AR25
PROGRAM STRUCTURE
AND
FIRST YEAR SYLLABUS

DEPARTMENT OF

ELECTRICAL AND ELECTRONICS ENGINEERING

For CBCS BASED B. TECH – FOUR YEAR PROGRAM
(Applicable for the batches admitted from AY 2025-26)

Geethanjali College of Engineering and Technology
(Autonomous)
Accredited by NAAC with A+ Grade; B.Tech. CSE, EEE, ECE accredited by NBA
Sy. No: 33 & 34, Cheeryal (V), Keesara (M), Medchal District, Telangana – 501301

CONTENTS

VISION AND MISSION OF THE INSTITUTION

Vision:

"To be an epicenter, promoting scholarly activities, fostering innovation, research, and entrepreneurship, leading sustainable societal development".

Mission:

- To solve complex societal problems, inculcating critical thinking and problem-solving skills.
- To inculcate creativity and innovation, developing a culture of research and entrepreneurship.
- To preserve and promote cultural heritage, humanistic and spiritual values, promoting peace and harmony in society.

VISION AND MISSION OF THE DEPARTMENT

Vision:

To provide excellent Electrical and Electronics education by building strong teaching and research environment

Mission:

- To offer high quality graduate program in Electrical and Electronics education and to prepare students for professional career or higher studies.
- The department promotes excellence in teaching, research, collaborative activities and positive contributions to society

PROGRAM EDUCATIONAL OBJECTIVES

1. To prepare students with excellent comprehension of mathematics, basic sciences and engineering subjects facilitating them to find gainful employment or pursue postgraduate program with an appreciation for lifelong learning.
2. To inculcate problem solving capabilities in students with analysis, design and practical skills that are Program Specific which would facilitate them to exhibit creativity and innovation that would enable them to develop modern equipment with emerging technologies of multidisciplinary nature for societal development.
3. To inculcate positive attitude, professional ethics, effective communication and interpersonal skills which would facilitate them to succeed in the chosen profession through research and development both as team member and as well as leader.

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

PROGRAMME OUTCOMES

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES

PSO1: Ability to apply fundamental knowledge to identify, interpret, formulate, design, analyze and investigate various problems of electrical and electronic systems/components and integrate them into generation, transmission, distribution and utilization of electrical energy through conventional and non-conventional energy sources.

PSO2: Ability to apply emerging technologies in the design, simulation and analysis of electrical and electronic systems and demonstrate capabilities of scientific and innovative thinking to meet the technical challenges of the society and industry.

SCHEME OF INSTRUCTIONS AND EXAMINATION

B. Tech. (ELECTRICAL AND ELECTRONICS ENGINEERING)

Academic Regulations: AR25 **Academic Year 2025-26**

PROGRAMME STRUCTURE

FIRST YEAR SEMESTER-I

S. No.	Course Code	Course	Category	Number of Hours/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	25EN11001	English for Skill Enhancement	HSMC	3	-	-	40	60	100	3
2	25MA11001	Matrices and Calculus	BSC	3	1	-	40	60	100	4
3	25PH11001	Advanced Engineering Physics	BSC	3	-	-	40	60	100	3
4	25CS11001	Programming for Problem Solving	ESC	2	-	-	40	60	100	2
5	25EE11002	Electrical Circuits - I	PCC	3	-	-	40	60	100	3
6	25ME11001	Engineering Drawing and Computer Aided Drafting	ESC	2	-	2	40	60	100	3
7	25EN11L01	English Language and Communication Skills Lab	HSMC	-	-	2	40	60	100	1
8	25PH11L01	Advanced Engineering Physics Lab	BSC	-	-	2	40	60	100	1
9	25CS11L01	Programming for Problem Solving Lab	ESC	-	-	2	40	60	100	1
10		Induction Program	-	-	-	-	-	-	-	-
		Total		**16**	**1**	**8**	**360**	**540**	**900**	**21**
		Total Hours Per Week		**25**						

Code	Definitions
HSMC	Humanities and Social Sciences including Management courses
BSC	Basic Science Courses
ESC	Engineering Science Courses
PCC	Professional core courses
PEC	Professional Elective courses
OEC	Open Elective courses
MC	Mandatory course
PROJ	Project, Internship, Mini Project and Technical Seminar
SDC	Skill Development Course
L	Lecture
T	Tutorial
P/D	Practical/Drawing
CIE	Continuous Internal Evaluation
SEE	Semester End Examination
C	Credits

FIRST YEAR SEMESTER-II

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	25MA12001	Ordinary Differential Equations and Vector Calculus	BSC	3	-	-	40	60	100	3
2	25CH12001	Engineering Chemistry	BSC	3	-	-	40	60	100	3
3	25CS12001	Data Structures	ESC	3	-	-	40	60	100	3
4	25EE12003	Electrical Circuits -II	PCC	3	-	-	40	60	100	3
5	25EC12001	Electronic Devices and Circuits	ESC	3	-	-	40	60	100	3
6	25CH12L01	Engineering Chemistry Lab	BSC	-	-	2	40	60	100	1
7	25CS12L01	Data Structures Lab	ESC	-	-	2	40	60	100	1
8	25EE12L03	Electrical Circuits Lab	PCC	-	-	2	40	60	100	1
9	25EC12L01	Electronic Devices and Circuits Lab	ESC	-	-	2	40	60	100	1
10	25ME12L01	Engineering Workshop	ESC	-	-	2	40	60	100	1
Total				**15**	**0**	**10**	**400**	**600**	**1000**	**20**
Total Hours Per Week				**25**						

SECOND YEAR SEMESTER-I

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	25MA21001	Numerical Methods and Complex Variables	BSC	3	-	-	40	60	100	3
2	25EE21001	Electromagnetic fields	PCC	3	-	-	40	60	100	3
3	25EE21002	Electrical Machines - I	PCC	3	-	-	40	60	100	3
4	25EE21003	Electrical Power Generation and Distribution	PCC	3	-	-	40	60	100	3
5	25EC21002	Digital Logic Design	ESC	3	-	-	40	60	100	3
6	25MS21001	Innovation and Entrepreneurship	HSMC	2	-	-	40	60	100	2
7	25MA21L01	Computational Mathematics Lab	BSC	-	-	2	40	60	100	1
8	25EE21L01	Electrical Machines - I Lab	PCC	-	-	2	40	60	100	1
9	25EC21L01	Digital Logic Design Lab	ESC	-	-	2	40	60	100	1
10	25EE21SD1	Design of Electrical Systems using Auto CAD	SDC	-	-	2	40	60	100	1
Total				**17**	**-**	**8**	**400**	**600**	**1000**	**21**
Total Periods Per Week				**25**						

SECOND YEAR SEMESTER-II

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	25CS22007	Python Programming	ESC	3	-	-	40	60	100	3
2	25EE22001	Electrical Machines - II	PCC	3	-	-	40	60	100	3
3	25EE22002	Electrical Power Transmission Systems	PCC	3	-	-	40	60	100	3
4	25EE22003	Electrical Measurements and Sensors	PCC	3	-	-	40	60	100	3
5	25EE22004	Signals and Systems	PCC	3	-	-	40	60	100	3
6	25CS22L07	Python Programming Lab	ESC	-	-	2	40	60	100	1
7	25EE22L01	Electrical Machines - II Lab	PCC	-	-	2	40	60	100	1
8	25EE22L03	Electrical Measurements and Sensors Lab	PCC	-	-	2	40	60	100	1
9	25EE22L02	Signals and Systems Lab	PCC	-	-	2	40	60	100	1
10	25EE22SD1	PCB Design	SDC	-	-	2	40	60	100	1
11	25CE22VA1	Environmental Science	MC	1	-	0	40	60	100	1
		Total		**16**	**-**	**10**	**440**	**660**	**1100**	**21**
		Total Periods Per Week		**26**						

THIRD YEAR SEMESTER-I

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	25EE31001	Power Electronics	PCC	3	-	-	40	60	100	3
2	25EE31003	Control Systems	PCC	3	-	-	40	60	100	3
3	25EE31002	Power System Protection	PCC	3	-	-	40	60	100	3
4	25EC31009	Microprocessors and Microcontrollers	ESC	3	-	-	40	60	100	3
Open Elective – I										
5	25CE31101	Building science and Technology	OEC	2	-	-	40	60	100	2
	25CS31102	Introduction to Operating Systems								
	25CS31103	Principles of Programming Languages								
	25AI31104	Fundamentals of Artificial Intelligence								
	25AI31105	Agentic Artificial Intelligence								
	25CY31106	Cyber Security								
	25CY31107	Ethical Hacking Fundamentals								
	25DS31108	R Programming								
	25DS31109	Data Engineering								
	25EC31111	Principles of Communication Systems								
	25ME31112	Industrial Robotics								
	25MS31113	Intellectual Property Rights								
	25MA31114	Logical Reasoning 1								
6	25EE31L01	Power Electronics Lab	PCC	-	-	2	40	60	100	1
7	25EE31L02	Control Systems Lab	PCC	-	-	2	40	60	100	1
8	25EC31L04	Microprocessors and Microcontrollers Lab	ESC	-	-	2	40	60	100	1
9	25EE31004	Field-Based Research Project / Internship	PROJ	-	-	4	-	100	100	2
10	25ME31SD5	Robotics and Automation	SDC	-	-	2	40	60	100	1
11	25EN31VA2	Indian Knowledge System	MC	1	-	-	40	60	100	1
			Total	**15**	**-**	**12**	**400**	**700**	**1100**	**21**
			Total Periods Per Week	**27**						

THIRD YEAR SEMESTER-II

S. No	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	25EE32001	Computer Techniques in Power Systems	PCC	3	-	-	40	60	100	3
2	25MS32002	Business Economics and Financial Analysis	HSMC	3	-	-	40	60	100	3
Professional Elective – I										
3	25EE32002	Renewable Energy Systems	PEC	3	-	-	40	60	100	3
	25EE32003	Utilization of Electrical Energy								
	25EE32004	Special Machines								
	25EC32007	VLSI Design								
Professional Elective – II										
4	25EE32005	Power Semiconductor Drives	PEC	3	-	-	40	60	100	3
	25EE32006	Electrical Estimation and Costing								
	25EE32007	High Voltage Engineering								
	25EE32008	Programmable Logic Controllers								
Open Elective – II										
5	25CE32201	Building Services Engineering	OEC	2	-	-	40	60	100	2
	25CS32202	Introduction to Computer Networks								
	25CS32203	Modern Databases								
	25AI32204	Introduction to Natural Language Processing								
	25AI32205	Fundamentals of Fuzzy Logic								
	25CY32206	Social Media Security								
	25CY32207	Information System Audit and Assurance								
	25DS32208	MERN Stack Development								
	25DS32209	Web Social Media Analytics								
	25EC32211	Introduction to Sensors and Instrumentation								
	25ME32212	Non-Conventional Sources of Energy								
	25MS32213	Supply Chain Management								
	25MA32214	Logical Reasoning 2								
6	25EN32L01	English for Employability Skills Lab	HSMC	-	-	2	40	60	100	1
7	25EE32L01	Power System Simulation Lab	PCC	-	-	2	40	60	100	1

8	25EE32L02	Electrical and Electronics Design Lab	PCC	-	-	2	40	60	100	1
9	25EE32SD1	Design of Solar Power System	SDC	-	-	2	40	60	100	1
10	25MS32VA3	Gender Sensitization*/ Human Values and Professional Ethics*	HSMC	1	-	-	40	60	100	0.5+0.5
Total				**15**	**-**	**8**	**400**	**600**	**1000**	**19**
Total Periods Per Week				**23**						

FOURTH YEAR SEMESTER-I

S. No.	Course Code	Course	Category	Number of Periods/ Week			Scheme of Examination with Maximum Marks			Number of Credits
				L	T	P/D	CIE	SEE	Total	C
1	25EE41001	Power Electronics for Renewable Energy Systems	PCC	3		-	40	60	100	3
2	25EE41002	Electric Vehicles	PCC	3	-	-	40	60	100	3
3	25MS41003	Fundamentals of Management	HSMC	3	-	-	40	60	100	3
Professional Elective – III										
4	25EE41003	Energy Storage Systems	PEC	3	-	-	40	60	100	3
	25EE41004	Power System Operation and Control								
	25EE41005	Power Quality								
	25EC41012	Digital Signal Processing								
Professional Elective – IV										
5	25EE41006	Battery Management Systems	PEC	3	-	-	40	60	100	3
	25EE41007	AI and ML for Electrical Engineering Applications								
	25EE41008	Smart Grid Technologies								
	25EE41009	Design for Internet of Things								
Open Elective – III										
6	25CE41301	Disaster Management	OEC	2	-	-	40	60	100	2
	25CS41302	Fundamentals of Cyber Security								
	25CS41303	Soft Computing								
	25AI41304	Chatbots								
	25AI41305	Conversational Artificial Intelligence								
	25CY41306	Data Privacy								
	25CY41307	Security Incident and Response Management								
	25DS41308	Android Application Development								
	25DS41309	Data Stream Processing using Spark								
	25EC41311	Electronics for Health Care								
	25ME41312	Digital Manufacturing								
	25MS41313	Project Management and Finance								
	25MA41314	Mathematics in India: From Vedic Period to Modern Times								

7	25EE41L01	Power Electronics for Renewable Energy Systems Lab	PCC	-	-	2	40	60	100	1
8	25EE41L02	Electric Vehicles Lab	PCC	-	-	2	40	60	100	1
9	25EE41010	Industry Oriented Mini Project /Internship	PROJ	-	-	4	-	100	100	2
Total				**17**	**-**	**8**	**320**	**580**	**900**	**21**
Total Periods Per Week				**25**						

FOURTH YEARSEMESTER – II

S. No.	**Course Code**	**Course**	**Category**	**Number of Periods/Week**			**Scheme of Examination with Maximum Marks**			**Number of Credits**
				L	**T**	**P/D**	**CIE**	**SEE**	**Total**	**C**
Professional Elective –V										
1	25EE42001	EV Charging Infrastructure	PEC	3	-	-	40	60	100	3
	25EE42002	Control Systems Design								
	25EE42003	HVDC Transmission								
	25EC42010	Embedded Systems								
Professional Elective –VI										
2	25EE42004	Smart Metering and Communication Protocols	PEC	3	-	-	40	60	100	3
	25EE42005	Energy Conservation and Audit								
	25EE42006	EHV AC Transmission								
	25EE42007	Electrical Distribution and Automation								
3	25EE42008	Project Work	PROJ	-	-	28	40	60	100	14
Total				**6**	**-**	**28**	**120**	**180**	**300**	**20**
Total Periods Per Week				**34**						

CREDIT DISTRIBUTION

S. No.	Broad Course Classification	Course Group/ Category (Corse Description)	*Breakup of Credits by*		
			GCET	***JNTUH***	**AICTE**
1	Foundation Courses (FnC)	BS – Basic Sciences (Includes Mathematics, Physics and Chemistry courses)	19	19	32
2		ES - Engineering Sciences (Includes Fundamental Engineering Courses)	27	22	29
3		HS – Humanities and Social Sciences (Includes courses related to Humanities, Social Sciences and Management)	13	13	12
4	Core Courses (CoC)	PC – Professional Core (Includes core courses related to the parent branch of Engineering.)	56	61	64
5	Elective Courses (EℓC)	PE – Professional Electives (Includes elective courses related to the parent branch of Engineering.)	18	18	15
6		OE – Open Electives (Elective courses which include inter-disciplinary courses or courses in an area outside the parent branch of Engineering.)	06	06	9
7	Other Core Courses (OCC)	Project Work (B.Tech. Project Work)	14	14	15
8		Industry raining/ Internship/ Industry Oriented Mini-project/Skill Development Courses (Industry Training/ Internship/ Industry Oriented Mini-Project/Skill Development Courses)	04	04	
9		Seminar (Seminar based on core contents related to parent branch of Engineering)			
10	Skill Development courses		04	04	
11	Value Added Courses (VAC)	Courses to build professional values, traditional knowledge and sensitization of societal issues	03	03	
		Total	164	164	176

OPEN ELECTIVES

OPEN ELECTIVES offered by a department SHOULD NOT be taken by the students of the same department.

S. No.	Name of the Course	Course Code
Open Elective - I		
1	Building science and Technology	25CE31101
2	Introduction to Operating Systems	25CS31102
3	Principles of Programming Languages	25CS31103
4	Fundamentals of Artificial Intelligence	25AI31104
5	Agentic Artificial Intelligence	25AI31105
6	Cyber Security	25CY31106
7	Ethical Hacking Fundamentals	25CY31107
8	R Programming	25DS31108
9	Data Engineering	25DS31109
10	Fundamentals of Electric Vehicles	25EE31110
11	Principles of Communication Systems	25EC31111
12	Industrial Robotics	25ME31112
13	Intellectual Property Rights	25MS31113
14	Logical Reasoning 1	25MA31114
Open Elective - II		
1	Building Services Engineering	25CE32201
2	Introduction to Computer Networks	25CS32202
3	Modern Databases	25CS32203
4	Introduction to Natural Language Processing	25AI32204
5	Fundamentals of Fuzzy Logic	25AI32205
6	Social Media Security	25CY32206
7	Information System Audit and Assurance	25CY32207
8	MERN Stack Development	25DS32208
9	Web Social Media Analytics	25DS32209
10	Digital Energy	25EE32210
11	Introduction to Sensors and Instrumentation	25EC32211
12	Non-Conventional Sources of Energy	25ME32212
13	Supply Chain Management	25MS32213
14	Logical Reasoning 2	25MA32214

Open Elective - III		
1	Disaster Management	25CE41301
2	Fundamentals of Cyber Security	25CS41302
3	Soft Computing	25CS41303
4	Chatbots	25AI41304
5	Conversational Artificial Intelligence	25AI41305
6	Data Privacy	25CY41306
7	Security Incident and Response Management	25CY41307
8	Android Application Development	25DS41308
9	Data Stream Processing using Spark	25DS41309
10	Sustainable Energy	25EE41310
11	Electronics for Health Care	25EC41311
12	Digital Manufacturing	25ME41312
13	Project Management and Finance	25MS41313
14	Mathematics in India: From Vedic Period to Modern Times	25MA41314

I Year I Semester
Detailed Syllabus

25EN11001 – ENGLISH FOR SKILL ENHANCEMENT

B. Tech. EEE - I Year I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite (s): None

Course Objectives: Develop an ability to

1. Improve vocabulary.
2. Use appropriate sentence structures in oral and written communication.
3. Strengthen reading comprehension and independent study skills.
4. Write paragraphs, essays, précis and draft letters.
5. Write technical reports

Course Outcomes: At the end of the course, students would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Infer and use appropriate vocabulary in oral and written communication.	PO 8 and 9 PSOs: Nil	I, II, III, IV V	2, 3, 4, 5	4
CO2	Apply the rules of functional grammar and sentence structures in communication.	PO 8 and 9 PSOs: Nil	I, II, III, IV V	2, 3, 4, 5	
CO3	Comprehend any given text and respond precisely.	PO 8 and 9 PSOs: Nil	I, II, III, IV V	2, 3, 4, 5	
CO4	Construct meaningful and explicit sentences in written form befitting the context.	PO 8 and 9 PSOs: Nil	I, II, III, IV V	2, 3, 4, 5	

UNIT –I

Theme: **Perspectives**

Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Words Often Misspelt - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Parts of Speech particularly Articles and Prepositions — Degrees of Comparison

Reading: Reading and Its Importance- Sub Skills of Reading – Skimming and Scanning.

Writing: Sentence Structures and Types -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely –Nature and Style of Formal Writing.

UNIT –II

Theme: **Digital Transformation**

Lesson on '*Emerging Technologies*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Reading Strategies-Guessing Meaning from Context – Identifying Main Ideas – Exercises for Practice

Writing: Paragraph Writing — Types, Structures and Features of a Paragraph - Creating Coherence — Linkers and Connectives - Organizing Principles in a Paragraph — Defining- Describing People, Objects, Places and Events — Classifying- Providing Examples or Evidence - Essay Writing - Writing Introduction and Conclusion.

UNIT –III

Theme: **Attitude and Gratitude**

Poems on '*Leisure*' by William Henry Davies and '*Be Thankful*' - Unknown Author from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Identifying Topic Sentence and Providing Supporting Ideas - Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Job Application with CV/Resume –Difference between Writing a Letter and an Email - Email Etiquette.

UNIT –IV

Theme: **Entrepreneurship**

Lesson on '*Why a Start-Up Needs to Find its Customers First*' by Pranav Jain from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: Standard Abbreviations in English – Inferring Meanings of Words through Context – Phrasal Verbs ― Idioms.

Grammar: Redundancies and Clichés in Written Communication – Converting Passive to Active Voice and Vice-Versa.

Reading: Prompt Engineering Techniques– Comprehending and Generating Appropriate Prompts - Exercises for Practice

Writing: Writing Practices- Note Making- Précis Writing.

UNIT –V

Theme: Integrity and Professionalism

Lesson on '*Professional Ethics*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: Technical Vocabulary and their Usage– One Word Substitutes – Collocations.

Grammar: Direct and Indirect Speech - Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) – Inferring the Meaning and Evaluating a Text- Exercises for Practice

Writing: Report Writing - Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Technical Report.

TEXT BOOK:

1. Board of Editors. *2025. English for the Young in the Digital World.* Orient Black Swan Pvt. Ltd.

REFERENCE BOOK(S):

1. Swan, Michael. (2016). *Practical English Usage.* Oxford University Press. New Edition.
2. *Karal, Rajeevan. 2023. English Grammar Just for You.* Oxford University Press. New Delhi
3. 2024. *Empowering with Language: Communicative English for Undergraduates.* Cengage Learning India Pvt. Ltd. New Delhi
4. Sanjay Kumar & Pushp Lata. 2022. *Communication Skills – A Workbook.* Oxford University Press. New Delhi
5. Wood, F. T. (2007). *Remedial English Grammar.* Macmillan.
6. Vishwamohan, Aysha. (2013). *English for Technical Communication for Engineering Students.* Mc Graw-Hill Education India Pvt. Ltd.

25MA11001 – MATRICES AND CALCULUS

B. Tech. EEE - I Year I Sem

L	T	P/D	C
3	1	-/-	4

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand various types of matrices, properties and rank of the matrix to find the solution for system of equations, if it exists.
2. Apply the knowledge of eigenvalues and eigenvectors of a matrix from quadratic form into a canonical form through linear and orthogonal transformations.
3. Familiarize students with the statements, geometrical interpretations, and applications of Mean Value Theorems such as Rolle's theorem, Lagrange's Mean Value Theorem, and Cauchy's Mean Value Theorem.
4. Compute partial derivatives, composite functions of several variables and apply the methods of differential calculus to optimize multivariable functions
5. Evaluate definite integrals to calculate surface and volume of revolutions of curves, multiple integrals and apply the same to solve engineering problems.

Course outcomes (COs): At the end of the course, student would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Apply elementary transformations to solve a system of linear equations and reduce the quadratic form to the canonical form using linear and / or orthogonal transformation.	PO 1, 2, 3 and PSO 1	I, II	1,2,3,4	4, 9
CO2	Apply Mean Value Theorems to analyze the behavior of functions, interpret their geometrical meaning, and solve related problems in mathematical and engineering contexts.	PO 1, 2, 3 and PSO 1	III	1,2,3,4	
CO3	Apply the concept of partial differentiation to solve constrained optimization problems without graphical representation	PO 1, 2, 3 and PSO 1	IV	1,2,3,4	
CO4	Apply the definite / multiple integrals to compute areas and volumes of any region / solids	PO 1, 2, 3 and PSO 1	V	1,2,3,4	

UNIT-I: Matrices

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method.

System of linear equations: Solving System of Homogeneous and Non-Homogeneous equations**,** Gauss Seidel Iteration Method.

UNIT-II: Eigenvalues and Eigenvectors

Linear Transformation and Orthogonal Transformation: Eigenvalues and eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), Finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic forms, Reduction of Quadratic form to canonical form by Orthogonal Transformation.

UNIT III: Single Variable Calculus:

Limits and Continuity of Functions and their properties, Mean Value Theorems – Rolle's Theorem, Lagrange's Mean Value Theorem with their geometrical interpretation and applications, Cauchy's mean Value Theorem, Taylor's Series (All the theorems without proof)

UNIT IV: Multivariable Calculus (Partial Differentiation and applications)

Definitions of Limit and Continuity, Partial Differentiation, Euler's Theorem, Total derivative, Jacobian, Functional dependence and independence.

Applications: Maxima and Minima of functions of two variables and three variables using method of Lagrange multiplier.

Improper Integrals: Beta and Gamma Functions and their applications without proofs.

UNIT V: Multivariable Calculus (Integration)

Evaluation of Double Integrals (Cartesian and polar coordinates), Change of order of integration (only Cartesian form), Change of variables for double integrals (Cartesian to polar),

Evaluation of Triple Integrals: Change of Variables for triple integrals (Cartesian to Spherical and Cylindrical polar coordinates).

Applications: Areas by double integrals and volumes by double integrals and triple integrals.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2011.
2. G.B. Thomos and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2002,
3. N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, 10th Edition, 2015.
4. H.K. Das and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand and Company Ltd, New Delhi.

25PH11001- ADVANCED ENGINEERING PHYSICS

B. Tech. EEE - I Year I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives: Develop an ability to

1. Understand the fundamental concepts of quantum behavior of matter in its micro state and experimental evidence to dual nature of matter, and physical significance and application of wave function.
2. Understand the characteristics of intrinsic and extrinsic semiconductors, and applications of Hall effect.
3. Understand the concepts of quantum computing principles, quantum gates, and basic quantum algorithms.
4. Understand the properties and applications of magnetic and dielectric materials.
5. Understand the working and applications of lasers and fibre optics in modern technology.

Course Outcomes: At the end of the course, students would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Apply quantum mechanical principles to explain particle behavior and energy band formation in solids.	PO 1, 2	I	1,2,3	4
CO2	Classify semiconductors, interpret Fermi level variations, and apply Hall effect concept to determine the type of semiconductor.	PO 1, 2	II	1,2,3	
CO3	Explain quantum computing concepts, quantum gates, and describe basic quantum algorithms.	PO 1, 2	III	1,2,3	
CO4	Classify magnetic and dielectric materials, assess their characteristics, and apply them in technological applications.	PO 1, 2	IV	1,2,3	
CO5	Explain principles of lasers and optical fibers, their operation and application in communication and sensing technologies.	PO 1, 2	V	1,2,3	

UNIT - I: Quantum Mechanics

Introduction, de-Broglie hypothesis, Heisenberg uncertainty principle, physical significance of wave function, postulates of quantum mechanics: operators in quantum mechanics, eigen values and eigen functions, expectation value; Schrödinger's time independent wave equation, particle in a 1D box, Bloch's theorem (qualitative), Kronig-Penney model (qualitative): E-k diagram, effective mass of electron, formation of energy bands, origin of

bandgap, classification of solids, concept of discrete energy levels and quantum confinement in nanomaterials.

UNIT - II: Semiconductors

Classification of semiconductors: n-type, p-type, carrier concentration in intrinsic and extrinsic semiconductors, Fermi level in intrinsic and extrinsic semiconductors, variation of Fermi level with temperature and concentration of dopants in extrinsic semiconductors, direct and indirect band gap semiconductors, Hall effect and its applications.

UNIT - III: Quantum Computing

Introduction, linear algebra for quantum computation, Dirac's Bra and Ket notation and their properties, Hilbert space, Bloch's sphere, concept of quantum computer, classical bits, Qubits, multiple Qubit system, quantum computing system for information processing, evolution of quantum systems, quantum measurements, entanglement, quantum gates, challenges and advantages of quantum computing over classical computation, Introduction to quantum algorithms: Deutsch-Jozsa, Shor, Grover (Qualitative).

UNIT - IV: Magnetic and Dielectric Materials

Introduction to magnetic materials, origin of magnetic moment-classification of magnetic materials, hysteresis, Weiss domain theory of ferromagnetism, soft and hard magnetic materials, synthesis of ferrimagnetic materials using sol-gel method, applications: magnetic hyperthermia for cancer treatment, magnets for EV, Giant Magneto Resistance (GMR) device.

Introduction to dielectric materials, types of polarization (qualitative): electronics, ionic & orientation; ferroelectric, piezoelectric, pyroelectric materials and their applications: Ferroelectric Random-Access Memory (Fe-RAM), load cell and fire sensor.

UNIT - V: Laser and Fiber Optics

Introduction to laser, characteristics of laser, Einstein coefficients and their relations, metastable state, population inversion, pumping, lasing action, Ruby laser, He-Ne laser, CO2 laser, semiconductor diode laser, applications: Bar code scanner, LIDAR for autonomous vehicle.

Introduction to fiber optics, total internal reflection, construction of optical fiber, acceptance angle, numerical aperture, classification of optical fibers, losses in optical fiber, applications: optical fiber for communication system, sensor for structural health monitoring.

TEXT BOOKS:

1. Walter Borchardt-Ott, *Crystallography: An Introduction*, Springer.
2. Charles Kittel, *Introduction to Solid State Physics*, John Wiley & Sons, Inc.

3. Thomas G. Wong, *Introduction to Classical and Quantum Computing*, Rooted Grove
4. Physics, Halliday, Resnick and Krane, Wiley Publishers, 5th edition, 2018.
5. Engineering Physics, B.K. Pandey, S. Chaturvedi, Cengage Learing.2012.

REFERENCE BOOKS:

1. Jozef Gruska, *Quantum Computing*, McGraw Hill
2. Michael A. Nielsen & Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press.
3. John M. Senior, *Optical Fiber Communications Principles and Practice*, Pearson Education Limited.
4. A Textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar, S. Chand, Revised edition, 2018.

25CS11001 – PROGRAMMING FOR PROBLEM SOLVING

B. Tech. EEE - I Year I Sem

L	T	P/D	C
2	-	-/-	2

Prerequisite(s): None

Course Objectives: Develop an ability to

1. Learn the fundamentals of computers.
2. Understand the various steps in program development.
3. Learn the syntax and semantics of the C programming language.
4. Learn the usage of structured programming approaches in solving problems.

Course outcomes (COs): At the end of the course, student would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Develop algorithms and flowcharts to solve problems and implement them using C programs.	PO1, 2, 3, 12, and PSO1, 2	I	3	4, 9
CO2	Apply control structures and iterative statements to solve real-world problems using C.	PO1, 2, 3, 4, 5, 10, 12, and PSO1, 2	II	3	4, 8
CO3	Design modular programs using functions, recursion, and preprocessor directives.	PO1, 2, 3, 12, and PSO1, 2	III	4	9, 12
CO4	Implement and analyze searching and sorting algorithms using arrays in C.	PO1, 2, 3, 4, 5, 10, 12, and PSO1, 2	IV	4	4, 9
CO5	Utilize pointers and strings for dynamic memory management and efficient program design.	PO1, 2, 3, 4, 5, 10, 12, and PSO1, 2	V	4	8, 9

UNIT - I: Logic Building

Flow chart, Algorithm, Pseudo code. Introduction to Programming Computer Languages, Creating and running programs, Program Development. Introduction to the C Language Background, C Programs, Identifiers, Data Types, Variables, Constants, Input/output functions. Operators Arithmetic, relational, logical, bitwise, conditional, increment/decrement, assignment. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions.

UNIT– II: **Control statements**

Selection Statements (decision making) – if and switch statements. Repetition statements (loops) while, for, do-while statements. Break, continue, goto statements.

UNIT - III: Functions and Program structure

User defined functions, inter function communication, Scope and Lifetime of variables, Storage classes-auto, register, static, extern, type qualifiers. The C preprocessor. Recursive functions.

UNIT - IV: **Array**s

Declaring and Referencing Arrays, Array Subscripts, Using Array Elements as Function Arguments, Array Arguments, Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms two – dimensional arrays matrix addition and matrix multiplication, Declaration of Multidimensional arrays.

UNIT - V: Pointers

Introduction, Pointers and addresses, Pointer types, Pointers and function arguments, Pointers and arrays, address arithmetic, Array of Pointers, Pointers to Pointers, Pointer to Function, pointers and multi-dimensional arrays. Dynamic Memory Allocation.

Strings: String Basics, String Library Functions: Assignment and Substrings, Longer Strings: Concatenation and Whole-Line Input, String Comparison, character pointers and functions

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
3. Yashvant Kanetkar, Let Us C, 18th Edition, BPB.
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

25EE11002 – ELECTRICAL CIRCUITS - I

B. Tech. EEE - I Year I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives: Develop an ability to

1. Understand the fundamental concepts of electrical circuits, laws and theorems governing circuit behavior.
2. Understand the steady state behavior of single-phase and three-phase AC circuits.
3. Understand the concepts of magnetic coupled circuits.

Course Outcomes: At the end of the course, students would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Apply fundamental circuit laws, network reduction techniques, analysis methods (Nodal, Mesh) and theorems to solve electrical circuits.	PO 1, 2, 3, 4, 5 and PSO 1, 2	I	3	4, 7
CO2	Analyze resonance, power, and three-phase balanced/unbalanced systems; evaluate power factor and performance parameters of AC circuits.	PO 1, 2, 3, 4, 5, 7, 11 and PSO 1, 2	II, III	4	7, 9, 12
CO3	Analyze the concepts of magnetic coupling to facilitate efficient circuit analysis and effective energy transfer in electrical systems.	PO 1, 2, 3, 4, 5, 7, 8, 11 and PSO 1, 2	IV, V	4	7, 9, 12

UNIT I: Network Elements & Laws

Active elements- Independent and dependent sources, Passive elements- R, L and C, Energy stored in Inductance and Capacitance, Kirchhoff's laws, Source transformation, Star-Delta transformation, Node voltage method, and Mesh current method.

UNIT II: Single-Phase Circuits

RMS and average values of periodic sinusoidal and non-sinusoidal waveforms, Phasor representation, j-Notation, Steady-state analysis of series, parallel circuits. Impedance, Admittance, Active and Reactive Powers, Complex Power.

Resonance: Series and parallel circuits, Bandwidth and Q-factor.

UNIT III: Three-phase Circuits

Analysis of balanced and unbalanced three-phase circuits, Star and delta connections, Measurement of three-phase power for balanced and unbalanced loads.

UNIT IV: Network theorems

Superposition theorem, Thevenin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Millman's theorem and Reciprocity theorem. (AC & DC).

UNIT V: Magnetic Coupled circuits

Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of circuits with mutual inductance

TEXT BOOKS:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGraw Hill, 2nd Edition, 2019.

REFERENCE BOOKS:

1. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGraw Hill, 5th Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGraw Hill, 6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.

25ME11001 – ENGINEERING DRAWING AND COMPUTER AIDED DRAFTING

B. Tech. EEE - I Year I Sem

L	T	P/D	C
2	-	-/2	3

Prerequisite(s): None

Course Objectives: Develop an ability to

1. Understand the fundamentals of engineering drawing and projection systems.
2. Enhance skills in constructing orthographic, isometric, and sectional views of engineering components.
3. Interpret and create technical drawings using CAD tools.
4. Familiarize with dimensioning standards and drafting conventions.
5. Bridge manual drafting techniques with computer-aided drafting practices.

Course Outcomes: At the end of the course, students would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Apply the concepts of Auto-CAD commands to practice Engineering Drawing.	PO 1, 3 and 9 PSOs: Nil	I, II, III, IV, V	3	4, 9, 11
CO2	Construct scales, Geometric curves (Conic sections & Cylindrical curves) by using Auto- CAD.	PO 1, 3 and 9 PSOs: Nil	I	3	
CO3	Apply the principles of Orthographic projections to draw points , Straight lines , Planes and regular solids by using Auto-CAD.	PO 1, 3 and 9 PSOs: Nil	II, III	3	
CO4	Develop the sectional views and surfaces of a solid Geometries by using Auto-CAD.	PO 1, 3 and 9 PSOs: Nil	IV	3	
CO5	Demonstrate drafting skills for Isometric and Orthographic views.	PO 1, 3 and 9 PSOs: Nil	V	2	

UNIT – I: Introduction to Engineering Graphics (Conventional)

Principles of Engineering Graphics and their Significance, Geometrical Constructions, Scales, Plain and Diagonal, Conic Sections including the Rectangular Hyperbola, General method only. Cycloid, Epicycloid and Hypocycloid.

UNIT - II: Orthographic Projections (Conventional and Computer Aided)

Introduction to Computer aided drafting, views, commands.

Principles of Orthographic Projections, Conventions, Projections of Points and Lines (Lines Inclined to both the Planes).

UNIT – III: Projections of Regular Planes and Solids (Conventional and Computer Aided)

Projections of Plane regular geometric figures. Computer aided orthographic projections of planes (Planes inclined to both the planes).

Right Regular Solids (Axis inclined to one plane)-Prism, Cylinder, Pyramid, Cone, Computer aided projections of planes & solids.

UNIT – IV: Sections of Solids and Development of Surfaces (Conventional)

Sectional views and development surfaces of Prism, Cylinder, Pyramid and Cone.

UNIT – V: Isometric Projections (Conventional and Computer Aided)

Principles of Isometric Projection, Isometric Scale, Isometric Views, Conventions, Isometric Views of Lines, Plane Figures, Simple and Compound Solids. Conversion of Isometric Views to Orthographic Views and Vice- versa.

Note:

1. The End Semester Examination will be in computer mode.
2. CIE – I will be in conventional/ computer mode.
3. CIE – II will be in computer mode.

TEXT BOOKS:

1. Engineering Drawing, N. D. Bhatt, Charotar, 54th Edition, 2023.
2. Engineering Drawing and graphics Using AutoCAD, T. Jeyapoovan and Vikas, S. Chand and company Ltd., 3rdEdition,2010.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C.M. Agrawal, McGraw Hill, 3rd Edition, 2019.
2. Engineering Graphics and Design, WILEY, John Wiley and Sons Inc, 3rdEdition, 2020.
3. Engineering Drawing, M. B. Shah and B.C. Rane, Pearson, 2nd Edition, 2009.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford, 1st Edition, 2015.
5. Computer Aided Engineering Drawing, K. Balaveera Reddy, CBS Publishers, 2nd Edition, 2015.

25EN11L01 – ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

B. Tech. EEE - I Year I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): Nil

Course Objectives: Develop an ability to

1. Enhance active listening skills
2. Listen and comprehend the speech of people from different linguistic backgrounds
3. Improve pronunciation and neutralize accent
4. Express ideas fluently and appropriately
5. Speak in social and professional contexts

Course outcomes: At the end of the course, the student would be able to:

CO	Course Outcomes	Related POs and PSOs	Related Exercises	BTL	Related SDGs
CO1	Listen actively and identify important information in spoken texts.	PO 8 and 9 PSOs: Nil	I, II, III, IV, V	2, 3, 4 and 5	4
CO2	Use Phonetics to neutralize accent and speak intelligibly.	PO 8 and 9 PSOs: Nil	I, II, III, IV, V	2, 3, 4 and 5	
CO3	Articulate ideas explicitly both verbally and non- verbally	PO 8 and 9 PSOs: Nil	I, II, III, IV, V	2, 3, 4 and 5	

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

a. **Computer Assisted Language Learning (CALL) Lab which focusses on listening skills**
b. **Interactive Communication Skills (ICS) Lab which focusses on speaking skills**

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise – I

CALL Lab:

Instruction: Speech Sounds-Listening Skill - Importance – Purpose - Types- Barriers - Active Listening

Practice: Listening to Distinguish Speech Sounds (Minimal Pairs) - *Testing Exercises*

ICS Lab:

❖ **Diagnostic Test – Activity titled '*Express Your View*'**

Instruction: Spoken and Written language - Formal and Informal English - Greetings – Introducing Oneself and Others

Practice: Any Ice-Breaking Activity

Exercise – II

CALL Lab:

Instruction: *Listening vs. Hearing - Barriers to* Listening

Practice: Listening for General Information - Multiple Choice Questions - *Listening Comprehension Exercises (It is essential to identify a suitable passage with exercises for practice.)*

ICS Lab:

Instruction: Features of Good Conversation – Strategies for Effective Communication

Practice: Role Play Activity - Situational Dialogues –Expressions used in Various Situations –Making Requests and Seeking Permissions — Taking Leave – Telephone Etiquette

Exercise - III

CALL Lab:

Instruction: Errors in Pronunciation – Tips for Neutralizing Mother Tongue Influence (MTI)

Practice: Differences between British and American Pronunciation – *Listening Comprehension Exercises*

ICS Lab:

Instruction: How to make Formal Presentations, Describing Objects, Situations, Process, Places, People and Events

Practice: Picture Description Activity – Looking at a Picture and Describing Objects, Situations, Places, People and Events *(A wide range of Materials / Handouts are to be made available in the lab.)* Oral Presentations.

Exercise – IV

CALL Lab:

Instruction: Techniques for *Effective* Listening

Practice: *Listening for Specific Details* - Listening - Gap Fill Exercises - *Listening Comprehension Exercises*
(It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:

Instruction: How to Tell a Good Story - Story Star- Sequencing-Creativity

Practice: Activity on Telling and Retelling Stories - Collage

Exercise – V

CALL Lab:

Instruction: Identifying the literal and implied meaning

Practice: Listening for Evaluation - Write the Summary – Listening Comprehension Exercises *(It is essential to identify a suitable passage with exercises for practice.)*

ICS Lab:

Instruction: Understanding Non-Verbal Communication

Practice: Silent Speech - Dumb Charades Activity

- **Post-Assessment Test on 'Express Your View'**

REFERENCE BOOKS:

1. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
2. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient BlackSwan Pvt. Ltd.
3. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press
4. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
5. Ur, Penny and Wright, Andrew. 2022. *Five Minute Activities – A Resource Book for Language Teachers.* Cambridge University Press.

25PH11L01 – ADVANCED ENGINEERING PHYSICS LAB

B. Tech. EEE - I Year I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course Objectives: Develop an ability to

1. To provide practical exposure to advanced concepts in solid-state and modern physics.
2. To study the physical properties of materials like semiconductors, ferromagnetic, and ferroelectric substances.
3. To perform semiconductor characterization using Hall effect and band gap experiments.
4. To explore the working principles of lasers and optical fibers through hands-on experiments.
5. To develop skills in data analysis, interpretation, and scientific reporting.

Course outcomes: At the end of the course, the student would be able to

CO	Course Outcomes	Related POs and PSOs	Related Experiments	BTL	Related SDGs
CO1	Analyze the characteristics of Solar cell and LED	PO 1, 2	3,4	3,4	4
CO2	Determine key electrical, magnetic, and optical properties of semiconductors and other functional materials.	PO 1, 2	6,7,8,9	3,4	
CO3	Characterize semiconductors using Hall effect and energy gap measurement techniques.	PO 1, 2	1,2	3,4	
CO4	Demonstrate working knowledge of laser systems and optical fiber parameters through experimental study.	PO 1, 2	5,10	3,4	
CO5	Apply scientific methods for accurate data collection, analysis, and technical report writing.	PO 1, 2	All	3,4	

LIST OF EXPERIMENTS: (A minimum of **Eight** Experiments to be conducted)

1. Determination of energy gap of a semiconductor.
2. Determination of Hall coefficient and carrier concentration of a given semiconductor.
3. Plot the V-I characteristics of a Solar cell.
4. Determination of Planck's constant using the V-I characteristics of the LED.
5. a. Determination of wavelength of a laser using a diffraction grating.
   b. Study of V-I & L-I characteristics of a given laser diode.
6. Determination of the magnetic moment of a bar magnet and the horizontal Earth's magnetic field.
7. Study of the B-H curve of a ferromagnetic material.
8. Study of the P-E loop of a given ferroelectric crystal.
9. Determination of the dielectric constant of a given material.
10. a. Determination of the numerical aperture of a given optical fiber.
    b. Determination of bending losses of a given optical fiber.

25CS11L01 – PROGRAMMING FOR PROBLEM SOLVING LAB

B. Tech. EEE - I Year I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course Objectives: Develop an ability to

1. Work with an IDE to create, edit, compile, run and debug programs
2. Analyze the various steps in program development.
3. Solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. Write modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. Write programs using the Dynamic Memory Allocation concept.

Course outcomes (COs): At the end of the course, student would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Formulate the algorithms for simple problems	PO 1, 2, 3, 5, and PSO1, 2	I	3	4, 9
CO2	Translate given algorithms to a working and correct program	PO 1, 2, 3, 5, and PSO1, 2	I	3	4, 8
CO3	Correct syntax errors as reported by the compilers.	PO 1, 2, 5, and PSO1, 2	I, II, III, IV, V	4	4
CO4	Identify and correct logical errors encountered during execution	PO 1, 2, 3, 5, 10, and PSO1, 2	I, II, III, IV, V	3	4, 9
CO5	Represent and manipulate data with arrays, strings	PO 1, 2, 3, 5, and PSO1, 2	IV, V	3	4, 9
CO6	Use pointers of different types	PO 1, 2, 3, 5, and PSO1, 2	V	3	
CO7	Modularize the code with functions so that they can be reused	PO 1, 2, 3, 5, and PSO1, 2	III	4	

PRACTICE SESSIONS:

Simple numeric problems:

a) Write a program for finding the max and min from the three numbers.

b) Write the program for the simple, compound interest.

c) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

5 x 1 = 5

5 x 2 = 10

5 x 3 = 15

d) Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

b) Write a program that finds if a given number is a prime number.

c) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

d) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

Arrays, Pointers and Functions:

a) Write a C program to find the minimum, maximum and average in an array of integers.

b) Write a C program that uses functions to perform the following: I. Addition of Two Matrices II. Multiplication of Two Matrices

c) Write a program for reading elements using a pointer into an array and display the values using the array.

d) Write a program for display values reverse order from an array using a pointer.

Strings:

a) Write a C program that uses functions to perform the following operations: I. To insert a sub-string into a given main string from a given position. II. To delete n Characters from a given position in a given string

b) Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

c) Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.

d) Write a C program to count the lines, words and characters in a given text.

Sorting and Searching:

a) Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search method.

b) Write a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using binary search method.

c) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

d) Write a C program that sorts the given array of integers using selection sort in descending order

e) Write a C program that sorts the given array of integers using insertion sort in ascending order

f) Write a C program that sorts a given array of names.

[Note: The programs may be executed using any available Open Source/ Freely available IDE Some of the Tools available are:

CodeLite: https://codelite.org/

Code::Blocks: http://www.codeblocks.org/

DevCpp :http://www.bloodshed.net/devcpp.html

Eclipse: http://www.eclipse.org

This list is not exhaustive and is NOT in any order of preference]

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
3. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
4. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
5. R.G. Dromey, how to solve it by Computer, Pearson (16th Impression)
6. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
7. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
8. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

I Year II Semester
Detailed Syllabus

25MA12001 – ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

B. Tech. EEE - I Year II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): 25MA11001- Matrices and Calculus

Course Objectives: Develop an ability to

1. Solve first and higher order differential equations of various types.
2. Analyze properties of Laplace Transform, and Inverse Laplace Transform.
3. Solve Ordinary Differential Equations using Laplace Transform techniques.
4. Explain properties of vector operators to determine solenoidal and irrotational vectors, directional derivatives of vectors.
5. Determine the length of a curve, area between the surfaces and volumes of solids using vector integration.

Course Outcomes (COs): At the end of the course, students would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Form first order differential equations for Growth and Decay and apply appropriate methods for solving them	PO 1, 2, 3 and PSO 1	I	1, 2, 3, 4	4, 9
CO2	Form higher order differential equations for Electrical circuits and apply appropriate methods for solving them.	PO 1, 2, 3 and PSO 1	II	1, 2, 3, 4	
CO3	Apply Laplace transform techniques to evaluate integrals and solve ordinary differential equations with initial conditions.	PO 1, 2, 3 and PSO 1	III	1, 2, 3, 4	
CO4	Analyze and compute vector derivatives and relate vector integrals to physical and engineering applications	PO 1, 2, 3 and PSO 1	IV & V	1, 2, 3, 4	

UNIT-I: First Order Ordinary Differential Equations

Exact Differential Equations, Equations reducible to Exact Differential Equations, Linear Differential Equations and Bernoulli's Equations orthogonal Trajectories (only in Cartesian Coordinates)

Applications: Newton's law of cooling, Law of Natural growth and decay

UNIT II: Ordinary Differential Equations of Higher Order

Higher Order Linear Differential Equations with Constant Coefficients: Non-homogeneous of the type e^{ax}, sin ax, cos ax, x^n, $e^{ax}V(x)$ and $xV(x)$**,** Method of variation of parameters.

Applications: Electrical Circuits.

UNIT III: Laplace Transforms

Definition of Laplace transform, Existence of Laplace transforms, Laplace transform of standard functions, first shifting theorem, Laplace transform of functions when they are multiplied and divided by "t", Laplace transforms of derivatives and integrals of functions, Laplace Transform of Periodic function, Inverse Laplace transform by different methods, Convolution theorem (without proof).

Applications: Evaluation of integrals using Laplace Transforms, Solving Initial Value Problems by using Laplace Transform method.

UNIT IV: Vector Differentiation

Vector point functions and Scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Vector Identities, Scalar potential function, Solenoidal and Irrotational vectors.

UNIT V: Vector Integration

Line, Surface and Volume Integrals. Theorems of Green's Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2011.
2. G.B. Thomos and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, 10th Edition, 2015.
4. H.K. Das and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand and Company Ltd, New Delhi.

25CH12001– ENGINEERING CHEMISTRY

B. Tech. EEE - I Year II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives: Develop an ability to

1. Acquire knowledge of various water treatment methods and their industrial significance in resolving the problem of water hardness.
2. Understand fundamental principles of electrochemistry and corrosion with a perspective of their industrial applications.
3. Impart fundamental knowledge of various energy sources and their practical applications in engineering.
4. Understand the various aspects of polymers, including conducting and biodegradable polymers, and their applications in diverse fields.
5. Acquire knowledge of materials such as cement, lubricants, and biosensors, as well as spectroscopic techniques applicable in engineering, industrial and biomedical fields.

Course Outcomes: At the end of the course, students would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Predict problems associated with hardness of water and identify appropriate method to treat hardness.	PO 1, 2	I	1, 2, 3	3, 6, 7, 8, and 12
CO2	Analyze different electrodes and corrosion control methods for interpreting their applications in various sectors.	PO 1, 2	II	1, 2, 3, 4	
CO3	Comprehend the usage of batteries, fuel cells and various energy sources, enhancing their potential as future engineers and entrepreneurs.	PO 1, 2	III	1, 2, 3	
CO4	Categorize polymers and their applications in different fields.	PO 1, 2	IV	1, 2, 3	
CO5	Apply knowledge of engineering materials and principles of spectroscopic techniques to support industrial and biomedical applications	PO 1, 2	V	1, 2, 3	

UNIT-I: Water and its treatment

Introduction- Hardness, types, degree of hardness and units. Estimation of hardness of water by complexometric method - Numerical problems. Potable water and its specifications (WHO) - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break-point chlorination. Defluoridation - Nalgonda technique.

Boiler troubles: Scales, Sludges and Caustic embrittlement. Internal treatment of boiler feed water - Calgon conditioning and Phosphate conditioning. External treatment methods -

Softening of water by ion- exchange processes. Desalination of brackish water – Reverse osmosis.

Unit-II: Electrochemistry and Corrosion

Introduction- Electrode potential, standard electrode potential, Nernst equation (no derivation), electrochemical cell - Galvanic cell, cell representation, EMF of cell - Numerical problems. Types of reference electrodes – Quinhydrone and Calomel electrode. Construction, working and determination of pH of an unknown solution using Quinhydrone and Calomel electrode.

Corrosion: Introduction- Definition**,** causes and effects of corrosion – Theories of corrosion, chemical and electrochemical theories of corrosion, Factors affecting rate of corrosion - Nature of the metal, Nature of the corroding environment. Corrosion control methods - Cathodic protection Methods - Sacrificial anode and impressed current methods. Metallic coatings-Methods of application - Galvanizing and Tinning.

UNIT III: Energy sources

Batteries: Introduction – Classification of batteries - Primary, secondary and reserve batteries with examples. Construction, working and applications of Lead – acid storage battery and Lithium-ion battery. Fuel Cells – Differences between a battery and a fuel cell, Construction and applications of Direct Methanol Fuel Cell (DMFC).

Fuels: Introduction and characteristics of a good fuel, Calorific value – Units - HCV, LCV- Dulong's formula - Numerical problems.

Fossil fuels: Introduction, Classification, Petroleum - Refining of Crude oil, LPG and CNG composition and uses.

Synthetic Fuels: Fischer-Tropsch process. Introduction and applications of Hythane and Green Hydrogen.

UNIT IV: Polymers

Definition - Classification of polymers: Based on origin and tacticity with examples – Types of polymerizations - Addition (free radical addition mechanism) and condensation polymerization. Plastics, Elastomers and Fibers: Definition and applications (PVC, Teflon, Nylon-6,6). Differences between thermoplastics and thermo setting plastics.

Conducting polymers: Definition and Classification with examples - Mechanism of conduction in trans-poly-acetylene and applications of conducting polymers.

Biodegradable polymers: Polylactic acid and its applications.

UNIT-V Engineering Materials and their applications

Cement: Portland cement, its composition, setting and hardening.

Lubricants: Definition and characteristics of a good lubricant. Properties of lubricants-viscosity, cloud and pour point, flash and fire point.

Biosensor - Definition, Amperometric Glucose monitor sensor.

Spectroscopic techniques and applications: UV-Visible spectroscopy- Principle, Selection rules, Types of electronic transitions and applications (Analysis of pollutants in dye industry); IR spectroscopy-Principle- Mode of vibrations, Applications in night vision-security, Pollution under Control- CO sensor (Passive Infrared detection),

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2. Engineering Chemistry by Rama Devi, Dr.P. Aparna and Rath, Cengage learning, 2025.

REFERENCE TEXT BOOKS:

1. Engineering Chemistry by Thirumala Chary, Laxminarayana & Shashikala, Pearson Publications (2020).
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi 2011.
3. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi 2015.
4. Engineering Analysis of Smart Material Systems by Donald J. Leo, Wiley, 2007.
5. Challenges and Opportunities in Green Hydrogen by **Editors:** Paramvir Singh, Avinash Kumar Agarwal, Anupma Thakur, R.K Sinha.
6. Raman Spectroscopy in Human Health and Biomedicine,
7. E-Content- https://doi.org/10.1142/13094 | October 2023
8. E-books: https://archive.org/details/EngineeringChemistryByShashiChawla/page/n11/mode/2up https://www.worldscientific.com/ doi/epdf/10.1142/13094

25CS12001 – DATA STRUCTURES

B. Tech. EEE - I Year II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): Programming for Problem Solving

Course Objectives: Develop ability to

1. Introduce students to advanced data representation techniques in C using structures, unions, enumerations, and typedef to effectively organize and manipulate complex data types.
2. Proficiency in file handling and data storage concepts, including text and binary file operations, database searching, file positioning, and multifile program design.
3. Build foundation in abstract data types and linear data structures, enabling students to implement and manage linked lists, circular lists, and doubly linked lists for efficient data organization.
4. Train students in the use of stacks and queues for solving computational problems such as expression conversion, evaluation, and balancing of symbols through algorithmic thinking.
5. Equip students with knowledge of hierarchical and network data structures, including trees and graphs, and their associated algorithms for searching, traversal, and application in problem-solving.

Course outcomes (COs): At the end of the course, student would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Apply user-defined data types such as structures, unions, and enumerations to represent complex data.	PO 1, 2, and PSO1	I	2, 3	4
CO2	Implement file operations on text and binary files for data storage, retrieval, and maintenance.	PO 1, 2, 3, and PSO 2	II	3, 4	9
CO3	Develop and manipulate linear data structures including linked lists, stacks, and queues.	PO 1, 3, 4, and PSO1	III, and IV	3, 4	8
CO4	Design and execute algorithms for trees and graphs including traversal, searching, and updating.	PO 1, 4, 5, and PSO 2	V	4, 5	9

UNIT – I: Structure and Union Types

Introduction, User-Defined Structure Types, Structure Type Data as Input and Output Parameters, Functions with Structured Result Values, Complex Structures, Self-Referential Structures, Bit Fields, Union Types, typedef, Enumeration.

UNIT – II: Text and Binary File Pointers

Files Introduction, Modes of File, Input/ Output Files - Review and Further Study, Binary Files, Searching a Database, File status functions, File positioning functions, Command Line Arguments, Multifile Programming.

UNIT–III: Introduction to Data Structures

Abstract data types, selecting a Data Structure, Linear list —Introduction, singly linked list, Circular Linked Lists, Doubly Linked List.

UNIT – IV: Stacks

Stack ADT, Stack applications -Infix Expression to Postfix Expression Conversion, Postfix Expression Evaluation, Balancing Symbols, Expression Tree, Queues- Queue ADT

UNIT – V: Trees

Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree, Binary Search Trees (BST), BST Operations- Searching, Insertion and Deletion, BST ADT.

Graphs: Introduction to types of Graphs, Representation of Graphs, Graph Traversal Algorithms – Depth First Search, Breadth First Search, Graph ADT, Applications of Graphs.

TEXTBOOKS:

1. Data Structures: Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning
2. Data Structure using C – Reema Thareja, 3rd Edition, Oxford University Press.
3. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

REFERENCE BOOKS:

1. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

25EE11003 – ELECTRICAL CIRCUITS - II

B. Tech. EEE - I Year II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): Matrices and Calculus and Electrical Circuits – I

Course Objectives: Develop an ability to

1. Understand transient behaviour in electrical circuits containing R, L, and C elements under different excitation conditions through analytical and problem-based approaches.
2. Apply the Laplace Transform technique for analyzing electrical circuits and determining transient and steady-state responses using real-world problem scenarios.
3. Understand the fundamental concepts of network topology and apply graphical methods for circuit analysis through mini-projects and problem-solving tasks.
4. Explain and analyze the parameters of two-port networks and their interrelationships for various configurations using simulation and project-based activities.
5. Understand basic concepts of filter design, including the analysis and applications of Constant-k and M-derived filters, and promote design-oriented learning through project/problem-based exercises.

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

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Analyze the transient response of series and parallel RLC circuits for DC and sinusoidal excitations using differential and integro-differential methods, and demonstrate analytical skills through problem-based learning.	PO 1, 2, 4, 5, 11 and PSO 1, 2	I	4	4,7
CO2	Apply Laplace Transform techniques to determine the transient and steady-state responses of electrical networks and validate findings through simulation or mini-projects.	PO 1, 2, 4, 5, 11 and PSO 1, 2	II	3	4,7
CO3	Apply concepts of network topology to formulate and solve problems using tie-set, cut-set, and incidence matrices through practical and collaborative learning tasks.	PO 1, 2, 4, 5, 11 and PSO 1, 2	III	3	9, 11
CO4	Determine and interpret two-port network parameters, analyze the performance of interconnected networks, and apply the knowledge in project-based circuit design problems.	PO 1, 2, 4, 5, 11 and PSO 1, 2	IV	4	7,12
CO5	Classify and design low-pass, high-pass, band-pass, and band-elimination filters using Constant-k and M-derived network principles, and implement design ideas through project-based or simulation-based learning activities.	PO 1, 2, 4, 5, 11 and PSO 1, 2	V	5, 6	9, 12

UNIT-I

Transient analysis: Significance of Initial conditions of R, L and C elements Transient response of series RL, RC and RLC circuits using integro-differential approach for DC and Sinusoidal excitations. Transient response of parallel RL, RC and RLC circuits using integro-differential approach for DC and Sinusoidal excitations.

UNIT-II

Electrical circuit Analysis using Laplace Transforms: Laplace Transforms of step, ramp, exponential, impulse functions (inputs) Transient response of series RL, RC and RLC circuits using Laplace Transforms approach for DC and Sinusoidal excitations. Transient response of parallel RL, RC and RLC circuits using Laplace Transforms approach for DC and Sinusoidal excitations.

UNIT-III

Network Topology: Graph, tree, chord, Tie-set, cut-set, incident matrices, Problems on Tie-set and cut-set matrices.

UNIT-IV

Two port network parameters: Open circuit impedance, short-circuit admittance, Transmission, Hybrid parameters & inter-relationships, Series, parallel and cascade connection of two port networks.

UNIT-V

Filters: Classification of filters – Low pass, High pass, Band pass and Band Elimination, Elementary treatment of Constant-k and M-derived filters-Low pass and High pass Filters, Band pass and Band elimination filters.

TEXTBOOKS:

1. Van Valkenburg M.E, “Network Analysis”, Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, “Network Analysis and Synthesis”, McGraw Hill, 2nd Edition, 2019.

REFERENCE BOOKS:

1. James W. Nilsson, Susan A. Riedel, “Electric Circuits”, Pearson, 11th Edition, 2020.
2. A Sudhakar, Shyammohan S Palli, “Circuits and Networks: Analysis and Synthesis”, McGraw Hill, 5th Edition, 2017.
3. Jagan N.C, Lakshrninarayana C., “Network Analysis”, B.S. Publications, 3rd Edition, 2014.
4. William Hayt H, Kimmerly Jack E. and Steven Durbin M, “Engineering Circuit Analysis”, McGraw Hill, 6th Edition, 2002.
5. Chakravarthy A., “Circuit Theory”, Dhanpat Rai & Co., First Edition, 1999.

25EC12001 - ELECTRONIC DEVICES AND CIRCUITS

B.Tech. EEE - I Year, II Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the working principles of semiconductor diodes and their functionality in rectifiers, clippers, and clampers.
2. Understand the operating characteristics of Bipolar Junction Transistors (BJTs) in various configurations.
3. Understand the principles of biasing of BJTs.
4. Understand the low frequency analysis of BJTs using small signal models.
5. Understand the operating characteristics of Field Effect Transistors (FETs), working principles of special purpose diodes, and advanced devices.

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

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Analyze the electrical characteristics and models of semiconductor diodes and apply them in rectifier and clipping circuits.	PO 1, 2, 3, 4, 5, 6, and PSO 1	I	4	4
CO2	Evaluate the operation and configurations of BJTs and analyze their input and output characteristics.	PO 1, 2, 3, 4, 5, and PSO 1	II	4	
CO3	Design appropriate biasing networks for BJTs and determine the operating point for amplifier applications.	PO 1, 2, 3, 4, 5, and PSO 1	III	3	
CO4	Analyze transistor amplifier circuits using h-parameter models and assess their performance for various configurations.	PO 1, 2, 3, 4, 5, 11, and PSO 1	IV	4	
CO5	Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like FinFETs and CNTFETs, and compare with modern device technologies.	PO 1, 2, 3, 4, 5, 6, 11, and PSO 1	V	4	

UNIT - I: Diode Characteristics and Applications

PN junction diode – V-I characteristics, Diode resistance and capacitance, Diode models (Ideal, Simplified, Piecewise Linear), Rectifiers — Half-wave, Full- wave (Center-tap and bridge), Capacitor filter for rectifiers, Clippers and Clampers, Zener diode – V-I characteristics and voltage regulation.

UNIT - II: Bipolar Junction Transistor (BJT)

Structure and working principle of BJT, Current components and transistor action, Configurations: Common Base (CB), Common Emitter (CE), Common Collector (CC), Input and output characteristics, Determination of h-parameters from transistor characteristics.

UNIT - III: BJT Biasing

Need for biasing and stabilization, Load line and operating point, Biasing techniques: Fixed bias, Collector-to-base bias, Voltage divider bias, Stability factors and thermal runaway

UNIT - IV: BJT Amplifiers

Transistor as a small-signal amplifier, h-parameter equivalent circuit, CE, CB, CC amplifier analysis using h-parameters, Approximate CE model – with and without emitter bypass capacitor.

UNIT - V: Special Purpose Diodes

Principle of Operation of — SCR, Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode

Field Effect Transistors and Advanced Devices: JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes — Structure, operation, and characteristics, Advanced Devices: FinFETs - 3D structure, Scaling advantages, CNTFETs - Structure, ballistic transport, fabrication, Comparison: CMOS vs. FinFET vs. CNTFET.

TEXT BOOKS:

1. Millman, Jacob, and Christos C. Halkias. *Electronic Devices and Circuits*. Tata McGraw-Hill, 1991.
2. Boylestad, Robert L., and Louis Nashelsky. *Electronic Devices and Circuit Theory*. Pearson, 11th ed., 2013.
3. Sedra, Adel S., and Kenneth C. Smith. *Microelectronic Circuits*. Oxford University Press, 7th ed., 2014.

REFERENCE BOOKS:

1. Bell, David A. *Electronic Devices and Circuits*. Oxford University Press, 5th ed., 2008.
2. Neamen, Donald A. *Electronic Circuit Analysis and Design*. McGraw-Hill, 2nd ed., 2001.
3. Salivahanan, S., and N. Suresh Kumar. Electronic Devices and Circuits, McGraw - Hill Education, 4th ed., 2017.
4. Razavi, Behzad. *Fundamentals of Microelectronics*. Wiley, 2nd ed., 2013.
5. Taur, Yuan, and Tak H. Ning. *Fundamentals of Modern VLSI Devices*. Cambridge University Press, 2nd ed., 2009.

25CH12L01– ENGINEERING CHEMISTRY LAB

B. Tech. EEE - I Year II Sem

L	T	P	C
-	-	2/-	1

Prerequisite(s): None

Course Objectives: Develop an ability to

1. Estimate the hardness content in water and check its suitability for drinking purpose.
2. Acquire ability to perform acid-base titrations using instrumental methods such as conductometry, potentiometry, and pH metry.
3. Gain hands-on experience in synthesizing polymers like Bakelite and Nylon – 6, 6 in the laboratory.
4. Measure physical properties like acid value and viscosity.
5. Gain conceptual understanding of experiments involving core chemical principles through virtual platforms, with relevance to engineering applications.

Course outcomes: At the end of the course, the student would be able to:

CO	Course Outcomes	Related POs and PSOs	Related Expts.	BTL	Related SDGs
CO1	Estimate hardness in water to verify its suitability for drinking purpose.	PO 1, 2	1	3,4	3, 6, 7, 8, 12
CO2	Apply instrumental techniques like conductometry, potentiometry, and pH metry.	PO 1, 2	2,3,4,5, 6	3,4	
CO3	Use fundamental preparatory techniques for the synthesis of polymers such as Bakelite and Nylon-6,6.	PO 1, 2	7,8	3,4	
CO4	Determine physical properties, namely acid value and viscosity of a given fluid.	PO 1, 2	10, 11	2	
CO5	Demonstrate the ability to analyze and interpret virtual experiments based on fundamental chemical principles applicable to engineering systems.	PO 1, 2	12,13,14,15	1,2	

LIST OF EXPERIMENTS: (A minimum of **TEN** Experiments are to be conducted using hardware)

1. Estimation of Hardness of water by EDTA Complexometric method.
2. Estimation of the concentration of strong acid by Conductometry.
3. Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry.
4. Estimation of concentration of Fe^{+2} ion by Potentiometry using $KMnO_4$.
5. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone.

6. Determination of an acid concentration using pH meter.
7. Preparation of Bakelite.
8. Preparation Nylon – 6, 6.
9. Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
10. Estimation of acid value of given lubricant oil.
11. Estimation of viscosity of lubricant oil using Ostwald's Viscometer.
12. Construction of Fuel cell and it's working.
13. Smart materials for Biomedical applications
14. Batteries for electrical vehicles.
15. Functioning of solar cell and its applications.

25CS12L02 – DATA STRUCTURES LAB

B. Tech. EEE – I Year, II Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): 25CS11001 - Programming for Problem Solving

Course Objectives: Develop an ability to

1. Introduce students to advanced data representation techniques in C using structures, unions, enumerations, and typedef to effectively organize and manipulate complex data types.
2. Proficiency in file handling and data storage concepts, including text and binary file operations, database searching, file positioning, and multifile program design.
3. Build foundation in abstract data types and linear data structures, enabling students to implement and manage linked lists, circular lists, and doubly linked lists for efficient data organization.
4. Train students in the use of stacks and queues for solving computational problems such as expression conversion, evaluation, and balancing of symbols through algorithmic thinking.
5. Equip students with knowledge of hierarchical and network data structures, including trees and graphs, and their associated algorithms for searching, traversal, and application in problem-solving.

Course outcomes (COs): At the end of the course, student would be able to

CO	Course Outcomes	Related POs and PSOs	Related Units	BTL	Related SDGs
CO1	Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.	PO 1, 2, 3, 4, 5, and PSO 1, 2	I, II, III, IV	3, 4	4, 8, 9
CO2	Ability to implement the concepts of Trees and Graphs	PO 1, 2, 3, 4, 5, and PSO 1, 2	V	4	4, 9

LIST OF EXPERIMENTS:

1. Write a program that uses functions to perform the following operations on singly linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal

2. Write a program that uses functions to perform the following operations on doubly linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal

3. Write a program that uses functions to perform the following operations on circular linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal

4. Write a program that implement stack (its operations) using i) Arrays ii) ADT

5. Write a program that implement Queue (its operations) using i) Arrays ii) ADT
6. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).
7. Write a program to implement Binary Search tree
8. Write a program to implement the Graph traversal methods i)DFS ii)BFS

TEXT BOOKS:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

REFERENCE BOOK (S):

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

25EE12L03 - ELECTRICAL CIRCUITS LAB

B. Tech. EEE – I Year II Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): 25EE11002 - Electrical Circuits - I

Course Objectives: Develop an ability to

1. Understand fundamental circuit laws and theorems through simulation and experimental verification.
2. Analyze the transient and steady-state behaviour of electrical circuits using hardware setups and circuit simulation tools.
3. Familiarize with network parameters, magnetic coupling, and power measurement techniques in both single-phase and three-phase systems.
4. Understand the frequency-domain behaviour of filters and enable students to evaluate their performance using circuit simulation tools.
5. Promote problem-solving, teamwork, and analytical skills through problem/project-based laboratory exercises and simulation activities related to real-world electrical systems.

Course outcomes (COs): At the end of the course, student would be able to

CO	Course Outcomes	Related POs and PSOs	Related Expts.	BTL	Related SDGs
CO1	Verify and analyze basic electrical theorems and circuit laws using experimental and simulation-based approaches, applying problem-solving and analytical skills.	PO 1, 2, 4, 5, 6, 11, and PSO 1	1, 7, 8 and Add. Exp. 1	4	4
CO2	Measure three-phase power in balanced loads using the two-wattmeter method and understand power relations in star and delta configurations.	PO 1, 2, 3, 6, 10 and PSO 1	4, 9	3	7
CO3	Determine and interpret the transient and steady-state responses of RL and RC circuits for various input excitations using circuit simulation tools.	PO 1, 2, 4, 5 and PSO 1	2, 10	4	9
CO4	Determine the coefficient of coupling, self, and mutual inductance in magnetically coupled circuits and relate them to practical applications in electrical systems.	PO 1, 2, 3, 5, 6 and PSO 1	5	3	7
CO5	Evaluate two-port network parameters (Z, Y, Transmission, Hybrid) and their interrelationships through experimental or simulation-based studies.	PO 1, 2, 4, 5, 10 and PSO 1	3	5	9
CO6	Analyze the frequency-domain characteristics of low-pass and high-pass filters using circuit simulation tools, demonstrating teamwork and technical reporting skills through project-based learning.	PO 1, 2, 4, 5and PSO 1	6 and Add. Exp. 2	4	9

LIST OF EXPERIMENTS:

1. Verification of Series and Parallel Resonance using any circuit simulation software (using LTSpice, MATLAB**,** PSPICE software or any other equivalent freeware software).
2. Determination of Time response of first order RL and RC circuit for periodic non – sinusoidal inputs – Time Constant and Steady-state error using any circuit simulation software (using LTSpice, MATLAB**,** PSPICE software or any other equivalent freeware software).
3. Determination of Two port network parameters – Z, Y, Transmission and Hybrid parameters.
4. Measurement of 3-phase power in Balanced Star connected load using Two-Wattmeter method.
5. Determination of Co-efficient of coupling, self and mutual inductance in magnetic Coupled Circuits.
6. Frequency domain analysis of Low-pass filter and High-pass filters using circuit simulation software (using LTSpice, MATLAB**,** PSPICE software or any other equivalent freeware software).
7. Verification of Superposition and Maximum Power Transfer theorems using any circuit simulation software (using LTSpice, MATLAB**,** PSPICE software or any other equivalent freeware software).
8. Verification of Thevenin's and Norton's theorems using any circuit simulation software (using LTSpice, MATLAB**,** PSPICE software or any other equivalent freeware software).
9. Measurement of Active Power for Delta connected balanced loads.
10. Determination of Time response of first order RL, RC circuit for periodic non – sinusoidal inputs – Time Constant and Steady state error.

ADDITIONAL EXPERIMENTS:

1. Verification of Compensation and Reciprocity Theorems.
2. Frequency domain analysis of band pass filters.

Note: All the simulation experiments are to be simulated using LTSpice, MATLAB**,** PSPICE software or any other equivalent freeware software

25EC12L01 – ELECTRONIC DEVICES AND CIRCUITS LAB

B.Tech. EEE - I Year, II Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course Objectives: Develop ability to

3. Identify various electronic components and understand their specifications.
4. Understand and operate various electronic measuring instruments.
3. Understand the characteristics of diode, and its applications in rectifier and voltage regulator.
4. Understand the characteristics of BJT and FET, and their application in amplifier circuits.
5. Understand the procedure for biasing of BJT.
6. Understand the procedure to simulate electronic circuits using various software tools.

Course outcomes: At the end of the course, the student would be able to:

CO	Course Outcomes	Related POs and PSOs	Related Expts.	BTL	Related SDGs
CO1	Use electronic instruments for measuring the parameters of various circuit components	PO 1, 2, 3, 4, 5, and PSO 1, 2	A. 1 - 4	2	4
CO2	Analyze the V-I characteristics of semiconductor devices such as diodes, BJTs, and FETs.	PO 1, 2, 3, 4, 5, and PSO 1, 2	B. 1 - 5 C. 4 - 7	4	
CO3	Assess basic rectifier, clipper, clamper, and voltage regulation circuits.	PO 1, 2, 3, 4, 5, 6, and PSO 1, 2	B. 2 - 4 C. 1 - 2	3	
CO4	Design biasing techniques for BJTs and determine their operating point using DC load line analysis.	PO 1, 2, 3, 4, 5, and PSO 1, 2	B.6	3	
CO5	Analyze transistor amplifier circuits in various configurations using h-parameter models.	PO 1, 2, 3, 4, 5, 11, and PSO 1, 2	C.3	4	
CO6	Simulate and interpret electronic circuits using appropriate simulation tools.	PO 1, 2, 3, 4, 5, 11, and PSO 1, 2	C.1 - 7	3	4, 9

LIST OF EXPERIMENTS:

A. Electronic Workshop Practice (Two lab sessions):

1. Identification, specification and testing of R, L, C Components, Potentiometers, Rheostats, Switches (SPST, SPDT, DPST, DPDT and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCBs, Sensors (LDR, Thermistors, Piezo-Buzzers)
2. Identification, specification, testing of Active Devices - Diode, BJT, JFET, MOSFET, Power Transistor, LED, LCD.

3. Study and operation of Multimeter, Voltmeter, Ammeter, Function Generator, Regulated Power Supply and CRO.
4. Soldering practice.

B. Hardware-Based Experiments (A minimum of 6 experiments are to be conducted**):**

1. Study the V–I characteristics of a PN junction diode in forward and reverse bias to determine cut-in voltage and dynamic resistance.
2. Examine the reverse bias characteristics of a Zener diode and demonstrate its application as a voltage regulator under varying conditions.
3. Design and analyze half-wave and full-wave rectifiers (center-tap and bridge) with and without capacitor filters to evaluate ripple factor and output voltage.
4. Implement clipper and clamper circuits to observe waveform shaping through positive, negative, and biased configurations.
5. Plot the input and output characteristics of a BJT in common emitter configuration to determine input/output resistance and current gain.
6. Design and test fixed bias and voltage divider bias circuits to establish a stable operating point for a BJT amplifier and study DC load line behavior.
7. Construct and analyze a Common Base (CB) configuration of a BJT to study input-output characteristics and determine current gain (α) and input/output resistance.

C. Software-Based Simulation Experiments (A minimum of 6 experiments are to be conducted**):**

1. Simulate a full-wave bridge rectifier with capacitor filter to analyze waveform smoothing and ripple reduction in DC power supply design.
2. Simulate a Zener diode-based voltage regulator to study voltage stabilization against varying supply voltages and load resistances.
3. Simulate a common emitter amplifier with and without emitter bypass capacitor to analyze the effect on voltage gain and signal amplification.
4. Simulate BJT operation as a switch and small-signal amplifier to understand its dual functionality in digital and analog applications.
5. Simulate the output and transfer characteristics of a JFET to determine parameters such as pinch-off voltage, drain resistance, and transconductance.
6. Simulate the characteristics of a MOSFET and design a CMOS inverter to study digital switching behavior and low-power logic design.
7. Simulate the transfer and output characteristics of an enhancement-mode NMOS transistor to analyze threshold voltage, drain current, and switching behavior.

25ME12L01 ENGINEERING WORKSHOP

B.Tech. EEE - I Year, II Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite (s): None

Course Objectives: Develop ability to

1. Understand basic manufacturing processes and workshop practices.
2. Gain hands-on experience in carpentry, fitting, welding, sheet metal, and machining
3. Use hand tools and measuring instruments.
4. Understand proper handling of workshop equipment and safety measures to be taken in handling the same
5. Build a foundational understanding of industrial production and fabrication.

Course outcomes: At the end of the course, the student would be able to:

CO	Course Outcomes	Related POs and PSOs	Relate Exercises	BTL	Related SDGs
CO1	Understand the basic manufacturing processes and operations	PO 1, 3, 9 and PSO 1	i, ii, iii, iv, v, vi, vii	2	4, 9, 12
CO2	Use hand tools and equipment safely and efficiently.	PO 1, 3, 9 and PSO 1	i, ii, iii, iv, v, vi, vii	3	
CO3	Perform basic operations in carpentry, fitting, welding, sheet metal work, and machining.	PO 1, 3, 9 and PSO 1	i, ii, iii, iv, v, vi, vii	3	
CO4	Read and interpret workshop drawings.	PO 1,3, 9 and PSO 1	i, ii, iii, iv, v, vi, vii	2	
CO5	Develop teamwork, time management, and quality awareness in a workshop environment.	PO 1, 3, 9 and PSO 1	i, ii, iii, iv, v, vi, vii	2	

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

i. **Carpentry:** T- Lap Joint, Dovetail Joint, Mortise and Tenon Joint

ii. **Fitting:** V- Fit, Dovetail Fit and Semi- circular fit

iii. **Tin Smithy**: Square Tin, Rectangular Tray and Conical Funnel

iv. **Foundry**: Preparation of Green Sand Mould using Single Piece and Split Pattern

v. **Welding Practice:** Arc Welding and Gas Welding

vi. **House wiring**: Parallel and Series, Two-way Switch and Tube Light

vii. **Black Smithy**: Round to Square, Fan Hook and S- Hook

2. TRADES FOR DEMONSTRATION AND EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXT BOOKS:

1. Workshop Practice, B. L. Juneja, Cengage Learning India, 1st edition, 2015.
2. Workshop Practice Manual, K. Venkata Reddy, BS Publication,6th Edition, Rpt.2025.

REFERENCE BOOKS:

1. Workshop Manual, K. Venugopal, Anuradha Publications, 2012th edition, 2012