CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B. Tech–Electrical &Electronics Engineering

CBCS & OUTCOME BASED COURSE STRUCTURE & SYLLABUS

(Effective for the students admitted into I year from the Academic Year 2025-26)

SEMESTER - I

S. No	Course Code	Course Title	Course Category	Hours per Week			Credits
				L	T	P	C
1	A500002	Ordinary Differential Equations and Vector Calculus	BSC	3	0	0	3
2	A500008	Advanced Engineering Physics	BSC	3	0	0	3
3	A500101	English for Skill Enhancement	HSMC	3	0	0	3
4	A505201	Programming For Problem Solving	ESC	3	0	0	3
5	A502201	Electrical Circuits - I	ESC	2	0	0	2
6	A500502	Advanced Engineering Physics Laboratory	BSC	0	0	2	1
7	A500504	English Language and Communication Skills Lab	HSMC	0	0	2	1
8	A500506	Introduction to Social Innovation	HSMC	0	0	2	1
9	A503503	Computer Aided Engineering Drawing	ESC	0	1	2	2
10	A505501	Programming For Problem Solving Laboratory	ESC	0	0	2	1
		Induction Program					
		Total:		**14**	**1**	**10**	**20**
		Total hours per Week:		**25**			

SEMESTER - II

S. No	Course Code	Course Title	Course Category	Hours per Week			Credits
				L	T	P	C
1	A500001	Matrices and Calculus	BSC	3	1	0	4
2	A500009	Engineering Chemistry	BSC	3	0	0	3
3	A505206	Python Programming	ESC	3	0	0	3
4	A505506	Data Structures Through C	ESC	3	0	0	3
5	A502301	Electrical Circuits - II	PCC	2	0	0	2
6	A500503	Engineering Chemistry Laboratory	BSC	0	0	2	1
7	A503502	Engineering Exploration and Practice	HSMC	0	0	2	1
8	A505507	Python Programming Laboratory	ESC	0	0	2	1
9	A505505	Data Structures Through C Laboratory	ESC	0	0	2	1
10	A502503	Electrical Circuits Laboratory	ESC	0	0	2	1
		Total:		**14**	**1**	**10**	**20**
		Total hours per Week		**25**			
		Total Credits in I Year: 40					

SEMESTER – III							
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	**C**
1	A500005	Numerical Methods and Complex Variables	BSC	3	0	0	3
2	A502302	Electromagnetic fields	PCC	3	0	0	3
3	A502303	Electrical Machines - I	PCC	3	0	0	3
4	A504201	Electronic Devices and Circuits	PCC	3	0	0	3
5	A502304	Power Systems - I	PCC	3	0	0	3
6	A502305	Electrical Measurements	PCC	3	0	0	3
7	A500501	Computational Mathematics Laboratory	HSMC	0	0	2	1
8	A502504	Electrical Machines - I Laboratory	PCC	0	0	2	1
9	A504502	Electronic Devices and Circuits Laboratory	PCC	0	0	2	1
10	A502701	Skill Development Course –1 Design of Electrical Systems using AutoCAD	SDC	0	0	2	1
	Total:			**18**	**0**	**8**	**22**
	Total hours per Week:			**26**			

SEMESTER – IV							
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	**C**
1	A502306	Electrical Machines – II	PCC	3	1	0	4
2	A502307	Power Systems – II	PCC	3	0	0	3
3	A504202	Digital Electronics	PCC	3	0	0	3
4	A502308	Control Systems	PCC	3	0	0	3
5	A500507	Social Innovation and Entrepreneurship	HSMC	0	1	2	2
6	A502505	Electrical Machines – II Laboratory	PCC	0	0	2	1
7	A504504	Digital Electronics Laboratory	PCC	0	0	2	1
8	A502506	Electrical Measurements Laboratory	PCC	0	0	2	1
9	A502702	Skill Development Course –1I PCB Design	SDC	0	0	2	1
10	A500901	Environmental Science	VAC	1	0	0	1
	Total:			**13**	**2**	**10**	**20**
	Total hours per Week			**25**			
	Total Credits in II Year: 42						

SEMESTER – V

S. No	Course Code	Course Title	Course Category	Hours per Week			Credits
				L	T	P	C
1	A5023XX	**Professional Core Course**	PCC	3	0	0	3
2	A5023XX	**Professional Core Course**	PCC	3	0	0	3
3	A5023XX	**Professional Core Course**	PCC	3	0	0	3
4	**PE-I**	**Professional Elective Course-I**	PEC	3	0	0	3
5	**OE-I**	**Open ElectiveCourse-I**	OEC	2	0	0	2
6	A500505	English for Employability Skills Laboratory	HSMC	0	0	2	1
7	A5025XX	**Professional Core Course Lab**	PCC	0	0	2	1
8	A5025XX	**Professional Core Course Lab**	PCC	0	0	2	1
9	A5028XX	Field Based Project	PROJ	0	0	4	2
	A5028XX	Internship					
10	A5027XX	Skill Development Course –III	SDC	0	0	2	1
11	A500702	Indian Knowledge System	VAC	1	0	0	1
	Total:			**15**	**0**	**12**	**21**
	Total hours per Week:			**27**			

SEMESTER – VI

S. No	Course Code	Course Title	Course Category	Hours per Week			Credits
				L	T	P	C
1	A500102	Business Economics and Financial Analysis	HSMC	3	0	0	3
2	A5023XX	**Professional Core Course**	PCC	3	0	0	3
3	A5023XX	**Professional Core Course**	PCC	3	0	0	3
4	**PEC-II**	**Professional Elective Course-II**	PEC	3	0	0	3
5	**OE-II**	**Open Elective Course – II**	OEC	2	0	0	2
6	A5025XX	**Professional Core Course Lab**	PCC	0	0	2	1
7	A5025XX	**Professional Core Course Lab**	PCC	0	0	2	1
8	A5025XX	**Professional Core Course Lab**	PCC	0	0	2	1
9	A5025XX	**Professional Core Course Lab**	PCC	0	0	2	1
10	A5027XX	Skill Development Course –IV	SDC	0	0	2	1
11	A500703	Gender Sensitization Lab	VAC	1	0	0	1
	A500704	Human Values and Professional Ethics					
	Total:			**14**	**0**	**10**	**20**
	Total hours per Week:			**24**			

	Total Credits in III Year: 41

SEMESTER – VII

S. No	Course Code	Course Title	Course Category	Hours per Week			Credits
				L	T	P	C
1	A500103	Fundamentals of Management	HSMC	3	0	0	3
2	A5023XX	**Professional Core Course**	PCC	3	0	0	3
3	A5023XX	**Professional Core Course**	PCC	3	0	0	3
4	**PEC-III**	**Professional Elective Course - III**	PEC	3	0	0	3
5	**PEC-IV**	**Professional Elective Course – IV**	PEC	3	0	0	3
6	**OE-III**	**Open Elective Course – III**	OEC	2	0	0	2
7	A5025XX	**Professional Core Course Lab**	PCC	0	0	2	1
8	A5025XX	**Professional Core Course Lab**	PCC	0	0	2	1
9	A5028XX	Industry Oriented Mini Project	PROJ	0	0	4	2
	A5028XX	Summer Internship					
	Total:			**17**	**0**	**8**	**21**
	Total hours per Week:			**25**			

SEMESTER – VIII

S. No	Course Code	Course Title	Course Category	Hours per Week			Credits
				L	T	P	C
1	**PEC-V**	**Professional Elective Course – V**	PEC	3	0	0	3
2	**PEC-VI**	**Professional Elective Course – VI**	PEC	3	0	0	3
3	A5028XX	Project Work	PROJ	0	0	28	14
	Total:			**6**	**0**	**28**	**20**
	Total hours per Week		**34**				
	Total Credits in IV Year: 41						
	Total Credits in B.Tech Electrical and Electronics Engineering: 164						

PROFESSIONAL ELECTIVE COURSES		
S. No	**Course code**	**Course Name**
PROFESSIONAL ELECTIVE COURSE-I		
1	A502401	Utilization of Electrical Energy
2	A502402	Renewable Energy Systems
3	A502403	VLSI Design
4	A502404	Fundamentals of AI &Ml
PROFESSIONAL ELECTIVE COURSE -II		
5	A502405	Power Semiconductor Drives
6	A502406	Flexible AC Transmission System Devices
7	A502407	Programmable Logic Controllers
8	A502408	Introduction to Machine Learning
PROFESSIONAL ELECTIVE COURSE -III		
9	A502409	Energy Storage Systems
10	A502410	Power Quality
11	A502411	Digital Signal Processing
12	A502412	Deep Learning
PROFESSIONAL ELECTIVE COURSE -IV		
13	A502413	Battery Management Systems
14	A502414	Smart Grid Technologies
15	A502415	AI and ML for Electrical Engineering Applications
16	A502416	Data Science for Engineers
PROFESSIONAL ELECTIVE COURSE -V		
17	A502417	EV Charging Infrastructure
18	A502418	HVDC Transmission
19	A502419	Embedded Systems
20	A502420	Network Security and Cryptography
PROFESSIONAL ELECTIVE COURSE -VI		
21	A502421	Electrical Distribution and Automation
22	A502422	Smart Metering and Communication Protocols
23	A502423	Energy Conservation and Audit
24	A502424	Cyber Security and Privacy

OPEN ELECTIVE COURSES:

Open Elective-I:

S.No	Offering Department	Course Code	Course Name
1	H&S	A500601	Numerical Methods for Engineers
2	H&S	A500603	Basics of Logistics and supply chain Management
3	H&S	A500604	Industrial Relations
4	CIV	A501601	Disaster Management
5	CIV	A501602	Low cost materials and Green Buildings
6	EEE	A502601	Fundamentals of Electric Vehicles
7	EEE	A502602	Industrial Automation and Control
8	MEC	A503601	Optimization Methods
9	MEC	A503602	Industrial Robotics
10	ECE	A504601	Fundamentals of Digital Electronics
11	ECE	A504602	Fundamentals of Embedded Systems
12	CSE	A505601	Fundamentals of operating Systems
13	CSE	A505602	Introduction to Database Management Systems

Open Elective-II:

S.No	Offering Department	Course Code	Course Name
1	H&S	A500602	Mathematics for Machine Learning
2	H&S	A500605	Ethics in Business & Corporate Governance
3	H&S	A500606	Basics of Marketing
4	CIV	A501603	Building Science and Technology
5	CIV	A501604	Environmental Impact Assessment
6	EEE	A502603	Digital Energy
7	EEE	A502604	Energy Audit
8	MEC	A503603	Artificial Intelligence in mechanical Engineering
9	MEC	A503604	Non-conventional Sources of Energy
10	ECE	A504603	Fundamentals of Image Processing
11	ECE	A504604	Principles of Communications
12	CSE	A505603	Introduction to Computer Networks
13	CSE	A505604	Java Programming

Open Elective-III:

S.No	Offering Department	Course Code	Course Name
1	H&S	A500607	Strategic Management
2	H&S	A500608	Digital Marketing
3	CIV	A501605	Road Safety Engineering
4	CIV	A501606	Building Services Engineering
5	EEE	A502605	Sustainable Energy
6	EEE	A502606	Smart Grid Systems
7	MEC	A503605	Engineering Materials
8	MEC	A503606	Digital manufacturing
9	ECE	A504605	Principles of VLSI
10	ECE	A504606	Electronics for Health Care
11	CSE	A505605	Web Programming
12	CSE	A505606	Fundamentals of Cyber Security

(A500002) ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All Branches)

B.Tech (EEE) - I Sem.

L	T	P	C
3	0	0	3

UNIT-I: First Order Ordinary Differential Equations

Exact differential equations – Equations reducible to exact differential equations – linear 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 terms of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x, $e^{ax}V(x)$ and $x\,V(x)$ – Method of variation of parameters.

UNIT-III: Laplace Transforms

Laplace Transforms: Laplace Transform of standard functions – First shifting theorem – Laplace transforms of functions multiplied by 't' and divided by 't' – Laplace transforms of derivatives and integrals of function – Evaluation of integrals by Laplace transforms – Laplace transform of periodic functions – Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation

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

UNIT-V: Vector Integration

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

TEXT BOOKS

1. Higher Engineering Mathematics (36th Edition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics (5th Edition), R.K. Jain and S.R.K. Iyengar, Narosa Publications, 2016.

REFERENCES

1. Advanced Engineering Mathematics (9th Edition), Erwin Kreyszig, John Wiley & Sons, 2006.
2. Calculus and Analytic geometry (9th Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Determine whether a given first-order differential equation is exact, linear or Bernoulli's and apply the concepts to model and analyze real-world problems.
2. Solve higher-order differential equations and apply Method of variation of parameters.
3. Utilize Laplace transform techniques for solving ordinary differential equations.
4. Find Gradient, Divergence, Curl and Directional derivatives of vector point functions and scalar point functions
5. Evaluate line, surface, and volume integrals in various coordinate systems. Transform one type of integral into another using the appropriate vector integral theorems.

CO-PO MAPPING

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

(A500008) ADVANCED ENGINEERING PHYSICS

(Common to All)

B.Tech (EEE) - I Sem.

L	T	P	C
3	0	0	3

UNIT - I: CRYSTALLOGRAPHY

Introduction: Unit cell, space lattice, basis, lattice parameters; crystal structures, Bravais lattices, packing factor: SC, BCC, FCC; Miller indices, inter-planar distance, defects in crystals (qualitative): point defects, line defects, surface defects and volume defects.

CONCEPT OF NANOMATERIALS & MATERIALS CHARACTERIZATION:

Surface to volume ratio, X -ray diffraction: Bragg's law, powder method, crystallite size - Debye Scherrer's formula, scanning electron microscopy (SEM): block diagram, working principle.

UNIT - II: QUANTUM MECHANICS

Introduction, de-Broglie hypothesis, 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, Kronig-Penny Model (qualitative), classification of solids, concept of discrete energy levels and quantum confinement in nanomaterial.

SEMICONDUCTORS AND DEVICES:

Intrinsic and Extrinsic semiconductors (qualitative), Hall effect, Construction, principle of operation and characteristics of P-N Junction diode. Direct and indirect band gap semiconductors – LED and Solar cells, their structure, materials, working principle and characteristics.

UNIT - III: QUANTUM COMPUTING

Introduction, linear algebra for quantum computation, Dirac's Bra and Ket notation and their properties, Hilbert space, Bloch's sphere (qualitative), concept of quantum computer, classical bits. Qubits, multiple Qubit system.

Quantum computing system for information processing, evolution of quantum systems, quantum measurements, Entanglement(qualitative), Single qubit gates, multi qubit gate, challenges and advantages of quantum computing over classical computation(qualitative). Quantum algorithms: Deutsch-Jozsa, Shor, Grover.

UNIT - IV: MAGNETIC 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 ferromagnetic materials using sol-gel method, applications: magnets for electric vehicles (EV).

DIELECTRIC MATERIALS :

Introduction to dielectric materials, types of polarization (qualitative): electronic, ionic & orientation; ferroelectric, piezoelectric, pyroelectric materials and their applications: Ferroelectric Random-Access Memory (Fe-RAM), production of Ultrasonics by piezoelectric method.

UNIT - V: LASER

Introduction to laser, characteristics of laser, Einstein coefficients and their relations, metastable state, population inversion, pumping mechanism, lasing action, Ruby laser, He-Ne laser, CO_2 laser, semiconductor diode laser, applications: Bar code scanner, LIDAR for autonomous vehicle.

FIBER OPTICS

Introduction to Fiber optics, total internal reflection, construction of optical fiber, acceptance angle, numerical aperture, classification of optical fibers, losses in optical fiber (qualitative), applications: optical fibers for communication system.

TEXTBOOKS:

1. Crystallography: An Introduction (3rd Edition), Walter Borchardt-Ott, Springer, 2011.
2. Introduction to Solid State Physics (9th Edition) Charles Kittel, John Wiley & Sons, Inc, 2018
3. Introduction to Classical and Quantum Computing, (1st Edition) Thomas G. Wong, Rooted Grove, 2022.
4. Physics of Semiconductor devices (4th edition), Simon.MSze and Kwok K . Ng, Wiley Student Edition, 2006.

REFERENCE BOOKS:

1. Quantum Computing (1st Edition), Jozef Gruska, McGraw Hill, 1999.
2. Quantum Computation and Quantum Information (10th Edition), Cambridge University Press, 2010
3. Optical Fiber Communications Principles and Practice (3rd Edition), Pearson Education Limited,2009
4. Essentials of Nano science& Nanotechnology(1stedition), Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 2021
5. Engineering Physics(3rd edition), PK Palanisam, SciTech Publications, 2015.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Analyze crystal structures, identify defects, and apply XRD and SEM techniques for material characterization.
2. Apply quantum mechanical principles to explain particle behavior and energy band formation in solids and classify semiconductor devices.
3. Understand quantum computing concepts, use quantum gates, and explain basic quantum information process.
4. Classify magnetic and dielectric materials and explain their properties, synthesis, and applications.
5. Appreciate the principles of lasers and fiber optics and their applications in communication.

CO-PO MAPPING

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

(A500101) ENGLISH FOR SKILL ENHANCEMENT

(Common to All)

B. Tech (EEE): I Semester

L	T	P	C
3	0	0	3

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.***

Prescribed Textbook

1. *English for the Young in the Digital World,*OrientBlackSwan Pvt. Ltd, Board of Editors. *2025.*

References:

1. *Practical English Usage,* Swan,Michael, Oxford University Press. New Edition..(2016).

2. *English Grammar Just for You. Karal, Rajeevan.*Oxford University Press. New Delhi (*2023).*

3. *Communication Skills –A Workbook.*Sanjay Kumar & Pushp Lata. Oxford University Press New Delhi (2022).

4. *English for Technical Communication for Engineering Students.*Vishwamohan, AyshaMc Graw-Hill Education India Pvt. Ltd.(2013)

COURSE OUTCOMES:

Students will be able to

1. Choose appropriate vocabulary in their oral and written communication.
2. Demonstrate their understanding of the rules of functional grammar and sentence structures.
3. Develop comprehension skills from known and unknown passages.
4. Write paragraphs, essays, précis and draft letters.
5. Write abstracts and reports in various contexts.

CO-PO MAPPING

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

(A505201) PROGRAMMING FOR PROBLEM SOLVING

(Common to CSE, CSD and CSM)

B. Tech (EEE): I Semester

L	T	P	C
3	0	0	3

UNIT - I:

Algorithms &Flowchart: Introduction to Algorithms, Characteristics of Algorithms, Introduction to flowcharts, Various symbols used in flowcharts, Algorithms and Flowcharts for various mathematical problems.

Introduction to C Programming: Executable Statements, General Form of a C Program, C Language Elements, Variable Declarations and Data Types, Operators, Precedence and Associativity, Arithmetic Expressions and its evaluations, Formatting Input/Output statements.

Decision Statements: Control Structures, Conditions, if Statement, if Statements with Compound Statements, Switch-Case statement.

UNIT - II:

Loop Control Statements: Repetition in Programs, Looping Statements – While, do-while, for Loop, Nested Loops, Jumping Statements – Goto, Break and Continue Statements.

Functions: Overview, Library functions, defining a function, accessing a function, function prototype, passing arguments to a function, Scope Rules – Storage Classes.

Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical Functions.

UNIT - III:

Pointers: Pointers and the Indirection Operator, Declaration & Initialization of a pointer, Multiple Calls to a Function with Input/Output Parameters, Formal Output Parameters as Actual Arguments, Pointer – Arithmetic, Pointer to Pointer, Dynamic Memory Allocation.

Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Passing Arrays to Functions, Parallel Arrays, Multidimensional Arrays, Pointers and Arrays.

UNIT - IV:

Strings: String Basics, defining a String, Initialization of Strings, Reading and Writing a String, String Library Functions, Pointers and Strings.

Structures and Unions: Introduction, defining a Structure, processing a Structure, User-Defined Structure Types, Array of Structures, Nested Structures, Self-referential Structures, Structures and Pointers, Structures and Functions, Unions, Enumerated Data type.

UNIT - V:

Text and Binary File Pointers: Input/Output Files – Basic file Operations, Random Access Files, Binary Files, Command Line Arguments.

Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort an array of elements (Bubble, Insertion and Selection sort algorithms).

TEXTBOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson

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. Yashavant 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. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

Course Outcomes: The student will learn to

1. Develop algorithms and flowcharts for solving computational problems and implement them using C language syntax.
2. Write C programs using control structures such as conditional, iterative, and jumping statements.
3. Design modular programs using user-defined functions, recursion, and demonstrate understanding of scope and storage classes.
4. Apply advanced C constructs such as pointers, arrays, strings, and structures to solve real-time problems.
5. Perform file handling operations and implement searching and sorting algorithms using C language.

CO-PO Mapping:

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

(A502201) ELECTRICAL CIRCUITS – I

B.Tech(EEE) - I Sem.

L	T	P	C
2	0	0	2

Prerequisites: Mathematics

Course Objectives:

- To gain knowledge in circuits and to understand the fundamentals of derived circuit laws.
- To learn steady state analysis of single-phase and three-phase circuits.
- To understand Theorems and concepts of magnetic coupled circuits.

UNIT-I:

Network Elements & Laws: Active elements- Independent and dependent sources, Passive elements- R, Land C, Energy stored in Inductance and Capacitance, Kirchhoff's laws, Source transformation, Star-Deltatransformation, Node voltage method, and Mesh current method, Super node and super mesh analysis with numericals.

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 powertransfer 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.

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. 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
1. 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,
2. 6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.

Online Recourses:

1. https://nptel.ac.in/courses/108/104/108104139/
2. https://nptel.ac.in/courses/108/106/108106172/

Course Outcomes: After successful completion of the course, the student will be able to:

1. Apply knowledge of mathematics, science, and engineering to the analysis and design of electrical circuits.
2. Explain the principle of AC fundamentals, series parallel circuits and resonance
3. Explain and analyse polyphase circuits.
4. Solve the complex AC & DC electric circuits by applying suitable principles and theorems.
5. Analysethe basic concepts of magnetic coupled circuits.

CO-PO MAPPING

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

(A500502) ADVANCED ENGINEERING PHYSICS LABORATORY

(Common to All)

L	T	P	C
0	0	2	1

B. Tech (EEE): I Semester

(Any 8 experiments are to be performed)

1. Determination of Planck's constant using Photo Electric Effect.
2. Determination of energy gap of a semiconductor.
3. Determination of Hall coefficient and carrier concentration of a given semiconductor.
4. Study of V-I characteristics of a LED
5. Study of V-I characteristics of a Solar Cell and find its Fill factor.
6. Determination of magnetic moment of a bar magnet and horizontal earth magnetic field.
7. Study of B-H curve of a ferromagnetic material.
8. Determination of dielectric constant of a given material.
9. Study of V-I & L-I characteristics of a given laser diode
10. a. Determination of wavelength of a laser using diffraction grating.
    b. Determination of LASER beam divergence
11. a. Determination of numerical aperture of a given optical fiber.
    b. Determination of bending losses of a given optical fiber.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Determine the energy gap using semiconductors using experimental methods.
2. Appreciate **and apply** the principles of **quantum physics** in the field of **optoelectronics**
3. Analyzethe variation of Magnetic fields and their properties
4. Examine and interpret the variation of dielectric properties of a material.
5. Demonstrate working knowledge of laser systems and optical fiber parameters through experimental study.

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

(A500504) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB
(Common to All)

B. Tech (EEE): I Semester	L	T	P	C
	0	0	2	1

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:
1. **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: Describing Objects, Situations, 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.)*

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

Suggested Software:
1. Punctuation Made Easy by Darling Kindersley.
2. **Free Mobile App**: The official OALD 10th Edition app provides **100 free sample entries.**
3. **Free Access**: Limited to downloadable samples (table of contents, sample pages, copyright information) available on the Cambridge website.

References:

- *Communicative English – A workbook.*Shobha, KN &Rayen, J. Lourdes. Cambridge University Press.(2019).

- *English Language Communication Skills – Lab Manual cum Workbook.*Cengage Learning India Pvt. Ltd.(2022).
- *Five Minute Activities – A Resource Book for Language Teachers*Ur, Penny and Wright, Andrew.Cambridge University Pres(2022).

Outcomes:

Students will be able to

1. Listen actively and identify important information in spoken texts
2. Interpret the speech and infer the intention of the speaker
3. Improve their accent for intelligibility
4. Speak fluently with clarity and confidence
5. Use the language in real life situations

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

(A500506)INTRODUCTIONTOSOCIALINNOVATION
(Commonto allbranches)

B.Tech(EEE) - I Sem.

L	T	P	C
0	0	2	1

WEEK-1

TypesandfeaturesofcommunityRural,Suburban,UrbanandRegional

WEEK-2

ServicebasedlearningAimsofCommunitybasedprojectsSustainableDevelopmentGoals

WEEK-3

CommunityvisitReportWritingResourceDiagramChapatiDiagramTransectWalk

WEEK-4

Thenon-profitsectorpublicsectortheprivatesectortheinformalsector

WEEK-5

Posterpresentationon foursectors

WEEK-6

ProcessofDesignThinking

WEEK-7

Socialorganizationsandenterprisessocial movements

WEEK-8

Socialsoftwaresandopen-sourcemethods

WEEK-9

IntroductiontoEthicsmoralvaluessignificanceofprofessionaleth

icscodeofconduct for engineers

WEEK-10

Identifyethicaldilemmasindifferenttasksofengineeringapplyingmoraltheoriesandcodesofconductforresolutionofethi

caldilemmas

WEEK-11

CasestudiesonEngineeringEthics

WEEK-12

StepsforPatentfilingandStartupsProcedure for grants of patents. Indian Scenario of Patenting, International cooperation on Intellectual Property, Documentation,PanelPresentation

TEXTBOOKS:

1. Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public Sectors;GeorgiaLevensonKeohane;Tata McGrawHill
2. SolvingProblemswithDesignThinking-TenStoriesofWhatWorks(ColumbiaBusinessSchoolPublishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett(Author)

REFERENCEBOOKS:

1. FundamentalsofIntellectualProperty(English)1stEdition(Paperback,Dr.KalyanC.Kankanala)P

ublisher:AsiaLawHouseISBN: 9789381849514, 938184951XEdition:1stEdition,2012.
2. IndianPatentLaw(English,Paperback,KalyanC.Kankanala)Publisher:OxfordUniversityPress-NewDelhi,ISBN: 9780198089605,0198089600Edition:2012.
3. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; PalgraveMacmillan
4. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply",Springer,2011.
5. EngineeringEthics:AnIndustrialPerspective;GailBaura;Elsevier
6. IntellectualPropertyandFinancingStrategiesforTechnologyStartups;GeraldB.Halt,Jr.,JohnC.Donch,Jr.,AmberR. Stiles,RobertFesnak;Springer

COURSEOUTCOMES:

OnCompletionofthecourse,thestudents willbeableto

1. IdentifycommunityissuesthroughcommunityInteraction
2. Illustratethefactorsaffectingsocialinnovationinvarioussectors
3. Applydesignthinkingconcepttoanalyzethecommunityproblems
4. AdopttheethicalvaluesinimplementingtheSocialinnovation
5. Describetheprocessofpropertyrightsandpatent filing.

CO-POMAPPING:

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

(A503503) COMPUTER AIDED ENGINEERING DRAWING

(Common to EEE, ECE, CSE, CSM, CSD)

B.Tech. (EEE): I Semester	L	T	P	C
	0	1	2	2

UNIT-I

Introduction to Engineering Drawing:

Principles of Engineering Drawing and their Significance, Geometrical Constructions, Introduction to Computer Aided Drafting Tool, Computer aided drafting of Conic Sections: Ellipse, Parabola and Hyperbola – General Method (eccentricity) only. Computer aided drafting of Cycloid, Epicycloids and Hypocycloid, Computer aided drafting of Scales – Plain & Diagonal Scales

UNIT-II

Orthographic Projections:

Introduction to Principles of Orthographic Projections – Conventions – Projections of Points, Lines, and Projections of Plane regular geometric figures using Computer aided drafting tool.

UNIT-III

Projections of Regular Solids:

Introduction to Regular Solids – Prism, Cylinder, Pyramid, Cone – Regular views using Computer aided drafting tool.

UNIT-IV

Isometric Projection:

Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines, Isometric Projection of Spherical Parts using Computer aided drafting tool.

UNIT-V

Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions, Conversion of orthographic projection into isometric view

TEXTBOOKS:

5. Engineering Drawing, N.D. Bhatt, Charotar Publishers, 54th Edition, 2023
6. Computer Aided Engineering Drawing, K. Balaveera Reddy et al, CBS Publishers, 2nd Edition, 2015

REFERENCE BOOKS:

1. Engineering Drawing, M. B. Shah, B.C. Rane, Pearson, 3rd Edition, 2015
2. Engineering Drawing, Basant Agrawal and C M Agrawal, McGraw Hill, 3rd Edition, 2019
3. Engineering Graphics and Design, WILEY, John Wiley and sons Inc, 3rd Edition, 2020
4. Engineering Drawing and graphics Using AutoCAD, T. Jeyapoovan, Vikas, S.Chand and Company Ltd, 3rd Edition, 2010

COURSE OUTCOMES:

On completion of the course students will be able to:

6. Understand and Apply concepts to construct engineering curves using Computer aided drafting tool
7. Apply the Orthographic projection for Points, Lines and Planes by Drafting tool
8. Construct and interpret Orthographic projections of Solids using Computer aided drafting tool
9. Create the Orthographic view to Isometric view using Computer aided drafting tool
10. Conversion of Orthographic view to Isometric view & vice versa using Computer aided drafting tool

(A505501) PROGRAMMING FOR PROBLEM SOLVING LABORATORY

B. Tech (EEE): I Semester

L	T	P	C
0	0	2	1

[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]

Operators and Expressions:

Practice Programs:

- Write a simple program that prints the results of all the operators available in C, Read required operand values from standard input.
- Write a C program to swap the contents of any two operands using suitable bitwise operator.
- Write a C program to compute $s = ut + ½ at^2$ [Read u, t & a values from keyboard].
- Write a C program for the simple and compound interest.

Additional Programs:

- Write a program that reads the radius of a circle (as a float value) and computes and prints the diameter, the circumference and the area, consider π value as a symbolic constant.
- Write a program that asks the user to enter the total time elapsed, in seconds, since an event and converts the time to hours, minutes and seconds. The time should be displayed as hours: minutes: seconds. [Hint: Use the remainder operator]

Decision statements:

Practice Programs:

- Write a C program for finding the max and min from the given three numbers.
- Write a C program to find the roots of a Quadratic equation.
- 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).

Additional Programs:

- Write a C program to calculate the electricity bill. Read starting and ending meter readings. The charges are as follows:

No. of Units Consumed	**Unit Cost (per unit)**
>=500	5.00 Rs/unit
>=200 to <500	3.50 Rs/unit
>=100 &<200	2.50 Rs/unit
Less than 100	1.50 Rs/unit

- Write a C program to convert years into 1. MINUTES 2. HOURS 3. DAYS 4. MONTHS 5. SECONDS using switch-case statement.

Loop Control Statements:

Practice Programs:

- 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

- Write a C program to print all the prime numbers between the given limits.

- Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome or not.
- Write a C program to construct a pyramid of numbers as follows:

```
1                    a
1  2                 b  b
1  2  3              c  cc
1  2  3  4           d  ddd
```

Additional Programs:

- 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.
- Write a C program to check whether the given year is leap-year or not using goto statement.
- Write a C program to summate the Sin Series of n terms [Hint: input x and n terms]

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$$

Functions & Recursion:

Practice Programs:

- Write a C program to find the sum of any two integers, using function.
- Write C programs that uses both recursive and non-recursive functions:
  a. To find the factorial of a given integer.
  b. To find the GCD (greatest common divisor) of two given integers.

Additional Programs:

- Write a C program to check whether the given number is Armstrong or not? using function
- Write a C program to convert the given decimal number into equivalent binary form.

Pointers and Arrays:

Practice Programs:

- Write a C program to perform different arithmetic operations using pointers.
- Write a C program to swap two numbers using call-by-value and call-by-reference concept.
- Write a C program to find the minimum, maximum and average in an array of integers.
- Write a C program that uses functions to perform the Addition of Two Matrices

Additional Programs:

- Write a C program that uses functions to perform the Multiplication of Two Matrices
- Write a program for display values in reverse order from an array using a pointer.
- Write a C program to read and display array elements using pointers only, and compute the minimum, maximum, and average using pointer operations.

Strings:

Practice Programs:

- Write C programs without using String-Handling functions:
  a. to find the length of a given string
  b. to append one string at end of another string
- 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, etc.) without using string handling functions
- Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
- Write a C program to count the lines, words and characters in a given text.

Additional Programs:

- 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
- Write a C program to find the length of a given string including and excluding spaces using pointers.

- Write a C program to read string from keyboard and display it using character pointer.

Structures:

Practice Programs:

- Write a C program to read and display a student structure with the following data items: student_name, student_rno, student_percentage.
- Write a C program to copy the structure elements from one structure variable to another.
- Write a C program to declare pointer to structure and display the contents of the structure.

Additional Programs:

- Write a C program to find the sum of any two complex numbers using function.
- Write a C program to read and display roll number, full name and date of birth of a student using nested structures.
- Write a C program to create enumerated data type for 12 months. Display their values in integer constants.

Files:

Practice Programs:

- Write a C program to write data to text file and read it.
- Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents and read the result file.

Additional Programs:

- Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file) using CLA.
- Write a C program to read and display the contents of an existing file by skipping the first n-characters from the beginning of the file. [Hint: Use fseek() funcion]

Sorting and Searching:

Practice Programs:

- 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.
- Write a C program that uses recursive and non-recursive functions to search for a Key value in a given sorted list of integers using binary search method.
- Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

Additional Programs:

- Write a C program that sorts the given array of integers using selection sort in descending order
- Write a C program that sorts the given array of integers using insertion sort in ascending order
- Write a C program that sorts a given array of names.

TEXTBOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson

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. Yashavant 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. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

Course Outcomes: The candidate is expected to be able to:

1. Develop and Execute C programs using basic input/output, operators, and control flow constructs.
2. Solve real-time problems using loops, user-defined functions, and recursion.
3. Apply pointer, array, string, and structure concepts to build efficient C programs.
4. Implement file operations and command-line arguments to read, write, and manipulate data.
5. Write programs for basic searching and sorting techniques using iterative and recursive logic.

CO-PO Mapping:

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

(A500001) MATRICES AND CALCULUS
(Common to All)

B. Tech (EEE): II Semester

L	T	P	C
3	1	0	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: Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: Eigen values – Eigen vectors 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 Continuous functions and its 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).

Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT - IV: Multivariable Calculus (Partial Differentiation and applications)

Definitions of Limit and continuity – Partial Differentiation: Euler's Theorem – Total derivative – Jacobian – Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

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 triple integrals.

TEXT BOOKS

1. Higher Engineering Mathematics (36th Edition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics (5th Edition), R.K. Jain and S.R.K. Iyengar, Narosa Publications, 2016.

REFERENCES

1. Advanced Engineering Mathematics (9th Edition), Erwin Kreyszig, John Wiley & Sons, 2006.
2. Calculus and Analytic geometry (9th Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Formulate the matrix representation of a system of linear equations and analyze the corresponding solution set.
2. Determine the eigenvalues and eigenvectors of a matrix, and reduce a quadratic form to its canonical form using orthogonal transformations.
3. Apply the mean value theorems to solve relevant problems in mathematical analysis. Find solution of improper integrals by using Beta and Gamma function
4. Find the extreme values of functions of two variables, both with and without constraints.
5. Evaluatemultiple integrals and apply the concept to calculate areas and volumes.

CO-PO MAPPING

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

(A500009) ENGINEERING CHEMISTRY

(Common to EEE, ECE, CSE, CSM, CSD)

B. Tech (EEE): II Semester

L	T	P	C
3	0	0	3

UNIT - I: Water and its treatment

Introduction - Hardness, types, degree of hardness and units. Estimation of hardness of water by EDTA 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 breakpoint chlorination. Defluoridation - Nalgonda technique.

Boiler troubles: Scales, Sludges and Caustic embrittlement. Internal treatment of boiler feed water - Calgon conditioning, Phosphate conditioning, Colloidal conditioning.External treatment methods - Softening of water by ion- exchange processes Desalination of brackish water - Reverse osmosis, Electrodialysis.

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 electrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE), Secondary reference electrode - Calomel electrode. Construction, working and determination of p^H of unknown solution using SHE and Calomel electrode.

Corrosion: Introduction- Definition, causes and effects of corrosion - Theories of corrosion, chemical and electrochemical theories of corrosion, Types of corrosion: galvanic, waterline and pitting 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.

UNIT - III: Energy sources

Batteries: Introduction - Classification of batteries - Primary, secondary and reserve batteries with examples. Construction, working and applications of Zn-air 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, Cracking - Types of cracking - Moving bed catalytic cracking. LPG and CNG composition and uses.

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

Biofuels: Biodiesel.

UNIT - IV: Polymers

Definition - Classification of polymers: Based on origin and tacticity with examples - Types ofpolymerization - Addition (free radical addition mechanism) and condensation polymerization.Plastics, Elastomers and Fibers: Definition and applications (PVC, Buna-S, Nylon-6,6). Differencesbetween thermoplastics and thermosetting plastics, Fiber reinforced plastics (FRP).

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

Biodegradable polymers: Polylactic acid and its applications.

UNIT - V: Advanced Functional Materials

Smart materials: Introduction, Classification with examples - Shape Memory Alloys - Nitinol,Piezoelectric materials - quartz and their engineering applications.

Biosensor - Definition, Amperometric Glucose monitor sensor.

Interpretative spectroscopic applications: UV-Visible spectroscopy for Analysis of pollutants in dyeindustry, IR spectroscopy in night vision-security, Pollution Under Control- CO sensor (Passive Infrareddetection), Raman spectroscopy (application) - Tumour detection in medical applications.

TEXTBOOKS:

7. Engineering Chemistry by J. Saroja, andD. Divya, Skytech Publishing Company, 2025.
8. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
9. Engineering Chemistry by Rama Devi, P. Aparna and Rath, Cengage learning, 2025.

REFERENCE BOOKS:

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

COURSE OUTCOMES:

On completion of the course students will be able to

11. Apply the principles of water chemistry to estimate hardness using EDTA and analyze water treatment processes, including disinfection, defluoridation, softening, and desalination methods.
12. Explain electrochemical concepts, determine electrode potentials, and evaluate corrosion mechanisms; propose appropriate corrosion control techniques for engineering applications.
13. Analyze the working and applications of batteries and fuel cells; evaluate the characteristics, calorific value, and environmental impact of fossil fuels, synthetic fuels, and biofuels.
14. Classify polymers, understand polymerization mechanisms, and examine the properties and engineering applications of plastics, elastomers, conducting polymers, and biodegradable polymers.
15. Identify smart materials, piezoelectric materials, and biosensors; utilize spectroscopic techniques (UV-Vis, IR, Raman) for environmental and biomedical applications.

CO-PO MAPPING

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

(A505206) PYTHON PROGRAMMING

(L	T	P	C
3	0	0	3

B. Tech (EE): II Semester

UNIT – I

Introduction to Python Programming: History and features of Python, Installation and setup of Python environment, Python interpreter and help utility, Variables, data types, and operators, Input/output operations, Using Python as a calculator, Writing basic Python programs, Control structures: if, if-else, if-elif-else, Looping constructs: for, while, break, continue, String operations and formatting

UNIT – II

Functions, Recursion and Data Structures: Defining and calling functions, Function parameters and return values, Recursion and recursive functions, Lists, tuples, dictionaries: creation and manipulation, List and dictionary operations, Searching and sorting in lists, Detecting and removing duplicates, Working with arrays using NumPy, Set operations and common value detection

UNIT – III

Object-Oriented Programming and Modules: Classes and objects, Attributes and methods, Constructors and destructors, Inheritance and polymorphism, Creating and using modules, Exception handling: try, except, finally, GUI programming using Tkinter, Drawing shapes on canvas: rectangles, points, circles, Adding attributes like color and position

UNIT – IV

File Handling and Text Processing: Reading and writing text files, File operations: open, read, write, append, Merging file contents, Searching for words in files, Word frequency analysis, Counting vowels, spaces, and case letters, Validating email and phone numbers, Removing and replacing words in strings

UNIT – V

Scientific Libraries and Logic Design: Introduction to NumPy, SciPy, and Matplotlib, Installing and exploring NumPy functionalities, Array operations and plotting basics, Implementing digital logic gates: AND, OR, NOT, XOR, Creating GUI windows with labels, text fields, buttons, Event handling in GUI applications, Recursive generation of binary strings

TEXTBOOKS:

1. Python Programming: A Complete Beginners Guide To Python, Nicholas I. Murphy, ISBN-13: 979-8343258240, Publisher: Independently published
2. Python Programming: Using Problem Solving Approach by Reema Thareja, Oxford University Press

REFERENCE BOOKS:

1. Think Python: How to Think Like a Computer Scientist by Allen B. Downey

Course Outcomes: The student will learn to

1. Understand the foundational concepts of Python programming including syntax, data types, operators, control structures, and string manipulation.
2. Apply functions, recursion, and data structures such as lists, tuples, dictionaries, and arrays to solve computational problems efficiently.
3. Implement object-oriented programming principles using Python classes and modules, and develop GUI applications using Tkinter.
4. Perform file handling operations and text processing tasks including reading, writing, searching, and analyzing textual data.
5. Explore scientific libraries such as NumPy, SciPy, and Matplotlib, and design logic-based applications including digital gates and GUI-based tools.

CO-PO Mapping:

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

CO4	**2**	**2**	**2**	**2**	**3**	**–**	**–**	**–**	**–**	**2**	**–**	**2**	**2**
CO5	**3**	**3**	**3**	**2**	**3**	**–**	**–**	**–**	**–**	**1**	**1**	**3**	**3**

(A505506) DATA STRUCTURES THROUGH C

B.Tech (EEE) - II Sem.

L	T	P	C
3	0	0	3

Prerequisites: A course on "Programming for Problem Solving

Course Objectives

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms.

Course Outcomes

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

UNIT – I

Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Abstract data types, selecting a Data Structure,

Linear list – Introduction, singly linked list, Circular Linked Lists, Doubly Linked List,

UNIT – II

Stacks- Operations, Stack Implementation – Arrays & ADT,

Stack applications: Conversion and Evaluation of expressions

Queues- operations, Queue Implementation – Arrays & ADT, Queue Applications.

UNIT – III

Trees: Introduction, Tree – Terminology, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree,

Binary Search Trees (BST): Introduction, BST Operations- Searching, Insertion and Deletion, BST Applications, Overview of AVL Trees and Red –Black Trees.

UNIT – IV

Hashing and Collision: Introduction, Hash Tables, Hash Functions,

Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method;

Collisions: Collision Resolution by Open Addressing, Collision Resolution by Chaining

Searching: Introduction, Linear search and Binary search

UNIT - V

Graphs: Introduction, Types of Graphs, Representation of Graphs, Graph Traversal Algorithms, Applications of Graphs

Sorting: Insertion sort, Quick sort and Merge sort

TEXTBOOKS:

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

REFERENCE:

3. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

(A502301) ELECTRICAL CIRCUITS – II
PROFESSIONALCORE

B.Tech (EEE)- II Sem.

L	T	P	C
3	0	0	3

Prerequisites: Matrices and Calculus and Electrical Circuits - I

Course Objectives:

- To study the transient and steady state analysis of RL, RC and RLC circuits (Series and Parallel)
- To understand the applications of Laplace transform.
- To learn about two-port networks and concept of filters.

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.System function, impedance and admittance functions

UNIT-V: Filters: Classification of filters – Low pass, High pass, Band pass and Band Elimination, Elementary treatmentof 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. 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.

Online Recourses:

1. https://nptel.ac.in/courses/108/104/108104139/
2. https://nptel.ac.in/courses/108/106/108106172/
3. https://www.digimat.in/nptel/courses/video/108105159/L01.html
4. https://www.digimat.in/nptel/courses/video/108102042/L01.htm

Course Outcomes: After successful completion of the course, the student will be able to:

1. Observe the response of various R, L and C circuits for different excitations
2. Examine the behavior of circuits using Laplace transforms
3. Explain the basic concepts of networks adopting graph theory

4. Obtain two port network parameters for various networks and its applications.
5. Design of various filters.

CO-PO MAPPING

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

(A500503) ENGINEERING CHEMISTRY LABORATORY

(Common to EEE, ECE, CSE, CSM, CSD)

L	T	P	C
0	0	2	1

I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometric method.

II. **Conductometry:**

1. Estimation of the concentration of strong acid by Conductometry.
2. Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry.

III. **Potentiometry:**

1. Estimation of concentration of Fe^{+2}ion by Potentiometry using $KMnO_4$.
2. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone

IV. **p^H Metry:** Determination of an acid concentration using p^H meter.

V. **Colorimetry:** Verification of Lambert-Beer's law using $KMnO_4$.

VI. **Preparations:**

1. Preparation of Bakelite.
2. Preparation of bioplastic from Starch.

VII. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VIII. **Virtual lab experiments:**

1. Construction of Fuel cell and it's working.
2. Smart materials for Biomedical applications.
3. Batteries for electric vehicles.
4. Functioning of solar cells and its applications

TEXTBOOKS:

10. Engineering Chemistry Lab manual (1st edition),J. Saroja, andD. Divya, Skytech Publishing Company(2025)
11. Lab manual for Engineering chemistry (1st edition), B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)

REFERENCE BOOKS:

14. Vogel's textbook of practical organic chemistry (5th edition)
15. Inorganic Quantitative Analysis (3rd edition), A.I. Vogel, ELBS Publications.
16. College Practical Chemistry (1st edition), V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

VIRTUAL LABS LINKS:

1. https://www.vlab.co.in/broad-area-chemical-sciences
2. https://chemcollective.org/
3. https://phet.colorado.edu/en/simulations/filter?subjects=chemistry&type=html
4. https://www.labster.com/discipline/chemistry

COURSE OUTCOMES:

On completion of the course students will be able to

6. Estimate the hardness of water, concentrations of acids, bases, and metal ions using volumetric, conductometric, potentiometric, and p^H metric techniques.
7. Verify Lambert-Beer's law using colorimetric analysis and interpret spectrophotometric data for chemical quantification.
8. Synthesize polymers such as Bakelite and bioplastics from starch and relate their properties to real-world engineering applications in material science.
9. Evaluate the rate of corrosion of mild steel under different environments and assess the effectiveness of corrosion inhibitors.
10. Simulate the functioning of fuel cells, smart materials, batteries, and solar cells through virtual laboratory simulations and assess their engineering applications.

CO-PO MAPPING

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

(A503502) ENGINEERING EXPLORATION AND PRACTICE
(Common to All)

B.Tech. (EEE): II Semester

L	T	P	C
0	0	2	1

Week-1: Difference between Science and Engineering, Scientist and Engineer needs and wants various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer. Significance of team work, Importance of communication in engineering profession

Week-2: Engineering Design Process, Need statement to Problem conversion, Pair wise comparison chart, decision matrix, Concepts of reverse engineering

Week-3: Project management tools: Check list, Time line, Gantt chart, Requirement Analysis

Week-4: Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism

Week-5: 3-D Modelling of a Box with two holes and curvature

Week-6: 3-D Modelling of Electronic Enclosure and Assembly of two parts

Week-7: Introduction to various platform – based development, Introduction to basic components, transducers, actuators and sensors, Introduction to Tinker cad

Week-8: Introduction to Arduino, basics of programming

Week-9: Interfacing Arduino with actuators and transducers

Week-10: Interfacing Arduino with Sensors, Liquid Crystal Display (LCD)

Week-11: Assembly and Crafting the Prototype

Week-12: Test and Validate the Prototype, Documentation, Panel Presentation

TEXTBOOKS

1. ConceptsinEngineeringDesign– 2016;bySumeshKrishnan(Author),Dr.MukulShukla(Author),Publisher:NotionPress.
2. Workshop Practice, B. L. Juneja, Cengage, 2016

REFERENCEBOOKS

1. AGhoshand AK Malik: Theory of Mechanism and Machine; East West Press(Pvt)Ltd., New Delhi.
2. Arduino Cookbook,2nd Edition by Michael Margolis: O'Reilly Media
3. Introduction to autocad®2017-2D and 3D design by Bernd S.Palmand Alf Yarwood, Routledge (Taylor and Francis group)
4. Engineering Fundamentals: An Introduction to Engineering (Mind Tap Course List)5th Edition by SaeedMoaveni
5. Software Project Management (SIE),(Fifth Edition);Bob Hughes, Mike Cotterell, Rajib Mall; Published by Tata McGraw –Hill Education Pvt. Ltd (2011);ISBN10:0071072748 ISBN13:9780071072748

COURSEOUTCOMES

On Completion of the course, the students will be able to:

1. Explain the importance of engineering profession in the world.
2. Identify multi-disciplinary approach required in solving an engineering problem
3. Build a mechanism for a given application
4. Create basic3D models and animations
5. Design a mechatronic system using Mechanical and Electronic components

CO-POMapping:

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

(A505507) PYTHON PROGRAMMING LABORATORY

B. Tech (EEE): II Semester

L	T	P	C
0	0	2	1

List of Experiments:

1.
   I. Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   II. Start the Python interpreter and type help() to start the online help utility.
1. Start a Python interpreter and use it as a Calculator.
2. Write a program to calculate compound interest when principal, rate and number of periods are given.
3. Read the name, address, email and phone number of a person through the keyboard and print the details.
4. Print the below triangle using for loop.

   5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1
5. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character(use 'if-else-if' ladder)
6. Python program to print all prime numbers in a given interval (use break)
7. Write a program to convert a list and tuple into arrays.
8. Write a program to find common values between two arrays.
9. Write a function called palindrome that takes a string argument and returnsTrue if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.
10. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
11. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
12. Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
13. The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
14. Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
15. Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
16. Remove the given word in all the places in a string?
17. Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
18. Writes a recursive function that generates all binary strings of n-bit length
19. Write a python program that defines a matrix and prints
20. Write a python program to perform multiplication of two square matrices
21. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
22. Use the structure of exception handling all general-purpose exceptions.
23. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
24. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.
25. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

26. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.
27. Write a python code to read a phone number and email-id from the user and validate it for correctness.
28. Write a Python code to merge two given file contents into a third file.
29. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
30. Write a Python code to Read text from a text file, find the word with most number of occurrences
31. Write a function that reads a file *file1* and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.
32. Import numpy, Plotpy and Scipy and explore their functionalities.
33. Install NumPypackage with pip and explore it.
34. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
35. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Introduction to Python Programming, Gowrishakar S, Veena A, CRC Press
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Python for Data Science, Dr. Mohd Abdul Hameed, Wiley publications
6. Core Python Programming, Dr. R. Nageswara Rao, Dreamtech press
7. Introduction to Python, Gowrishankar S, Veena A., CRC Press

Course Outcomes: The student will learn to

1. Understand and apply basic Python syntax, data types, control structures, and string operations.
2. Develop Python programs using functions, recursion, and data structures like lists, tuples, dictionaries, and arrays.
3. Implement object-oriented programming concepts and GUI applications using Python modules and Tkinter.
4. Perform file handling and text processing operations including reading, writing, searching, and analyzing textual data.
5. Utilize scientific libraries (NumPy, SciPy, Matplotlib) and design logic-based applications including digital gates and GUI tools.

CO-PO Mapping

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

(A505505) DATA STRUCTURES THROUGH C LABORATORY

B.Tech (EEE) - II Sem.

L	T	P	C
0	0	2	1

Prerequisites: 1. A course on "Programming for Problem Solving"

Course Objectives:

- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stack and queues.

Course Outcomes:

- 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.
- Ability to implement searching and sorting algorithms

List of Experiments:

Basic Programs:

1. Write a C program to implement the following operations on to a 1D Array:
   a. INSERT b. DELETE c. SEARCH d. TRAVERSE
2. Write a C program to implement Self-referential Structure.
3. Write a C program to Perform Dynamic Memory Allocation.

Linked List:

1. Write a C program to implement Single linked list i) Insertion ii)Deletion iii)Display
2. Write a function to reverse the nodes of a Single linked list

Additional:

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

Stacks & Queues:

1. Write a program that implement Stack (its operations) using Arrays
2. Write a program that implement Queue (its operations) using Arrays
3. Write a program that implement Circular Queue (its operations) using Arrays

Additional:

1. Write C programs to implement Stack ADT using Linked List
2. Write C programs to implement Queue ADT using Linked List
3. Write C programs to implement Circular Queue ADT using Linked List

Applications of Stacks:

1. Write a C program to Convert the given Infix Expression to Postfix Expression.
2. Write a C program to Evaluate the given Postfix Expression.

Binary Trees:

1. Write a C program to create a Binary tree with tree traversals:

i) Pre- Order ii) Post –Order iii) In-Order

2. Write a C program to find height of a Binary tree
3. Write a C program to count the number of leaf nodes in a tree

Binary Search Trees:

1. Write a C program to implement Binary search tree i) Insertion ii) deletion iii) Traversals
2. Write a C Program to Check if a Given Binary Tree is an AVL Tree or Not

Additional:

1. Write a C program to implement AVL tree i) Creation ii) Deletion iii) Traversals

Searching & Hashing:

2. Write a C program to implement i) Linear search ii). Binary search
3. Write a C program to implement different hash methods

Additional:

1. Write a C program to implement Separate chaining
2. Write a C program to implement the following collision resolving techniques:

i) Linear Probing ii) Quadratic Probing

Graphs & Sorting:

1. Write a C program for implementing Graph traversal i) DFS
2. Write a C program for implementing Graph traversal i) BFS
3. Write a C program to implement the following sortings:

i. Insertion sort ii. Merge sort

Additional:

1. Write a C program to implement the Quick sort

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:

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

(A502503) ELECTRICAL CIRCUITS LABORATORY
PROFESSIONALCORE

B.Tech (EEE) - II Sem.

L	T	P	C
0	0	2	1

Thefollowingexperimentsarerequiredtobeconductedascompulsory

1. VerificationofSeriesandParallelResonance.
2. Verification of Thevenins and Nortans theorem for DC Circuits
3. Determination ofTwoportnetwork parameters–Z &Yparameters.
4. DeterminationofTwoportnetworkparameters–A,B,C, Dparameters.
5. Verification of Superposition and maximum power transfer theorems for DC circuits.
6. FrequencydomainanalysisofLow-passfilter.
7. Frequencydomain analysisofBand-passfilter.
8. MeasurementofActivePowerforStarandDeltaconnected balancedloads

Inadditiontotheabove eightexperiments,atleastanytwooftheexperimentsfromthefollowinglistarerequiredtobeconducte d

1. MeasurementofReactivePowerforStarandDeltaconnectedbalancedloads.
2. Frequencydomain analysisofHigh-pass filter.
3. Determination of Time response of first order RL and RC circuit for periodic non –sinusoidal inputs– TimeConstant andSteadystate error.
4. DeterminationofTwoportnetworkparameters-Hybridparameters.
5. Determination of Time response of first order RLC circuit for periodic non – sinusoidal inputs – TimeConstantandSteadystate error.
6. Verification of Millimans and compensation Theorem for DC circuits.

Course Outcomes: Up on the completion of the course students will be able to

1. Verify network theorems for DC excitations.
2. VerifyofSeriesandParallelResonance.
3. Determine Z, Y and H, ABCD Parameters of a circuit.
4. Analyse various filter circuits in frequency domain.
5. Determine active power and reactive power for various loads.

CO-PO MAPPING

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

(A500005) NUMERICAL METHODS AND COMPLEX VARIABLES

(Common for EEE and ECE)

L	T	P	C
3	0	0	3

B.Tech (EEE) - IIISEM

UNIT-I: Fourier series &Fourier Transforms

Fourier series – Dirichlet's Conditions – Half-range Fourier series – Fourier Transforms Definition. Fourier Sine and Cosine transforms (Elementary illustrations)

UNIT-II: Numerical Methods-I

Solution of polynomial and transcendental equations: Bisection method – Iteration Method – Newton-Raphson method and Regula-Falsi method. Finite differences: forward differences – backward differences – central differences – symbolic relations – Interpolation using Newton's forward and backward difference formulae – Lagrange's method of interpolation.

UNIT-III: Numerical Methods-II

Numerical integration: Trapezoidal rule - Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Ordinary differential equations: Taylor's series –Modified Euler's method – Runge-Kutta method of fourth order for first order ODE.

UNIT-IV: Complex Differentiation

Differentiation of Complex functions – Analyticity – Cauchy-Riemann equations (without proof) – Harmonic Functions – Finding harmonic conjugate – Milne-Thomson method – Elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT-V: Complex Integration

Line integral – Cauchy's theorem – Cauchy's Integral formula – Zeros of analytic functions – Singularities – Taylor's series – Laurent's series. Residues – Cauchy Residue theorem (All theorems without Proof).

TEXT BOOKS

1. Higher Engineering Mathematics (36^{th} Edition), B.S. Grewal, Khanna Publishers, 2010.
2. Introductory methods of numerical analysis (4^{th} Edition), S.S. Sastry, PHI, 2005.

REFERENCES

1. Complex Variables, Murray R. Spiegel, Ph.D., Seymour Lipschutz, Ph.D., John J. Schiller, Ph.D., Dennis Spellman, Ph.D., (Schaum's outline)
2. Numerical methods for Scientific and Engineering Computations, M. K. Jain, S.R.K. Iyengar, R.K. Jain, New Age International publishers.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Express any periodic function in terms of sine and cosine using Fourier series representation.
2. Determine the roots of polynomial and transcendental equations, and estimate values for given data using interpolation techniques.
3. Obtain numerical solutions for a given first-order ordinary differential equation.
4. Analyze complex functions for analyticity and perform differentiation
5. Perform integration using Cauchy's integral and residue theorems.

CO-PO MAPPING

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

(A502302) ELECTROMAGNETIC FIELDS
PROFESSIONALCORE

L	T	P	C
3	0	0	3

B.Tech(EEE)- IIISEM

Prerequisites: Mathematics & Physics

Course Objectives:

- To introduce the concepts of electric field and magnetic field.
- To know Applications of electric and magnetic fields in the development of the theory for powertransmission lines and electrical machines.

UNITI: **ReviewOfVectorCalculus**

Vectoralgebra-addition,subtraction,componentsofvectors,scalarandvectormultiplications,tripleproducts, threeorthogonal coordinate systems (rectangular, cylindrical and spherical). Analysis of differential volumes, differentialsurfacesanddifferentiallengthsinRectangular,CylindricalandSphericalcoordinatesystems.Conversionofa vectorfromonecoordinatesystemtoanother.

UNITII:StaticElectricFields

Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume chargedistributions. Gauss law and its applications. Maxwell's first law, div (D) = ρvAbsolute Electric potential, potentialdifference,Calculationofpotentialdifferencesfordifferentconfigurations.Electricdipole,ElectrostaticEnerg yandEnergydensity.

UNITIII:Conductors,DielectricsAndCapacitance

Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfectdielectric materials. Permittivity of dielectric materials, Boundary Conditions between two dielectrics and betweenconductor and dielectric, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation,SolutionofLaplaceandPoisson'sequation,ApplicationofLaplace'sandPoisson's equations.

UNITIV: StaticMagneticFields

Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials.Steadymagneticfieldsproducedbycurrentcarryingconductors.Maxwell'ssecondEquation,div(B)=0.

Ampere's circuital law and its applications Ampere's circuital law and its applications viz. MFI due to an infinitesheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's thirdequation, Curl(H)=Jc,Fieldduetoa circular loop, rectangularandsquareloops.

MagneticForces,MaterialsandInductance

Force on a moving charge, Force on a differential current element, Force between differential current elements,Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits,inductancesandmutual inductances.

UNITV:TimeVaryingFieldsAndMaxwell'sEquations

Faraday's law for Electromagnetic induction, Displacement current, Point form of equation,Integral form ofMaxwell'sequations, MotionalElectromotiveforces..

TEXTBOOKS:

1. W.Hayt,"EngineeringElectromagnetics",McGrawHillEducation,2012.
2. M. N.O. Sadiku,"ElementsofElectromagnetics",OxfordUniversityPublication,2014.

REFERENCEBOOKS:

1. A.Pramanik,"Electromagnetism-Theoryandapplications",PHILearningPvt.Ltd,NewDelhi,2009.

2. A.Pramanik,"Electromagnetism-Problemswithsolution",PrenticeHallIndia,2012.
3. G.W.Carter,"Theelectromagneticfieldinitsengineeringaspects",Longmans,1954.
4. W.J.Duffin,"ElectricityandMagnetism",McGrawHill Publication,1980.
5. W. J.Duffin, "AdvancedElectricityandMagnetism", McGrawHill,1968
6. .E.G.Cullwick,"TheFundamentalsofElectromagnetism",CambridgeUniversityPress,1966.
7. B. D. Popovic, "Introductory Engineering Electro magnetics", Addison-Wesley EducationalPublishers,InternationalEdition, 1971.

COURSEOUTCOMES:

Onsuccessfulcompletionofthecourse,students willbeableto

1. Applythevectoralgebraforunderstandingdifferentcoordinatesystems
2. Explainthebasiclawsof electrostaticfield.
3. Obtaintheelectricfieldsforsimpleconfigurationsunderstaticconditions.
4. Evaluatestaticmagneticfieldsusingdifferentlawsandexploretheforces&torquesonvariouscurrent distributions
5. AnalyzetimevaryingelectricandmagneticfieldsandExpressMaxwell'sequationsindifferentforms anddifferentmedia

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

(A502303) ELECTRICAL MACHINES – I
PROFESSIONALCORE

L	T	P	C
3	0	0	3

B.Tech (EEE) - IIISEM

Prerequisites: Electrical Circuits -I & II

Course Objectives:

- To study and understand different types of DC machines and their performance evaluation throughvarious testing methods.
- To understand the operation of single-phase and Three-phase Transformers
- To analyze the performance of transformers through various testing methods.

UNIT -I:

D.C. Generators: Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings – simplex and multiplex windings (elementary treatment only) – EMF Equation. Concept of Armature reaction and commutation – Cross magnetizing and de-magnetizing AT/pole. Methods of Excitation – separately excited and self-excited generators – build-up of EMF - critical field resistance and critical speed. Performance Characteristics of shunt, series and compound generators and applications.

UNIT -II:

DC Motors: Principle of operation – Back EMF. - Torque equation – characteristics and application of shunt, series and compound motors. 3-point starter, Speed control of DC shunt and series motors - Armature voltage and field flux control methods. Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency. Testing of DC Machines: Methods of Testing – Direct, Indirect, and Regenerative Testing – Brake Test – Swinburne's Test – Hopkinson's Test.

UNIT -III:

Single Phase Transformers: Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no-load and on load - phasor diagrams and Applications.

UNIT -IV:

Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency & supply voltage on iron losses. Testing of Transformers: Open Circuit and Short Circuit tests - Sumpner's Test - predetermination of efficiency and regulation-separation of losses test.

UNIT -V:

Parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit – comparison with two winding transformers.

Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Scott connection and Applications.

TEXT BOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, Revised Edition, 2021.
2. I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

REFERENCE BOOKS:

1. Prithwiraj Purkait, Indrayudh Bandyopadhyay, "Electrical Machines", Oxford, 2017.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

Online Recourses:

1. https://nptel.ac.in/courses/108/105/108105155/
2. https://nptel.ac.in/courses/108/105/108105017/
3. https://nptel.ac.in/courses/108/106/108106071/

CourseOutcomes:

Attheendofthiscourse,studentswilldemonstratetheabilityto

1. Describeoperationofdcgeneratorsfordifferentexcitation,starting,speedcontrolmethods.
2. AnalyzetheoperationofDCmotor.
3. Examinetheoperationofsingle-phasetransformers.
4. Evaluate the performance oftransformers by suitable tests.
5. Demonstratepolyphasetransformersandtheirperformancethroughtesting.

CO-PO MAPPING

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

(A504201) ELECTRONIC DEVICES AND CIRCUITS

(Common to All)

B.Tech (ECE): III Semester

L	T	P	C
3	0	0	3

UNIT-I

Diode Characteristics and Applications: PN junction diode – I-V 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 – I-V 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

Transistor 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.

TEXTBOOKS:

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.

REFERENCEBOOKS:

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.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Analyze the characteristics of semiconductor diodes and apply them in rectifier clippers and clipping circuits.
2. Evaluate the operation and configurations of Bipolar Junction Transistors (BJTs) and analyze their input and output characteristics.
3. Design appropriate biasing networks for BJTs and determine the operating point for amplifier applications.
4. Analyze transistor amplifier circuits using h-parameter models and assess performance for various configurations.
5. Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like FinFETs and CNTFETs, and compare modern device technologies

CO-PO MAPPING:

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

(A502304) POWER SYSTEMS – I
PROFESSIONALCORE

L	T	P	C
3	0	0	3

B.Tech (EEE) - IIISEM

Prerequisite: Electrical Circuits-I & II

Course Objectives:

- To understand the power generation through conventional.
- To illustrate the economic aspects of power generation and tariff methods
- To know about substations and distribution systems

UNIT-I

Generation of Electric Power: Structure of power system **,**Operation of Hydel, Thermal, Nuclear and Gas Power plant with layouts - Description of components-Choice of site - advantages and disadvantages, Introduction and description of components- renewable energy sources and plants (solar and wind).

UNIT-II:

Economics of Power Generation: Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load curve, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariffs.

UNIT-III:

Air Insulated Substations (AIS): Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

UNIT-IV

Gas Insulated Substations (GIS): Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT-V:

AC Distribution: Introduction, comparison between DC & AC distribution, AC distribution, Single phase, 3-phase 3 wire, 3-phase 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in AC Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

TEXT BOOKS:

1. C. L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", 2nd Edition, New Age International, 2009.
2. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
3. J. B. Gupta, A Course in Power Systems" Katson Books, 11th Edition, 2016.

REFERENCE BOOKS:

1. C.L. Wadhwa, "Electrical Power Systems", 5th Edition, New Age International, 2009.
2. M.V. Deshpande, "Elements of Electrical Power Station Design", 3rd Edition, Wheeler Pub. 1998.
3. H. Cotton & H. Barber, "The Transmission and Distribution of Electrical Energy", 3rd Edition, 1970.
4. W. D. Stevenson, "Elements of Power System Analysis", 4th Edition, McGraw Hill, 1984.
5. V. K. Mehta and Rohit Mehta, "Principles of Power Systems", S. Chand & Company Ltd, New Delhi, 2004.

Course Outcomes: After successful completion of the course, the student will be able to:

1. Explain the layout, operation, and components of major power plants
2. Analyze key economic parameters of power generation
3. Illustrate and analyze the layout and components of Air Insulated Substations (AIS)
4. Explain the construction, advantages, and types of Gas Insulated Substations (GIS)
5. Understand the design and operation of AC distribution systems

CO-PO MAPPING

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

(A502305) ELECTRICAL MEASUREMENTS
PROFESSIONALCORE

L	T	P	C
3	0	0	3

B.Tech (EEE) - IIISEM

Prerequisites: Electrical Circuits-I &II, Analog Electronics and Electromagnetic Fields.

Course Objectives:

- To introduce the basic principles of all measuring instruments.
- To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.
- To understand the basic concepts of smart and digital metering.

UNIT - I: INTRODUCTION TO MEASURING INSTRUMENTS: Classification – deflecting, control anddampingtorques–AmmetersandVoltmeters–PMMC,movingirontypeinstruments– expressionforthedeflectingtorque and control torque – Errors and compensations, extension of range using shunts and series resistance.Electrostatic Voltmeters-electrometertypeand attracteddisctype– extensionofrange ofE.S.Voltmeters

UNIT-II:POTENTIOMETERS&INSTRUMENTTRANSFORMERS: PrincipleandoperationofD.C.Crompton'spotentiometer–standardization– Measurementofunknownresistance,current,voltage.A.C.Potentiometers:polarandcoordinatetype'sstandardization –applications.CTandPT–Ratioandphaseangleerrors

UNIT-III: MEASUREMENT OF POWER & ENERGY: Single phase dynamometer wattmeter, LPF and UPF,Double element and three element dynamometerwattmeter,expressionfor deflecting andcontrol torques– Extensionof range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced andunbalancedsystems.Singlephaseinductiontypeenergymeter–drivingandbrakingtorques– errorsandcompensations – testing by phantom loading using R.S.S. meter. Three phase energy meter – tri-vector meter,maximumdemandmeters.

UNIT-IV:DC&ACBRIDGES:Methodofmeasuringlow,mediumandhighresistance–sensitivityofWheatstone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement ofhigh resistance – loss of charge method. Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson'sbridge - Owen's bridge. Measurement of capacitance and loss angle –Desaunty's Bridge - Wien's bridge – ScheringBridge.

UNIT-V: TRANSDUCERS: Definition of transducers, Classification of transducers, Advantages of Electricaltransducers,Characteristicsandchoiceoftransducers;PrincipleoperationofLVDTandcapacitortransducers; LVDTApplications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Piezo electrictransducers,photovoltaic,photo conductive cells,andphotodiodes.
INTRODUCTION TO SMART AND DIGITAL METERING: Digital Multi-meter, True RMS meters, Clamp-on meters, Digital Energy Meter, Cathode Ray Oscilloscope, Digital Storage Oscilloscope.

TEXTBOOKS:

1. A.K.Sawhney,"Electrical&ElectronicMeasurement&Instruments",DhanpatRai&Co.Publications,2005.
2. Dr.RajendraPrasad,"ElectricalMeasurements&MeasuringInstruments",KhannaPublishers1989.

REFERENCEBOOKS:

1. G.K.Banerjee,"ElectricalandElectronicMeasurements",PHILearningPvt.Ltd.,2ndEdition,2016.
2. R. K. Rajput,"Electrical&ElectronicMeasurement&Instrumentation", S.ChandandCompanyLtd.,2007.
3. S.C.Bhargava,"ElectricalMeasuringInstrumentsandMeasurements",BSPublications,2012.
4. BuckinghamandPrice, "ElectricalMeasurements",Prentice–Hall,1988.

5. Reissland,M.U,"ElectricalMeasurements:Fundamentals,Concepts,Applications",NewAgeInternational (P)Limited Publishers,1stEdition2010.
6. E.W.GoldingandF.C.Widdis,"ElectricalMeasurementsandmeasuringInstruments",fifthE dition,WheelerPublishing, 2011.

CourseOutcomes:

Aftercompletionofthecoursethestudentmustbeableto

1. Understanddifferenttypesofmeasuringinstruments,theirconstruction,
2. Explain theoperationandcharacteristicsandidentifytheinstruments suitablefortypicalmeasurements
3. Elucidatethemeasurementofvoltage,current,Powerfactor,powerandenergy
4. Illustrateoperationofvariousbridges
5. Apply the knowledge about transducers and instrument transformers to use them effectively and alsosmartanddigitalmeteringforindustrialapplications.

CO-PO MAPPING

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

(A500501) COMPUTATIONAL MATHEMATICS LAB
(Using Python software)
(Common for All Branches)

B.Tech (EEE) - IIISEM

L	T	P	C
0	0	2	1

Visualize all solutions graphically through programs

Programs:

UNIT-I: Eigen values and Eigenvectors:

WEEK 1

Write a program to find solution of system of homogenous linear equations(trivial and non-trivial)

WEEK 2

Write a program to find solution of system of non-homogenous linear equation (unique and infinite)

WEEK 3

Write a program to obtain the eigen values and eigen vectors for dynamically generated matrix

Write a program to obtain matrix from quadratic form and orthogonalize the matrix

WEEK 4&5

UNIT-II: Solution of Algebraic and Transcendental Equations

Write a program to find real root of a given algebraic/transcendental equation using Bisection method.

WEEK 6&7

Write a program to find real root of a given algebraic/transcendental equation using Newton Raphson Method**.**

UNIT-III: Linear system of equations:

Jacobi's iteration method and Gauss-Seidal iteration method

WEEK 8

Write a program to find solution of given system of linear equations using Jacobi's method

WEEK 9

Write a program to find solution of given system of linear equations using Gauss-Seidal method.

UNIT-IV: First-Order ODEs

Exact and non-exact equations, Applications: exponential growth/decay, Newton's law of cooling.

WEEK 10

Write a program to **s**olve exact and non-exact equations

WEEK 11

Write a program to solve Newton's law of cooling problems and exponential growth/decay

UNIT-V: Higher order linear differential equations with constant coefficients

WEEK 12

Write a program to solve homogeneous ODEs

Write a program to solve non-homogeneous ODEs

WEEK 13

Write a program to solve Partial Derivatives and Jacobian of several variables

WEEK 14

Write a program for finding Maxima and Minima of functions of two variables

TEXT BOOKS

1. The fundamentals of Python: First Programs, Kenneth A. Lambert, Cengage Learnings, 2011.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing.

REFERENCES

1. An Introduction to Python, John C. Lusth, The University of Alabama, 2011.
2. Introduction to Python, CDave Kuhlman, 2008.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Develop Python programs to compute the eigenvalues and eigenvectors of a matrix.
2. Implement Python code to solve algebraic and transcendental equations, as well as systems of linear equations.
3. Write Python programs to obtain solutions for first-order ordinary differential equations and higher-order linear differential equations with constant coefficients.
4. Develop Python code to solve partial differential equations
5. Determine maxima and minima of functions.

CO-PO MAPPING

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

(A502504) ELECTRICAL MACHINES - I LABORATORY
PROFESSIONALCORE

L	T	P	C
2	0	0	2

B.Tech (EEE) - IIISEM

Thefollowingexperimentsarerequiredtobeconducted compulsoryexperiments:

1. MagnetizationcharacteristicsofDCshuntgenerator(Determinationofcriticalfieldresistanceand criticalspeed)
2. LoadtestonDCshuntgenerator(Determinationofcharacteristics)
3. LoadtestonDCseriesgenerator(Determinationofcharacteristics)
4. Hopkinson'stestonDCshuntmachines(Predetermination ofefficiency)
5. Swinburne'stestand speedcontrolofDCshuntmotor(Predeterminationofefficiencies)
6. BraketestonDCcompoundmotor(Determination ofperformancecurves)
7. OCand SCTestonSinglePhaseTransformer
8. BraketestonDCshuntmotor(Determinationofperformancecurves)

Inadditiontotheaboveeightexperiments,atleastanytwooftheexperimentsfromthefollowinglistarer equiredtobe conducted:

1. LoadtestonDCcompoundgenerator(Determination ofcharacteristics.
2. FieldstestonDCseriesmachines(Determination ofefficiency)
3. RetardationtestonDCshuntmotor(Determinationoflossesatratedspeed)
4. Separation oflossesinDCshuntmotor.
5. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-PhaseTransformer
6. LoadTeston SinglePhaseTransformer (CalculateEfficiencyandRegulation)

COURSEOUTCOMES:

Onsuccessfulcompletionofthecourse,students willbeableto

1. Explain theprocessofemfinduced inDCgenerator**.**
2. Analyzethecharacteristicsofdifferenttypesof DCgenerators byperformingloadtest.
3. EvaluateperformanceofDCmachinesthroughdifferenttests.
4. Determinetheefficiencyof DCM/G byconductingHopkinson'stest.
5. Drawtheperformancecurvesofdifferent DCmotors bybraketests.

CO-PO MAPPING

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

(A504502) ELECTRONIC DEVICES AND CIRCUITS LABORATORY

B.Tech (EEE): III Semester

L	T	P	C
0	0	2	1

List of Experiments:

A. Hardware-Based Experiments (7):

1. Study the I–V 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.

B. Software-Based Simulation Experiments (7):

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.

Hardware Requirements:

1. Regulated DC Power Supply (0–30V)
2. Function Generator
3. Digital Multimeter
4. Cathode Ray Oscilloscope (CRO) or DSO
5. Breadboards and Connecting Wires
6. Resistors, Capacitors, Diodes (1N4007, Zener Diodes)
7. BJTs (e.g., BC107, 2N2222), JFETs (e.g., J201), MOSFETs (e.g., IRF540N)
8. Trainer Kits (optional but preferred for ease)

Software Requirements (Any one of the listed tools or equivalent):

1. LTSpice (Free from Analog Devices)
2. NI Multisim (Academic License or Student Version)
3. Proteus Design Suite (Simulation and PCB Design)
4. TINA-TI (Free from Texas Instruments)
5. PSPICE for TI or OrCAD Lite
6. Windows PC or Laptop with minimum 4GB RAM and i3 processor or better

Course outcomes:

At the end of the course the student will be able to

1. Analyze the I–V characteristics of semiconductor devices such as diodes, BJTs, and FETs.
2. Design and the evaluate performance parameters for basic rectifier, clipper, clamper, and voltage regulation circuits.
3. Demonstrate biasing techniques for BJTs and determine their operating point using DC load line analysis.
4. Design and analyze transistor amplifier circuits in various configurations.
5. Simulate and interpret electronic circuits using appropriate simulation tools.

CO-PO Mapping:

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

(A502701) DESIGN OF ELECTRICAL SYSTEMS USING AUTOCAD
(Skill Development Course –1)

L	T	P	C
0	0	2	1

B.Tech (EEE) - IIISEM

Prerequisite:

Course Objectives:

1. To provide hands-on training in using AutoCAD for electrical design and drafting.
2. To understand the principles of preparing electrical wiring diagrams and panel layouts.
3. To enable students to design residential, commercial, and industrial electrical systems.
4. To introduce students to symbols, standards, and practices in electrical CAD.

Module I: Introduction to AutoCAD for Electrical Design Overview of AutoCAD interface and tools

- Layers, blocks, and annotation in AutoCAD
- Electrical symbols: IEC/ANSI/IS standards
- Drawing and modifying basic electrical elements

Lab Experiments:

- Creating simple electrical circuit diagrams using AutoCAD
- Use of layers and blocks for electrical layouts

Module II: House Wiring and Lighting System Design

- Design of single-line diagrams (SLDs)
- Layout of internal wiring for residential buildings
- Load calculation and cable selection
- Earthing and protection system basics

Lab Experiments:

- Preparation of residential wiring layout
- Switchboard and lighting plan for 1BHK/2BHK houseModule III: Commercial and Industrial Electrical Layouts
- Design of power circuits and lighting for commercial buildings
- Distribution board design and component placement
- Panel board and busbar layout

Lab Experiments:

- Design and drafting of distribution system for a small commercial building
- Electrical room layout with control panels

Module IV: Substation and Control Circuit Design

- Single-line diagram of substations
- Control circuit schematics
- Relay control and contactor wiring diagrams
- Cable routing and tray layout

Lab Experiments:

- Drawing of 11kV/440V substation SLD
- Panel wiring diagram for DOL/Star-Delta motor starter

Module V: Mini Project and Professional Practice

- Project planning, drawing standards, title block, and BOM
- Design and documentation of a small-scale electrical system
- Printing, plotting, and exporting drawings
  Lab Activity:
- Mini-project: Design and documentation of electrical system for a small apartment, lab, or factory setup

Software Requirements:

- AutoCAD Electrical (Student or Institutional License)
- Optional: E-Plan, DraftSight, or similar tools for advanced users

TEXT BOOKS:

1. K.B. Raina and S.K. Bhattacharya “Electrical Design Estimating and Costing” New Age International.
2. Prof. Sham Tickoo “AutoCAD Electrical 2023 for Electrical Control Designers” CADCIM

Technologies.
3. Surjit Singh “Basic Electrical Engineering Drawing”Dhanpat Rai & Co.

REFERENCE BOOKS:

1. Frederic P. Hartwell and Herbert P. Richter “Practical Electrical Wiring” Park Publishing.
2. James A. Leach and Shawna Lockhart “AutoCAD 2023 Instructor” SDC Publications.
4. Ray C. Mullin and Phil Simmons “Electrical Wiring Residential” Cengage Learning.
IS 732: Code of Practice for Electrical Wiring Installations.
5. National Electrical Code (NEC) – India.

Online Resources:

1. Autodesk Knowledge Network: https://knowledge.autodesk.com.
2. NPTEL: Basic Electrical Drawing and CAD-related modules (search under "Electrical Engineering").

Course Outcomes: After successful completion of the course, the student will be able to:

1. Apply AutoCAD tools to create electrical schematics and layouts.
2. Design residential and commercial wiring systems as per standards.
3. Develop and document substation and panel wiring drawings.
4. Interpret electrical diagrams and create professional CAD documentation.
5. Work on real-time electrical design problems using CAD tools

CO-PO MAPPING

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

(A502306) ELECTRICAL MACHINES – II
PROFESSIONALCORE

L	T	P	C
3	1	0	4

B.Tech (EEE) - IVSEM

Prerequisites: Electrical Circuits-I &II and Electrical Machines -I

Course Objectives:

1. To deal with the detailed analysis of three phase induction motors & Alternators.
2. To understand operation, construction and types of single-phase motors and their applications.
3. To introduce the concept of parallel operation of alternators.

UNIT - I:

Three Phase Induction Machines: Constructional details of cage and wound rotor machines-production o a rotating magnetic field - principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current and Power factor at standstill and during operation. Rotor power input, rotor copper loss and mechanical power developed and their inter relation. Torque equation-expressions for maximum torque and starting torque – torque-slip characteristics.

UNIT - II:

Characteristics of Induction Machines: Equivalent circuit - phasor diagram - crawling and cogging, No-load Test and Blocked rotor test –Predetermination of performance-Methods of starting and starting current and Torque calculations, Applications.

Speed Control Methods: Change of voltage, change of frequency, voltage/frequency, injection of an EMF into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

UNIT - III:

Synchronous Generator (Alternator): Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – EMF Equation. Harmonics in generated EMF – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – phasor diagram – load characteristics.

UNIT - IV:

Regulation of Synchronous Generator: Synchronous impedance method, MMF method, ZPF method and ASA methods – two reaction theory– Determination of Xd and Xq (Slip test) Phasor diagrams – Regulation ofsalient pole alternators.

Parallel Operation of Synchronous Generator: Synchronizing Alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input.

UNIT - V:

Synchronous Motors: Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed. Hunting and its suppression – Methods of starting.

Single Phase Machines: Single phase induction motor – Constructional Features-Double revolving field theory – split-phase motors – AC series motor- Universal Motor- Shaded pole motor and Applications.

TEXT BOOKS:

1. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
2. I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

REFERENCE BOOKS:

1. Prithwiraj Purkait, Indrayudh Bandyopadhyay, “Electrical Machines”, Oxford, 2017.
2. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.

3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

Online Recourses:

1. https://nptel.ac.in/courses/108/105/108105131/
2. https://nptel.ac.in/courses/108/106/108106072/

Course Outcomes: Bytheendofthecoursestudentswillbeableto

1. Explain the operation of poly phase Induction Machine and its performance characteristics of InductionMotor
2. Analyzeperformancecharacteristicsofacmachines.
3. Explainconstructionalfeatures,types,operationofsynchronousmachines
4. Examinetheparalleloperationofsynchronousmachines.
5. Illustratetheoperationofdifferenttypesofsingle-phase inductionmotorandspecialmotors

CO-PO MAPPING

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

(A502307) POWER SYSTEMS – II
PROFESSIONALCORE

L	T	P	C
3	0	0	3

B.Tech (EEE) - IVSEM

Prerequisite: Electrical Circuits-I&II and Power Systems –I

Course Objectives:

- To study the performance of transmission lines and travelling waves.
- To understand the concept of voltage control, compensation methods and per unit representation of power systems.
- To know the, Symmetrical components and fault calculation analysis

UNIT-I

Overhead Transmission Lines: Line conductors, Composite conductors transposition, bundled conductors, Inductance and capacitance of single phase and three phase lines with symmetrical spacing, and effect of earth on capacitance, skin and proximity effects.

Overhead Line Insulators: Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators, Sag and Tension calculations.

UNIT-II:

Performance of Lines: Representation of lines, short transmission lines, medium length lines, nominal T and PI-representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C,and D constants, Ferranti Effect.

Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methods of reducing corona loss, Advantages and Disadvantages of corona, interference between power and Communication lines.

UNIT-III:

Voltage Control & Power Factor Improvement: Introduction – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers, power factor improvement methods.

Compensation in Power Systems: Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line.

UNIT-IV

Per Unit Representation of Power Systems: The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages of per unit system.

Travelling Waves on Transmission Lines: Production of travelling waves, open circuited line, short-circuited line, line terminated through a resistance, line connected to a cable, Reflection and Refraction coefficients.

UNIT-V:

Symmetrical Components and Fault Calculations: Significance of positive, negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedances and sequence networks, fault calculations, sequence network equations, single line to ground fault, line to line fault, double line to ground fault, three phase fault, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

TEXT BOOKS:

1. C. L. Wadhwa, “Generation, Distribution and Utilization of Electrical Energy”, 3rd Edition, New Age International, 2009.
2. D.P. Kothari and I.J. Nagrath, “Modern Power System Analysis”, Tata Mc Graw Hill Pub. Co., New Delhi, Fourth edition, 2011.

REFERENCE BOOKS:

1. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
2. W. D. Stevenson, "Elements of Power System Analysis", 4th Edition, McGraw Hill, 1984.
3. John J. Grainger & W.D. Stevenson, "Power System Analysis", Mc Graw Hill International,1994.
4. Hadi Sadat, "Power System Analysis", Tata Mc Graw Hill Pub. Co. 2002.

Course Outcomes: After successful completion of the course, the student will be able to:

1. Explain the construction and characteristics of overhead transmission lines
2. Model and analyze the performance of various transmission lines using equivalent circuit representations
3. Describe various methods for voltage control and power factor improvement in power systems
4. Apply per unit system representation to power systems and Explain and analyze travelling wave phenomena on transmission lines
5. Determine the fault currents for symmetrical and unsymmetrical faults

CO-PO MAPPING

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

(A504202) DIGITALELECTRONICS

B. Tech. (EEE) IV-Semester

L	T	P	C
3	0	0	3

UNIT-I

Fundamentals of Digital Systems and Logic Families: Digital signals, Number systems- Binary, Signed binary, Octal, hexadecimal number, Binary arithmetic, Number system conversions, One's and Two's complements arithmetic, AND, OR, NOT, NAND,NORandExclusive-ORoperations,Booleanalgebra,Examples of IC gates, Examples of Digital circuits, Binary theorems.

UNIT-II

Combinational Circuits-I: Standard representation for logic functions, K-map representation of 2,3,4 variables and simplification of logic functions using K- map, Minimization of logical functions, Don't care conditions, Multiplexer, De-Multiplexer.

UNIT-III

Combinational Circuits-II: Adders, Subtractors, Carry look ahead adder, Digital comparator, Parity checker/generator, Code converters, Priorityencoders, Decoders/Drivers for displaydevices, Q-M method of function realization.

UNIT-IV

SequentialCircuits: Introductionto flip-flops, SR, JK, T and D type's flip-flops, Conversionof flip-flops, Shift registers, Ring counter, Johnson counter, Ripple (Asynchronous) counters, Synchronous counters.

UNIT-V

Semiconductor Memories and Programmable Logic Devices: Memory organization and operation, expandingmemorysize,classificationandcharacteristicsofmemories,sequentialmemory,read-onlymemory (ROM), ROM types, Read and write memory (RAM) types, Programmable logic array, Programmable array logic, Field Programmable Gate Array (FPGA).

TEXTBOOKS:

1. A. Anand Kumar,"FundamentalsofDigitalCircuits",PrenticeHallIndia,2016.
2. M.M.Mano,"DigitallogicandComputerdesign",PearsonEducationIndia,2016.

REFERENCEBOOKS:

1. R.S.Sedha,"ATextbookofDigitalElectronics",S.Chand,2005
2. R.P.Jain,"ModernDigitalElectronics",McGrawHillEducation,2009.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Apply Boolean algebra and number system concepts to analyze and implement basic digital logic circuits using various logic families.
2. Simplify and implement combinational logic functions using Karnaugh maps, multiplexers, and demultiplexers.
3. Design and analyze advanced combinational circuits including arithmetic units, code converters, comparators, and display drivers.
4. Design and implement sequential circuits using flip-flops, counters, and shift registers for specified functional and timing requirements.
5. Demonstrate the organization, classification, and application of semiconductor memories and programmable logic devices in digital system design.

CO-PO Mapping:

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

(A502308) CONTROL SYSTEMS
PROFESSIONALCORE

L	T	P	C
3	0	0	3

B.Tech (EEE) - IVSEM

Prerequisite: Electrical Circuits-I & II and Electrical Machines-I
Course objectives:

- Understand the mathematical modelling of physical systems.
- Comprehend the representation of dynamical systems through input-output models, including transferfunctions and state-space models.
- Understand the design of controllers and compensators to enhance the performance and stability ofdynamical systems

UNIT - I:
Mathematical modelling of physical systems: Open – loop and Closed loop Systems, Concept of FeedbackControl, Benefits of Feedback and Effects of feedback, Linear, Non-Linear, Time Variant and Time Invariantsystems, Mechanical and Electrical Systems. Transfer function, Block-Diagram Techniques, Signal flow graph,Controller Components: DC Servo motors, AC Servomotors, Synchro's.

UNIT - II:
Time-Domain Analysis with Input-Output Models: Time response of first and second order systems for standard test inputs. Analysis of standard Second order systems with step input, Types of System, Error Analysis for Linear time Invariant Systems, Design specifications for second-order systems based on the time response.
Concept of Stability: Routh-Hurwitz Criteria. Relative Stability analysis, Root-Locus technique: Construction ofRoot-loci.

UNIT - III:
Frequency Domain Analysis: Introduction to frequency response, Relationship between time and frequencyresponse, Concept of Bode plots and construction. Polar plots, Nyquist stability criterion. Relative stabilityusing Nyquist criterion – gain and phase margin

UNT - IV:
Classical Controllers and Compensators: Proportional, Integral and Derivative Controllers- PI, PD and PIDcontrollers, Lead, Lag and Lead-Lag compensators (elementary treatment only).

UNT - V:
State Variable Analysis: Concept of State, State variables and State model. State Representation, Transformation of State variables, Solution of state equations and Complete response of the Systems. Conceptof controllability and observability.

TEXT BOOKS:
1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
3. Norman S Nise, "Control Systems Engineering", Wiley, 2019 8th Edition.

REFERENCE BOOKS:
1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
2. K. R. Varmah, "Control Systems", McGraw Hill Education, 2010.

Online Recourses:
1. https://www.controleng.com
2. https://www.mathworks.com
3. https://nptel.ac.in/courses/108/102/108102043

Course Outcomes: After successful completion of the course, the student will be able to:

1. Understand and model physical systems and find the transfer function
2. Analyze time-domain behavior of first and second order systems, evaluate stability using Routh-Hurwitz criteria, and apply root-locus techniques for system design.
3. Understand frequency-domain characteristics of systems, construct Bode and Polar plots, and determine system stability using Nyquist criterion with gain and phase margins.
4. Study classical controllers/compensators to improve the performance and stability of linear timeinvariantsystems.
5. Formulate state-space models of dynamic systems, solve state equations, and analyze controllability and observability of systems

CO-PO MAPPING

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

(A500507) SOCIAL INNOVATION AND ENTREPRENEUSHIP

B.Tech. IVSem.	L	T	P	C
	0	1	2	2

Week-1

Identifycommunityissuesto beaddressed,RequirementsAnalysis:ExtensiveUserrequirementsanalysis, GeneratingeffectiveSystemRequirementdocument

Week-2

Introduction to Innovation & Entrepreneurship, Innovation vs. Invention vs. Creativity, Types of Entrepreneurs (Tech, Social, Green)

Week-3

SocialInnovation–CaseStudies, ImpactofSocialInnovationoncommunities

Week-4

ProcessofSocialInnovationPrompts–identifyingneeds,Proposals–generatingideas,Prototyping–testingthe ideainpractice,

Week-5

Sustaining-developingabusinessmodel,Scalinganddiffusion-growingsocialinnovations,Systematicchange

Week-6

Introductiontosustainability,Sustainabilityleadership,Lifecycleassessment, Carbonfoot printcalculation

Week-7

Business Model & Start-Up Ecosystem Elements of a business model (Canvas model)

Week-8

Identify and map global competitors, review industry trends, and understand market sizing: TAM, SAM, and SOM. Assessing scope and potential scale for the opportunity

Week-9

TypesofStart-Ups,Market analysis and feasibility Minimum Viable Product (MVP), Marketrisksand Marketingstrategies, legal aspects in startup, National Innovation Startup Policy (NISP) and its features

Week-10

Government schemes for startups (Startup India, Atal Innovation Mission) Incubators, accelerators

Week-11

Financial planning, budgeting, and cost estimation for the Business model

Week-12

Funding options: Bootstrapping, Angel investors, venture pitching readiness, Documentation, Panel Presentation

TEXT BOOKS:

1. “Innovation and Entrepreneurship” by Peter F.Drucker
2. “Entrepreneurship Development” by S.S.Khanka
3. “Design Thinking” by Tim Brown

REFERENCE BOOKS:

1. AICTE Innovation Cell & Startup India Toolkit
2. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean
3. Introduction to Sustainability by Robert Brinkmann, Wiley-Blackwell

Course Outcomes:

On the completion of the course, the student will be able to:

1. Understand the fundamentals of innovation, creativity, and entrepreneurs
2. Develop innovative solutions to the community issues
3. Assess market competition, estimate market size, and develop a prototype.
4. Develop a scalable business model
5. Analyze Business and financial planning models and Go-to-Market strategies

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

(A502505) ELECTRICAL MACHINES – II LABORATORY
PROFESSIONALCORE

L	T	P	C
0	0	2	1

B.Tech (EEE) - IVSEM

Thefollowingexperimentsarerequiredtobeconductedascompulsoryexperiments:

1. Sumpner'stestonapairofsingle-phasetransformers
2. No-load&BlockedrotortestsonthreephaseInductionmotor
3. Regulationofa three–phasealternatorbysynchronousimpedance&m.m.f.methods
4. 'V'and'InvertedV'curvesofathree—phasesynchronousmotor.
5. Equivalent Circuitofasingle-phaseinductionmotor
6. DeterminationofXdandXqofasalientpolesynchronous machine
7. Braketest onthreephaseInductionMotor
8. Regulationofthree-phasealternatorbyZ.P.F.method

Inadditionto theaboveeightexperiments,ateastanytwoofthefollowingexperimentsarerequiredtobeconducted fromthe followinglist:

1. Separationofcorelossesofasingle-phasetransformer
2. Efficiencyofathree-phasealternator
3. ParalleloperationofSingle-phaseTransformers
4. Heatruntestonabankof3Nos.ofsingle-phaseDeltaconnected transformers
5. Measurementofsequenceimpedanceofa three-phasealternator.
6. ScottConnectionoftransformer

COURSEOUTCOMES:

Aftersuccessfulcompletionofthiscourse,thestudentscanbeableto

1. Analyzetheperformance oftransformersbyconductingdifferenttests
2. Identifytheperformanceofa3-Ø&1-Øinductionmotorusingvarious methods
3. Applydifferentmethodsforfindingregulationof3-Øalternator.
4. Analysevariouscurvesofsynchronous motor.
5. DetermineXd &Xqofa salientpolesynchronousmachine

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

(A504504) DIGITAL ELECTRONICS LABORATORY

B. Tech. (EEE) IV-Semester

L	T	P	C
0	0	2	1

List f Experiments:

1. Realization of Boolean Expressions using Gates.
2. Design and realization logic gates using universal gates.
3. Generation of clock using NAND/NOR gates.
4. Designa4–bitAdder/ Subtractor.
5. Design and realizationa4–bit gray to binary and Binary to Gray Converter.
6. Design and realization of a 4-bit pseudo random sequence generator using logic gates.
7. Design of Mod-8 Counter using JK Flip-flops.
8. Design and realization of 4-bit parallel load and serial out shift register using flip-flops.
9. Design and realization Asynchronous and Synchronous counters using flip-flops.
10. Design and realization 8x1using 2x1 mux.
11. Design and realization 4-bit comparator.
12. Verification of truth tables and excitation tables of flip-flops

TEXTBOOKS:

1. A.Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. M.M.Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCEBOOKS:

1. R.S.Sedha,“ A Textbook of Digital Electronics”, S.Chand, 2005
2. R.P.Jain,"ModernDigitalElectronics",McGrawHillEducation,2009

COURSE OUTCOMES:

On completion of the course students will be able to

1. Apply basic laws of Boolean algebra to simplify and implement logical expressions using different logic gate families.
2. Design and realize of Combinational logic circuits.
3. Design and implementation of Sequential logic circuits.
4. Interpret and verify truth tables, excitation tables, and timing diagrams to validate the functionality of digital circuits.
5. Design and test digital logic circuits using discrete components and integrated circuits from various logic families such as DTL, TTL, and ECL.

CO-PO Mapping:

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

(A502506) ELECTRICAL MEASUREMENTS LABORATORY
PROFESSIONALCORE

L	T	P	C
0	0	2	1

B.Tech (EEE) - IVSEM

Thefollowingexperimentsarerequiredtobeconductedascompulsoryexperiments:

1. CalibrationandTestingofsingle-phaseenergyMeter.
2. Calibrationofdynamometerpowerfactormeter.
3. CromptonD.C.Potentiometer–CalibrationofPMMCammeter andPMMCvoltmeter.
4. Kelvin'sdoubleBridge–Measurementofresistance– Determination ofTolerance.
5. DielectricoiltestingusingH.T.testingKit.
6. ScheringBridge&AndersonBridge.
7. Measurementof3-Phasereactivepowerwithsingle-phasewattmeter.
8. Measurement of Parameters of choke coil using 3 voltmeter and 3 ammeter method

Inadditiontotheaboveeightexperiments,atleastanytwooftheexperimentsfromthefollowinglistarer equiredtobe conducted:

1. CalibrationofLPFwattmeter–byPhantomtesting.
2. Measurementof3-phasepowerwithsinglewattmeterandtwoCTs.
3. C.T.testingusingmutualInductor– Measurementof%ratioerrorandphaseangleofgivenCTbyNullmethod.
4. PT testing by comparison – V. G. as Null detector – Measurement of % ratio error and phase angle of thegivenPT
5. Resistancestraingauge–strainmeasurementsandCalibration.
6. Measurementofdisplacementwiththehelpof LVDT.

Course Outcomes: After successful completion of this course, the student will be able to

1. Calibrate single phase energy meter, dynamometer power factor meter and Crompton's D.C Potentiometer.
2. Measure resistance, inductance and capacitance using suitable bridges practically.
3. Apply the single phase wattmeter method for measuring the 3-phase reactive power.
4. Measure the choke coil parameters
5. Make use of H.T testing kit to test dielectric strength

CO-PO MAPPING

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

(A502702) PCB DESIGN
Skill Development Course –II

L	T	P	C
0	0	2	1

B.Tech (EEE) - IVSEM

Course Objectives:

- To understand the basics of PCB types, materials, and design standards.
- To gain hands-on experience with PCB layout software tools.
- To develop skills in schematic capture, component placement, routing, and Gerber generation.
- To fabricate and test a simple single-layer PCB.

Module I: Fundamentals of PCB Design

- Types of PCBs: Single-layer, Double-layer, Multilayer
- PCB materials and manufacturing process
- PCB design rules and standards (IPC standards)
- Introduction to EDA tools (e.g., KiCad, Eagle, Altium, EasyEDA)

Lab Activity:

- Exploring the user interface of PCB design software
- Setting up design rules

Module II: Schematic Design

- Creating circuit schematics using PCB CAD tools
- Component library management
- Electrical rule checking (ERC)
- Netlist generation

Lab Activity:

- Designing a basic power supply or LED flasher circuit
- Performing ERC and generating netlist

Module III: PCB Layout and Routing

- Importing netlist to layout editor
- Footprint assignment and component placement
- Manual vs auto-routing
- Design Rule Check (DRC)

Lab Activity:

- Placing components and routing for the schematic designed earlier
- Performing DRC and correcting errors

Module IV: PCB Output Files and Fabrication

- Generating Gerber files, drill files, and BOM
- Understanding layers (Top, Bottom, Soldermask, Silkscreen)
- PCB printing, photoresist method, and etching
- Introduction to SMD and through-hole assembly

Lab Activity:

- Generate Gerber files and preview using Gerber viewer
- Fabricate a basic single-layer PCB (simulation or actual lab process)

Module V: Mini Project and Testing

- Assembling components on fabricated PCB
- Soldering and desoldering techniques
- Continuity testing and troubleshooting
- Mini-project: Design a simple power supply, logic gate trainer, or timer circuit

Lab Activity:

- Complete mini project: From schematic to testing of PCB

TEXT BOOKS:

1. Walter C. Bosshart “Printed Circuit Board Design and Technology” Tata McGraw Hill
2. Clyde F. Coombs “Printed Circuit Boards: Design and Technology”: McGraw-Hill
3. Peter Dalmaris “PCB Design Using KiCad 6”

REFERENCE BOOKS:

1. Kraig Mitzner "Complete PCB Design Using OrCAD Capture and PCB Editor"
2. James Angus "Electronic Product Design"

IPC Standards:

3. IPC-2221: Generic Standard on Printed Board Design
4. IPC-7351: Generic Requirements for Surface Mount Design

Software Tools (Free/Open Source Recommended):

1. KiCad (Open-source)
2. EasyEDA (Online tool)
4. Eagle CAD (Free for education)
5. LTSpice / Tinkercad for circuit simulation (optional)

Course Outcomes: After successful completion of the course, the student will be able to:

1. Understand the design and fabrication process of PCBs.
2. Design schematic diagrams and convert them to PCB layouts.
3. Apply routing and layout techniques using EDA tools.
4. Generate Gerber files and perform DRC/ERC effectively.
5. Fabricate, assemble, and test basic single-layer PCBs.

CO-PO MAPPING

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

(A500901) ENVIRONMENTAL SCIENCE

B.Tech (EEE) - IVSEM

L	T	P	C
2	0	0	0

UNIT-I

Environmental Studies: Introduction, Definition, scope and importance, Ecosystems: Introduction, types, characteristic features, structure and functions of ecosystems, Bio-geo chemical cycle, Classification of Eco system.

UNIT-II

Natural Resources: Classification of Resources, Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer – pesticide problems, Forest resources, Use and over-exploitation.Mining and dams – their effects on forest and tribal people, Water resources, Use and over- utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Dams –benefits and costs, Conflicts over Water, Energy resources.

UNIT-III

Bio-diversity and its conservation, Value of bio-diversity-consumptive and productive use, social, ethical, aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity– In-situ and Ex-situ conservation.

UNIT-IV

Environmental Pollution–Local and Global Issues,Nature of thermal pollution and nuclear hazards, Global warming, Acid rain,Ozone depletion, Environmental case studies.

UNIT-V

Environmental Problems in India,Drinking water, sanitation and public health,Effects of the activities on the quality of environment, Water scarcity and groundwater depletion,Controversies on major dams – resettlement and rehabilitation of people: problems and concerns,Rain water harvesting, cloud seeding and watershed management. Economy and Environment, The economy and environment interaction,Economics of development, preservation and conservation, Sustainability: theory and practices,Limits to growth, Equitable use of resources for sustainable life styles, Environmental Impact Assessment.

Text Books

1. Environmental Science (1st edition), Y. Anjaneyulu, B S Publications.
2. Environmental studies (1st edition), Deekshadave, Cengage learning India Pvt. Ltd.

Reference books

1. Environmental sciences and Engineering (1st edition), P. Venugopal Rao, PHI learning Pvt. Ltd.,
2. Environmental Science and Technology (1st edition), M. Anji Reddy, B S Publications.
3. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
4. Environmental Encyclopedia (Cunningham, W.P., et al., Jaico Publishing House, Mumbai, 2003.

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

1. Acquire the knowledge on environmental science
2. Acquire the knowledge of various natural resources
3. Understand the importance of conservation and preserve the biodiversity
4. Understand the hazardous effects of environmental pollution
5. Develop skills in understanding various environmental problems

CO-PO MAPPING:

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

CO3	2	2	3	1	-	2	3	1	-	-	2
CO4	2	3	2	2	-	2	3	1	-	-	2
CO5	2	2	3	3	-	3	3	1	-	-	2