 50 marks and scaled down to 20	20
Continuous Evaluation	Continuous Evaluation in every lab session by the Course Coordinator	30
Total		50

Teaching - Learning – Evaluation Scheme

Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching	2	14	28
2.	Evaluation of Learning Process	-	-	2
Total Learning Hours / Semester				30

Evaluation of Learning Process

Conducting Lab CIE for the listed program Part A & Open-ended question not done in regular lab sessions under PART-B

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	1	2	2
CO2	-	-	3	-	3	-	-	3	3	-	2	2	2

Course Title	UI/UX LABORATORY		
Course Code	25CS408D	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	02
CIE	50 Marks	Total Hours	28P + 2EV = 30
SEE	50 Marks		
Course Objective: Acquire hands on experience on computer assembly and disassembly, trouble shooting and computer networking			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply UI/UX design principles, wireframing, prototyping, and interaction design techniques to develop intuitive user interfaces for web and mobile applications.	1, 5, 11	1, 2
2.	Develop user-centric UI/UX solutions and interactive prototypes for real-world applications using modern design tools, while effectively documenting laboratory experiments, project activities, and design workflows.	3, 5, 8, 9, 11	1, 2
Course Contents:			
PART A			
1. Chat App Redesign: Create a Wireframe and redesign any popular chat app. 2. Food App: Create a wireframe, Design and Prototype the UI Pages for the food application. 3. Social Media App: Create a wireframe Design and Prototype social media photo sharing app. 4. Product Website: Design and prototype a product website page. Create web pages and rollovers for the web pages 5. Travel Agency Website: Create a wireframe, Design and prototype the UI for the website including design for Home Page with search bar, Activities page, Client Testimonial Page, Image Gallery 6. UI/UX Designer Portfolio Design: Create a wireframe, Design and prototype a UI for a portfolio including design for About page, Work showcase page, Blog page, contact page 7. Dashboard Design: Create a wireframe, Design and Prototype Dashboard UI page, add some Dashboard details, statistics and graphs, Add dropdown options for some dashboard details 8. E-Commerce Website: Create a wireframe, Design and prototype Web pages including product category pages (example: mobiles, gaming consoles, Speakers), product pages in each category, buy now page, add to cart page 9. Educational Website: Create a wireframe, Design and Prototype the UI for an educational website include a Homepage with footer, About Us Page, Programs page, Instructors page, pricing page, Payments page with radial buttons. Design dropdowns for programs button 10. Music Player App: Create a wireframe, Design and prototype the pages with a background and a Rollover button, and Song selection Page with a Home Rollover button. The third page may include animated play and pause button, play music animation, timer animation.			
PART B (Open end Problems)			
1	Design a Wireframe and Prototype for a Smart Healthcare Appointment System Tasks a) Conduct a brief user requirement analysis by identifying: a. Target users. b. User goals. c. Key challenges in the existing appointment process. b) Define the application's information architecture by identifying the primary screens, such as: a. Login/Registration b. Home Dashboard		

	c. Doctor Search d. Appointment Booking e. Appointment History f. Notifications g. User Profile c) Create low-fidelity wireframes for at least five major screens using any UI/UX design tool (e.g., Figma, Adobe XD, Balsamiq). d) Apply UI/UX design principles by: a. Designing intuitive navigation. b. Maintaining visual consistency. c. Selecting appropriate icons and typography. d. Ensuring accessibility and responsive layout. e) Develop a clickable prototype demonstrating the navigation flow between screens. f) Conduct a basic usability evaluation by: a. Identifying usability issues. b. Collecting user feedback from peers. c. Suggesting improvements based on the evaluation. g) Prepare a design report including: a. User personas. b. User flow diagram. c. Wireframes and prototype screenshots. d. Design decisions. e. Observations and recommendations.
2	Design and Prototype a Smart Grocery Shopping Application Tasks a) Conduct a brief user requirement analysis by identifying: a. Target users. b. User needs and expectations. c. Common challenges in existing grocery shopping applications. b) Develop an information architecture by identifying the major application screens, such as: a. Splash Screen b. Login/Registration c. Home Dashboard d. Product Categories e. Product Details f. Shopping Cart g. Order Checkout h. Order Tracking i. User Profile c) Create low-fidelity wireframes for at least six key screens using a UI/UX design tool (e.g., Figma, Adobe XD, Sketch, or Balsamiq). d) Design high-fidelity user interfaces by applying: a. Consistent color palette and typography. b. Appropriate icons and images. c. Responsive layouts. d. Accessibility guidelines. e. Visual hierarchy and spacing. e) Develop an interactive prototype demonstrating complete user navigation, including: a. Product browsing. b. Adding items to the cart. c. Checkout process. d. Order tracking.

	f) Perform a usability evaluation by: a. Testing the prototype with peers. b. Identifying usability issues. c. Recording feedback. d. Suggesting design improvements. g) Prepare a design report containing: a. User Persona(s). b. User Journey Map. c. Wireframes. d. High-fidelity UI Screens. e. Prototype link or screenshots. f. Design rationale and usability findings.
3	Design and Prototype a Smart Travel Planner Mobile Application Tasks a) Conduct a brief user requirement analysis by identifying: a. Target users. b. User goals and expectations. c. Common challenges faced while planning trips. b) Define the application's information architecture by identifying the primary screens, such as: a. Welcome/Login b. Home Dashboard c. Destination Search d. Trip Planner e. Accommodation Booking f. Expense Tracker g. Saved Trips h. User Profile c) Create low-fidelity wireframes for at least six major screens using a UI/UX design tool (e.g., Figma, Adobe XD, Sketch, or Balsamiq). d) Design high-fidelity UI screens by applying: a. Consistent color palette and typography. b. Appropriate icons and illustrations. c. Responsive layouts. d. Accessibility and usability guidelines. e. Clear navigation and visual hierarchy. e) Develop an interactive prototype that demonstrates the complete user journey, including: a. Searching destinations. b. Planning an itinerary. c. Booking accommodations. d. Viewing travel expenses. e. Managing profile settings. f) Conduct a usability evaluation by: a. Testing the prototype with peers. b. Identifying usability issues. c. Collecting and analyzing user feedback. d. Recommending design improvements. g) Prepare a design report including: a. User Persona(s). b. User Flow Diagram. c. Wireframes. d. High-fidelity UI Screens. e. Prototype screenshots or link.

	f. Design rationale. g. Usability findings and recommendations.
4	Design and Prototype a University Event Portal Website Tasks a) Conduct a brief user requirement analysis by identifying: a. Target users. b. User goals and expectations. c. Essential features required in the website. b) Develop the website information architecture by identifying key pages, such as: a. Home b. Events c. Event Details d. Registration e. Gallery f. Contact Us c) Create low-fidelity wireframes for the major web pages using a UI/UX design tool (e.g., Figma, Adobe XD, Sketch). d) Design high-fidelity web page layouts by applying: a. Consistent color scheme and typography. b. Appropriate icons, images, and banners. c. Responsive layout principles. d. Clear navigation menus and visual hierarchy. e) Create interactive rollover (hover) effects for website components such as: a. Navigation menu items. b. Buttons. c. Event cards. d. Images or banners. f) Develop an interactive prototype demonstrating navigation between the web pages, including registration and event information workflows. g) Conduct a usability evaluation by: a. Testing the prototype with peers. b. Identifying usability issues. c. Collecting feedback. d. Recommending improvements based on user observations. h) Prepare a design report containing: a. User Persona(s). b. Sitemap and Navigation Flow. c. Wireframes. d. High-fidelity web page designs. e. Prototype screenshots or link. f. Description of rollover effects. g. Usability findings and recommendations.
5	Design and Prototype a Smart Fitness & Wellness Website Tasks a) Conduct a brief user requirement analysis by identifying: a. Target users. b. User goals and expectations. c. Key features required for the website. b) Develop the website information architecture by identifying the major pages, such as: a. Home Page (with search bar) b. Fitness Programs

	c. Trainer Profiles d. Success Stories/Testimonials e. Image Gallery f. Contact Us c) Create low-fidelity wireframes for at least six web pages using a UI/UX design tool (e.g., Figma, Adobe XD, Sketch). d) Design high-fidelity UI screens by applying: a. Consistent color palette and typography. b. Appropriate icons and fitness-related imagery. c. Responsive layouts for desktop and mobile devices. d. Clear navigation menus and visual hierarchy. e. Accessibility and usability guidelines. e) Develop an interactive prototype demonstrating the user journey, including: a. Searching for fitness programs. b. Browsing trainer profiles. c. Viewing testimonials. d. Exploring the image gallery. e. Contacting the fitness center. f) Conduct a usability evaluation by: a. Testing the prototype with peers. b. Identifying usability issues. c. Collecting user feedback. d. Recommending improvements based on the evaluation. g) Prepare a design report including: a. User Persona(s). b. Sitemap and Navigation Flow. c. Wireframes. d. High-fidelity UI Screens. e. Prototype screenshots or link. f. Design rationale. g. Usability findings and recommendations.
6	Design and Prototype a Personal Learning & Achievement Portfolio Website Tasks a) Conduct a brief user requirement analysis by identifying: a. Target audience. b. User goals and expectations. c. Essential features required in the portfolio website. b) Develop the website information architecture by identifying the primary pages, such as: a. Home b. About Me c. Projects & Achievements d. Skills & Certifications e. Blog f. Contact c) Create low-fidelity wireframes for at least six web pages using a UI/UX design tool (e.g., Figma, Adobe XD, Sketch, or Balsamiq). d) Design high-fidelity UI screens by applying: a. A consistent color palette and typography. b. Appropriate icons, illustrations, and profile images. c. Responsive layouts for desktop and mobile devices. d. Clear navigation and visual hierarchy. e. Accessibility and usability guidelines.

	e) Develop an interactive prototype demonstrating the complete navigation flow, including: a. Viewing profile information. b. Browsing projects and achievements. c. Exploring blog posts. d. Viewing certifications and skills. e. Contacting the portfolio owner. f) Conduct a usability evaluation by: a. Testing the prototype with peers. b. Identifying usability issues. c. Collecting and analyzing user feedback. d. Recommending improvements based on the evaluation. g) Prepare a design report containing: a. User Persona(s). b. Sitemap and User Flow. c. Wireframes. d. High-fidelity UI Screens. e. Prototype screenshots or link. f. Design rationale. g. Usability findings and recommendations.
7	Design and Prototype a Smart Hospital Management Dashboard Tasks a) Conduct a brief user requirement analysis by identifying: a. Target users (e.g., hospital administrators, doctors, department heads). b. User goals and expectations. c. Key performance indicators (KPIs) required for monitoring hospital operations. b) Define the dashboard information architecture by identifying the major sections, such as: a. Overview b. Patient Statistics c. Department Performance d. Revenue Analysis e. Staff Availability f. Emergency Cases c) Create a low-fidelity wireframe for the dashboard using a UI/UX design tool (e.g., Figma, Adobe XD, Sketch, or Balsamiq). d) Design a high-fidelity dashboard UI that includes: a. KPI Cards (e.g., Total Patients, Bed Occupancy, Revenue, Available Doctors). b. Statistical graphs (line, bar, pie, or area charts). c. Department-wise performance summaries. d. Recent activity or notification panel. e. Responsive and visually consistent layout. e) Add interactive components, such as: a. Dropdown menus to filter data by department, date range, or doctor. b. Search functionality for patients or departments. c. Navigation menu and action buttons. d. Interactive charts with hover or click effects. f) Develop an interactive prototype demonstrating: a. Dashboard navigation. b. Dynamic filtering using dropdowns. c. Viewing detailed statistics. d. Switching between dashboard sections. g) Conduct a usability evaluation by: a. Testing the prototype with peers.

	b. Identifying usability issues. c. Collecting user feedback. d. Suggesting improvements based on the evaluation. h) Prepare a design report containing: a. User Persona(s). b. Dashboard Information Architecture. c. Wireframes. d. High-fidelity Dashboard Screens. e. Prototype screenshots or link. f. Design rationale. g. Usability findings and recommendations.
8	Design and Prototype an Online Bookstore Website Tasks a) Conduct a brief user requirement analysis by identifying: a. Target users. b. User goals and expectations. c. Essential features required for an online bookstore. b) Develop the website information architecture by identifying the major pages, such as: a. Home b. Book Categories (e.g., Fiction, Academic, Technology, Biography) c. Book Details d. Shopping Cart e. Checkout/Buy Now f. Order Confirmation g. User Profile c) Create low-fidelity wireframes for at least seven web pages using a UI/UX design tool (e.g., Figma, Adobe XD, Sketch, or Balsamiq). d) Design high-fidelity UI screens by applying: a. A consistent color palette and typography. b. Appropriate icons, images, and banners. c. Responsive layouts for desktop and mobile devices. d. Clear navigation and visual hierarchy. e. Accessibility and usability guidelines. e) Develop an interactive prototype demonstrating the complete user journey, including: a. Browsing book categories. b. Viewing book details. c. Adding books to the shopping cart. d. Proceeding to checkout. e. Viewing order confirmation. f) Include interactive UI elements such as: a. Search bar for books. b. Category filters. c. Sort options (e.g., price, popularity, rating). d. Quantity selector. e. Wishlist or favorites option. g) Conduct a usability evaluation by: a. Testing the prototype with peers. b. Identifying usability issues. c. Collecting user feedback. d. Recommending improvements based on the evaluation. h) Prepare a design report containing: a. User Persona(s).

	b. Sitemap and Navigation Flow. c. Wireframes. d. High-fidelity UI Screens. e. Prototype screenshots or link. f. Design rationale. g. Usability findings and recommendations.
9	Design and Prototype a Digital Library Website Tasks a) Conduct a brief user requirement analysis by identifying: a. Target users. b. User goals and expectations. c. Essential features required for the digital library. b) Develop the website information architecture by identifying the major pages, such as: a. Home Page (including header, search bar, featured resources, and footer) b. About the Library c. Digital Collections d. Authors & Publishers e. Membership Plans f. Online Membership/Payment Page g. Contact Us c) Create low-fidelity wireframes for at least six web pages using a UI/UX design tool (e.g., Figma, Adobe XD, Sketch, or Balsamiq). d) Design high-fidelity UI screens by applying: a. A consistent color palette and typography. b. Appropriate icons, illustrations, and images. c. Responsive layouts for desktop and mobile devices. d. Clear navigation and visual hierarchy. e. Accessibility and usability guidelines. e) Design interactive UI elements, including: a. A dropdown menu for digital collections or resource categories. b. Radio buttons on the membership/payment page for selecting membership plans or payment methods. c. Search functionality for books and journals. d. Navigation menus and call-to-action buttons. f) Develop an interactive prototype demonstrating the complete user journey, including: a. Browsing digital collections. b. Viewing resource details. c. Selecting a membership plan. d. Completing the online membership/payment process. g) Conduct a usability evaluation by: a. Testing the prototype with peers. b. Identifying usability issues. c. Collecting and analyzing user feedback. d. Recommending improvements based on the evaluation. h) Prepare a design report containing: a. User Persona(s). b. Sitemap and Navigation Flow. c. Wireframes. d. High-fidelity UI Screens. e. Prototype screenshots or link. f. Design rationale. g. Usability findings and recommendations.

10	Design and Prototype a Smart Podcast Streaming Mobile Application Tasks a) Conduct a brief user requirement analysis by identifying: a. Target users. b. User goals and expectations. c. Key features required for a podcast streaming application. b) Develop the application's information architecture by identifying the primary screens, such as: a. Welcome/Home Screen b. Podcast Categories c. Episode Selection d. Now Playing e. Favorites/Playlist f. User Profile c) Create low-fidelity wireframes for at least six major screens using a UI/UX design tool (e.g., Figma, Adobe XD, Sketch, or Balsamiq). d) Design high-fidelity UI screens by applying: a. A consistent color palette and typography. b. Appropriate icons and illustrations. c. Responsive layouts for different mobile screen sizes. d. Clear navigation and visual hierarchy. e. Accessibility and usability guidelines. e) Incorporate interactive UI elements, including: a. Background images or themes appropriate for the application. b. Hover/Rollover effects for navigation buttons and podcast cards. c. Category selection and search functionality. d. Home navigation button with rollover interaction. f) Design a Now Playing screen that includes: a. Animated Play/Pause button. b. Progress bar with elapsed and remaining time. c. Audio waveform or equalizer animation. d. Playback controls (Next, Previous, Shuffle, Repeat). g) Develop an interactive prototype demonstrating: a. Navigation between screens. b. Selecting and playing podcast episodes. c. Managing playlists or favorites. d. Interactive playback controls and animations. h) Conduct a usability evaluation by: a. Testing the prototype with peers. b. Identifying usability issues. c. Collecting user feedback. d. Recommending improvements based on the evaluation. i) Prepare a design report containing: a. User Persona(s). b. Sitemap and User Flow. c. Wireframes. d. High-fidelity UI Screens. e. Prototype screenshots or link. f. Design rationale. g. Usability findings and recommendations. Pre-requisite (If any): Fundamental of Designing a page
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EBOOKS/MOOC:													
Online Courses and Video Lectures:													
Teaching -Learning– Evaluation Scheme:													
Sl. No	Teaching and Learning Method						No. of Hours/ Week		No. of Weeks		Hours/ Semester		
1.	Laboratory Teaching						2		14		28		
2.	Evaluation of Learning Process						-		-		2		
Total Learning Hours / Semester											30		
Proposed Assessment Plan (for 50 marks of CIE):													
Tool		Remarks									Marks		
CIE		Laboratory CIE - conducted for 50 marks and scaled down to 20									20		
Continuous Evaluation		Continuous Evaluation in every lab session by the Course Coordinator									30		
Total Marks											50		
Evaluation of Learning Process													
Conducting Lab CIE for the listed program Part A & Open-ended question not done in regular lab sessions under PART-B													
Course Articulation matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	1	2	2
CO2	-	-	3	-	3	-	-	3	3	-	2	2	2

Semester:IV						
PHYSICAL EDUCATION (SPORTS & ATHLETICS)– II						
Course Code	:	25PE2		CIE	:	100 Marks
Course Type	:	NCMC				
Total Hours	:	15 P				
Course Outcomes: At the end of the course, the student will be able to						
1. Understand the ethics and moral values in sports and athletics						
2. Perform in the selected sports or athletics of student’s choice.						
3. Understand the roles and responsibilities of organization and administration of sports and games.						
Module I: Ethics and Moral Values 4 Hours						
A. Ethics in Sports						
B. Moral Values in Sports and Games						
Module II : Specific Games (Any one to be selected by the student) 16 Hours						
A. Volleyball –Attack, Block, Service, Upper Hand Pass and Lowerhand Pass.						
B. Athletics (Track Events) –Any event as per availability of Ground.						
Module III : Role of organisation and administration 4 Hours						

Scheme and Assessment for auditing the course and Grades:

Sl.No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes/Assignment–2,eachof 20marks	40
3.	Final presentation/exhibition/Participation in competitions/ practical on specific tasks assigned to the students	40
Total		100

Semester IV			
Yoga - II			
Course Code	25YOG2	CIE	100 Marks
Course Type	NCMC		
Total Hours	2 hrs/week		
Course Objectives The objectives of this course are to: 1. Introduce students to the origin, history, philosophy, and fundamental concepts of Yoga. 2. Familiarize students with the different schools of Yoga, its aims, objectives, and the importance of prayer in Yogic practice. 3. Develop awareness of the rules, regulations, and safety precautions to be followed during Yogic practices. 4. Enable students to learn and practice Suryanamaskara and selected Yogasanas with proper techniques for improving physical and mental well-being. 5. Promote a healthy life style by encouraging regular Yogic practice, correcting misconceptions about Yoga, and fostering positive health, self-discipline, and overall wellness.			
Patanjali's Ashtanga Yoga: Patanjali's Ashtanga Yoga, its need and importance. Yama: Ahimsa, satya, asteya, brahmacharya, aparigraha, Niyama : shoucha, santosh, tapa, svaadhyaya, Eshvarapranidhan, Suryanamaskar 12 count 4 rounds. Different types of Asanas: Sitting 1. Sukhasana, 2.Paschimottanasana, Standing1. Ardhakati Chakrasana, 2.ParshvaChakrasana, Prone line 1. Dhanurasana Supine line 1. Halasana, 2. Karna Peedasana Kapalabhati: Meaning, importance and benefits of Kapalabhati. 40strokes/min3 rounds Pranayama-1. Suryanuloma-Viloma, 2.Chandranuloma-Viloma, 3-Suryabhedana, 4-Chandra Bhedana, 2.Nadishodhana, 3-BhramariPranayama, Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, precautionary measures and benefits of each Pranayama			
Course Outcomes: Upon successful completion of this course, the student will be able to: 1. Explain the origin, history, philosophy, objectives, and different schools of Yoga, along with its role in promoting holistic health and well-being. 2. Understand and apply the rules, regulations, and ethical practices associated with Yogic exercises, including the significance of prayer and Suryanamaskara. 3. Demonstrate the correct techniques of selected Yogasanas, such as sitting, standing, prone, and supine postures, while observing appropriate precautions. 4. Analyze the physical, mental, and therapeutic benefits of Yogic practices and distinguish between authentic Yogic practices and common misconceptions about Yoga. 5. Adopt Yoga as a regular life style practice to enhance physical fitness, mental wellness, discipline, and overall quality of life.			

Suggested Learning Resources: (TextBook/ReferenceBook/Manuals):**Text books:**

1. George Feuerstein: the yoga Tradition (its history, literature, philosophy and practice)
2. Sri Ananda: The complete Book of yoga Harmony of Body and Mind (Orient paper Backs: Vision Books Pvt.Ltd..1982.
3. B.K.Slyenkar: Light on the Yoga sutras of Patanjali (Haper Collins Publications India Pvt.Ltd.New Delhi.)
4. Science of Divinity and Realization of Self Vethathiri Publication,(6-11)WCSC,Erode

Reference books/Manuals:

1. Principles and Practice of Yoga in Health Care,Publisher:Handspring Publishing Limited. ISBN:9781909141209,978190914209
2. BasavaraddiV: Yoga in School Health, MDNIY NewDelhi. 2009
3. Dr.HR.Nagendra: Yoga Research and application (Vivekanda Kendra Yoga Prakashana Bangalore)
4. Dr.Shirley Telles: Glimpses of Human Body (Vivekanda KendraYoga Prakashana Bangalore).

Web links and Video Lectures (e-Resources):

Search by topics to get the videos

Assessment Structure:

This course is having only **Continuous Internal Assessment (CIE)** marks of 100.

Weightage	Marks
Attendance to all the sessions	20Marks
Practical sessions on Yoga and Its Benefits	40Marks
Two Assignments	40Marks
Total Marks	100

A student shall obtain a minimum of 40% marks or 40 marks out of 100 to qualify in the course.

Community/Societal Project

A community is a social unit or group of people sharing socially significant characteristics, such as place, set of norms, culture, religion, values, customs or identity. A community project involves addressing issues or needs within such a community or a network of entities working towards a common purpose. These projects may cover a wide range of areas, including welfare, sustainability, technology integration, and social development. Examples include establishing and maintaining an orphanage, implementing solar power generation and its maintenance, or developing environmental improvement solutions, etc. A community project is an experiential learning activity that encourages students to identify, analyze, and address real-life problems of the community using engineering knowledge. It aims to promote social responsibility and civic engagement, interdisciplinary thinking and collaboration and practical application of theoretical concepts, thereby enabling students to contribute meaningfully to community welfare and sustainable development. Students can take up projects individually or in a group not exceeding 4 students.

Environmental Science Project

The Environmental Science Project is an applied learning component designed to develop students' awareness, understanding, and responsibility toward the environment. It provides an opportunity to study real-world environmental issues and apply scientific and engineering principles to design feasible and sustainable solutions. The topics under environment include, but not limited to, climate change, biodiversity, air and water pollution, land use, excess use of natural resources, earthquakes, rise in the earth's temperature, power generation, soil erosion, environment issues related programme, etc. The project involves problem identification, field surveys, case studies, data collection, environmental audits, analysis, and proposal of remedial or preventive measures aimed at improving biodiversity, air quality, and thermal comfort, etc. Students can take up projects individually or in a group not exceeding 4 students. Students can opt for Interdisciplinary Project based on their interest.

Hackathon Based Project

The term hackathon is derived from the combination of hack (referring to clever problem-solving, not illegal activity) and marathon, which denotes an arduous (i.e., difficult) intellectual task requiring sustained effort, endurance, and mental resilience. The meaning of a hackathon varies depending on the specific context and intent. In an academic context, a hackathon can be considered to involve several concepts, ranging from resourceful, unconventional approaches to problem-solving. Though a hackathon is an event, typically lasting for a few days to address a specific challenge, for academic purposes, it is conducted as a noncompetitive semester-long activity. The evaluation is done as and when the project is completed, by a panel of industry experts. The hackathons not only help participants develop skills like problem-solving, critical thinking, creativity, teamwork, communication and time management, but also foster indigenous technology development, promote innovation and entrepreneurship, and contribute to non-formal learning and skill enhancement. Students can take up a hackathon project individually or in a group of not exceeding 4 students.

The respective BoS will announce the problem statements in the beginning of the 5th semester. The topic selected can be discipline specific, interdepartmental, industrial, social (refers to immediate human relations, interactions, and individual behavior within a community), societal (describes larger, general issues, institutions, and structures that define society as a whole), environmental, health, financial, or innovative in nature, leading to development of a working prototype, application, or product. Hackathon projects are aligned with the principles of Outcome-Based Education (OBE) and support the objectives of innovation, skill development, and experiential learning in engineering education. Projects shall be evaluated by industry experts, based on creativity, problem-solving approach, teamwork, and possible implementation, as far as possible, as and when the project is completed.

Capstone Project

The Capstone project is a comprehensive, year-long project carried out in two phases during 6th and 7th semesters of the undergraduate engineering/technology program. It integrates knowledge and skills acquired from multiple courses and disciplines to address a complex, real-world problem.

This project provides students with an opportunity to apply scientific principles, engineering methodologies, and technological tools to conceive, design, implement and evaluate an engineering solution. It serves as a culminating academic experience to demonstrate program outcomes, including problem-solving ability, teamwork, communication skills, and practical application of engineering principles. Students can take up projects individually or in a group not exceeding 4 students. The group may have students from the same discipline and drawn from different disciplines.

Types of Capstone Projects: Capstone projects undertaken for one year may fall into one or more of the following categories:

- a) Research-Oriented Projects
 - Focus on investigating new concepts, theories, or technologies.
 - Aim to generate new knowledge or contribute to academic research.
- b) Experimental/Analytical Projects
 - Based on laboratory or field experiments to validate a hypothesis or study a phenomenon.
 - Including detailed data collection, analysis, and interpretation.
- c) Simulation/Modelling Projects
 - Use computational tools to model, simulate, and predict system behavior.
 - Reduce the need for physical prototyping in the initial stages.
- d) Industrial/Industry-Sponsored Projects
 - Carried out in collaboration with an industry partner, address real-world engineering problems faced by the organization.
- e) Interdisciplinary/Multidisciplinary Projects
 - Combine knowledge and techniques from multiple engineering domains or other fields such as management, medicine, or environmental sciences.
- f) Entrepreneurial/Innovation Projects
 - Focus on product or service innovation with potential for commercialization.
 - Include aspects of market analysis, cost estimation, and business planning.