DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech 1st Year (DR26 Regulations)
(For the A.Y: 2026-27)

COURSE STRUCTURE & SYLLABUS

DEPT OF ELECTRICAL AND ELECTRONICS ENGINEERING

D.N.R.COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
(Approved by AICTE, New Delhi & Affiliated to JNTUK,Kakinada)
(Accredited with A++Grade by NAAC & Accredited by NBA (B.Tech-CSE, ECE &EEE))
BALUSUMUDI,BHIMAVARAM,W.G.Dist.,A.P.,PIN-534 202
Ph:08816-221238,Email:dnrcet@gmail.com,Website:https://dnrcet.org

DR26 - B.Tech I Year Course Structure & Syllabus

B.TECH-ELECTRICAL AND ELECTRONICS ENGINEERING

B. Tech. I Year I Semester

S.No.	Category	CODE	Title	L	T	P	Credits
1	BSC	A2610001	Linear Algebra and Calculus	3	0	0	3
2	BSC	A2610003	Applied Physics for Electrical and Electronics	3	0	0	3
3	BSC	A2610009	Applied Physics for Electrical and Electronics Lab	0	0	3	1.5
4	ESC	A2610017	Design Thinking and Innovation	0	1	3	2.5
5	ESC	A2610020	Computational Thinking and Problem Solving using C	3	0	0	3
6	ESC	A2610021	Computational Thinking and Problem Solving using C Lab	0	0	3	1.5
7	ESC	A2610200	Basic Electrical Circuits	3	0	0	3
8	ESC	A2610203	Basic Electrical Circuits Lab	0	0	3	1.5
9	ESC	A2610501	IT and Electronic Workshop Lab	0	0	2	1
10	MNC	A2610013	Sports and Yoga	0	0	2	0
			Total	12	1	16	20

B. Tech. I Year II Semester

S.No.	Category	CODE	Title	L	T	P	Credits
1	HSM	A2620000	English for Technical Communications	3	0	0	3
2	BSC	A2620001	Differential Equations and Vector Calculus	3	0	0	3
3	MNC	A2620003	NSS/Community Service	0	0	2	0
4	HSM	A2620004	English for Technical Communications and Moodles Lab	0	0	3	1.5
5	BSC	A2620009	Chemistry for Electrical Systems	3	0	0	3
6	BSC	A2620014	Chemistry for Electrical Systems Lab	0	0	3	1.5
7	ESC	A2620018	Engineering Graphics Lab	0	1	3	2.5
8	PCC	A2620200	Electric Circuit Analysis	3	0	0	3
9	PCC	A2620202	Electric Circuit Analysis Lab	0	0	3	1.5
10	PCC	A2620400	Semiconductor Devices	3	0	0	3

	Total	15	1	14	22

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CATEGORY BSC	LINEAR ALGEBRA AND CALCULUS (Common to all branches)	L	T	P	C
COURSE CODE A2610001		3	0	0	3

Pre-requisite: Mathematics of 10+2 / Intermediate level (algebra, matrices and basic calculus)

Course Objectives:

The main objective of this course is to provide the learner with variety of linear algebra techniques to solve linear systems, orthogonal representation of the quadratic surfaces and apply its knowledge in optimization problems.

It aims further to calculate areas, surfaces and volumes in various coordinate systems

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Apply matrix techniques to find matrix properties, solve linear equations, and use numerical methods in engineering and scientific problems.	K3
CO2	Develop and use of matrix algebra techniques that are needed by engineers for practical applications	K4
CO3	Utilize mean value theorems for real life problems.	K3
CO4	Solve problems involving functions of several variables using partial differentiation, total derivatives, Taylor/ Maclaurin series, Jacobians, and optimization techniques including Lagrange multipliers.	K3
CO5	Apply double, triple integrals to solve problems involving their applications	K3

Remember; K1- Understand; K2- Apply; K3- Analyze; K4- Evaluate; K5- Create

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

Correlation levels 1, 2 or 3 as defined below
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correction

UNIT-I: MATRICES

Rank of a matrix by echelon form, normal form. Inverse of Non-singular matrices by Gauss- Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations, Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT-II: EIGENVALUES, EIGENVECTORS 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 forms by Orthogonal Transformation. Singular valued Decomposition.

UNIT-III: CALCULUS

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems. Taylor's and Maclaurin series**.**

UNIT-IV: PARTIAL DIFFERENTIATION AND APPLICATIONS (MULTI VARIABLE CALCULUS)

Functions of several variables: Continuity and Differentiability, Partial derivatives, Total derivatives, Chain rule, Euler's Theorem, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, Maxima and Minima of functions of two variables without constraints and with Constraints-Method of Lagrange multipliers.

UNIT-V: MULTIPLE INTEGRALS

Double integrals, Change of order of integration, Triple integrals, Change of variables from Cartesian to polar, Cylindrical and Spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

LEARNING RESOURCES:

Text Books:

1. Grewal,B.S.(2024). Higher Engineering Mathematics,45th Edition. Khanna Publishers.
2. Kreyszig,E.(2025). Advanced Engineering Mathematics, 11thEdition.JohnWiley&Sons.

Reference Books:

1. Ramana,B.V.(2017). Higher Engineering Mathematics. McGraw Hill Education.
2. James,G.(2018). Advanced Modern Engineering Mathematics.5thEditionPearsonpublishers.

CATEGORY BSC	APPLIED PHYSICS FOR ELECTRICAL AND ELECTRONICS (Common to EEE and ECE branches)	L	T	P	C
COURSE CODE A2610003		3	0	0	3

Pre-requisites: Nil

COURSE OBJECTIVES:

1. To provide knowledge on wave optics concepts such as interference, diffraction, and polarization with relevant engineering applications.
2. To understand the basic concepts of Laser light sources and working principle of optical fibers and identify the engineering applications of lasers and optical fibers in communication.
3. To familiarize students with electrical properties of metals and semiconductors and relevant applications in electronic devices.
4. To equip students the fundamentals of quantum mechanics and principles relevant to engineering applications such as quantum computing.
5. To impart knowledge on electromagnetic field theory and its applications

COURSE OUTCOMES:

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

CO	Course Outcome Statement	Cognitive Level
CO1	**Explain** the need for coherent sources and apply the principles of interference, diffraction, and polarization of light in engineering applications	K3
CO2	**Analyze** the working of lasers, fiber optics, and advanced sensing systems in optical communication and signal processing techniques	K4
CO3	**Analyze** the electrical properties of metals, classify the energy bands of semiconductors, identify the type of semiconductor using the Hall effect, and identify the applications of semiconductors in electronic devices	K4, K5
CO4	**Apply** the concepts of quantum mechanics and quantum computing for secure communication applications	K3
CO5	**Apply**Maxwell'sequationsandelectromagneticfieldconceptstoantenna-basedsystems	K3

Remember; K1- Understand; K2- Apply; K3- Analyze; K4- Evaluate; K5- Create

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

Correlation levels 1, 2 or 3 as defined below
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UNIT–I: APPLIED WAVE OPTICS

Interference: Superposition Principle – Coherence – Types of Interference – Thin-film interference (reflection

geometry) – Newton's rings – Determination of wavelength and refractive index.

Diffraction and Optical Surveying: Fresnel and Fraunhofer diffraction – Fraunhofer's diffraction due to single slit, double slit & N-slits (qualitative) – Diffraction Grating and grating spectrum – Dispersive and Resolving power of a grating.

Polarization: Types of polarization–Nicol's prism–Half-wave and Quarter-wave plates.

UNIT–II: QUANTUM PHOTONICS & ADVANCED SENSING

Lasers: Principles of Absorption – Spontaneous and Stimulated Emission – Population Inversion – Three level and Four level laser systems – Construction and working of Ruby and He-Ne Laser – Applications (qualitative).

Fiber Optics: Propagation mechanism – Numerical Aperture – Acceptance angle – Types of optical fibres – Classifications and Modes of optical fibres.

UNIT–III: ELECTRICAL PROPERTIES OF METALS & SEMICONDUCTORS

Electrical Properties of Metals: Classical free electron theory – merits and demerits, Quantum free electron theory–equation for electrical conductivity–Fermi-Dirac statistics–Fermi level and variation with temperature.

Semiconductors: Formation of energy bands – Classification of solids **-** Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors: density of charge carriers (qualitative)–dependenceofFermienergyoncarrierconcentrationandtemperature–Driftanddiffusioncurrents – Einstein's equation – Hall effect – Hall coefficient – Applications of Hall effect.

UNIT-IV: INTRODUCTION TO QUANTUM MECHANICS & QUANTUMCOMPUTING

Quantum Mechanics: deBroglie concept of matter waves– Heisenberg's uncertainty principle–Wavefunction – Postulates of quantum mechanics – Schrödinger's time dependent and time-independent wave equations – Particle in a one-dimensional potential well – Quantum tunnelling (basic idea).

Quantum Computing: Introduction to quantum computing – Classical bits vs qubits – Superposition and entanglement – Basic quantum operations – Hadamard gate – Pauli-X gate – Idea of quantum measurement.

UNIT-V: INTRODUCTION TO EM THEORY

Introduction – Wave Equation in differential form in free space – Vector Analysis – Divergence and Curl of electric field and magnetic field(static) –Gauss'divergence theorem –Stokes'theorem –Derivations of the four Maxwell Equations and their significance. Maxwell's equations in vacuum, Energy transport and Poynting Vector.

LEARNING RESOURCES:

TEXTBOOKS

1. Avadhanulu, M.N.,Kshirsagar,P.G.,& Murthy,T.V.S.A.,A text book of engineering physics, S.Chand Publishing(2019)
2. P.K.PalaniSamy, Engineering Physics, SciTech Publications(2019)

REFERENCE BOOKS

1. Nielsen& Chuang, Quantum Computation & Quantum Information, Cambridge(2010).
2. D.J. Griffiths, Introduction to Electrodynamics, Cambridge.

LEARNING RESOURCES & NPTEL LINKS

1. NPTEL– nptel.ac.in
2. MIT Open Course Ware– ocw.mit.edu
3. Hyper Physics– hyperphysics.phy-astr.gsu.edu
4. Feynman Lectures– feynmanlectures.caltech.edu
5. PhET Simulations– phet.colorado.edu
6. Library of Congress– loc.gov/rr/scitech/selected-internet/physics.html

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CATEGORY BSC	APPLIED PHYSICS FOR ELECTRICAL AND ELECTRONICS LAB (Common to EEE and ECE branches)	L	T	P	C
COURSE CODE A2610009		0	0	3	1.5

COURSE OBJECTIVES:

- To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

COURSE OUTCOMES:

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

CO	Course Outcome Statement	Cognitive Level
CO1	**Apply** optical phenomena such as interference and diffraction to determine key parameters including the radius of curvature of lenses and wavelengths of monochromatic light sources.	K3
CO2	**Evaluate** the electrical and dielectric properties of materials, including dielectric constants and temperature-dependent resistance of thermistors.	K5
CO3	**Analyze** solid-state semiconductor devices and magnetic materials to estimate energy bandgaps and analyze magnetic hysteresis (B-H curves).	K4
CO4	**Investigate** electromagnetic fields and current-field interactions, specifically measuring magnetic field distributions along the axis of circular coils.	K4
CO5	**Apply** principles of wave dynamics, acoustics and simple harmonic motion to evaluate mechanical oscillations, determine gravitational acceleration, verify laws of stretched strings and measure frequencies using compound pendulums, Sonometers and Melde's apparatus.	K3

Remember; K1- Understand; K2- Apply; K3- Analyze; K4- Evaluate; K5- Create

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

Correlation levels 1, 2 or 3 as defined below
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LIST OF EXPERIMENTS

(Any 10 of the following listed experiments)
(Out of which any **TWO** experiments may be conducted in virtual mode)

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by forming Newton's rings.
3. Determination of wavelength of Laser and grating element.
4. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.

5.Determination of resolving power of telescope.

6. Verification of Brewster's law.
7. Determination of dielectric constant of given capacitor by charging and discharging method.
8. Determination of temperature coefficients of a thermistor.
9. Determination of the energy gap of a semiconductor using p-n junction diode.
10. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
11. Determination of the Resistivity of semiconductor by four probe method.
12. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
13. Estimation of Planck's constant using photoelectric effect.
14. Study the variation of magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
15. Sonometer : Verification of laws of stretched string.
16. Determination of frequency of electrically maintained tuning fork by Melde's apparatus.
17. Determination of Acceleration due to gravity and Radius of gyration using Compound pendulum.
18. Determination of magnetic susceptibility by Kundt's tube method

LEARNING RESOURCES:

REFERENCES:

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"S Chand Publishers, 2017.

WEB RESOURCES:

- V-Lab: vlab.co.in

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY ESC	DESIGN THINKING AND INNOVATION (Common to all Branches)	L	T	P	C
COURSE CODE A2610017		0	1	3	2.5

Pre-requisites: NIL

Course Objectives:

1. Introduce students to the principles, mindset and methodologies of Design Thinking and human-centered problem solving.
2. Develop students' ability to observe, empathize, analyze user needs and formulate well-defined engineering and societal problems.
3. Develop students' creative and innovative thinking abilities through systematic ideation, concept generation and evaluation techniques.
4. Enable students to develop, prototype, test and iteratively improve solutions using user feedback and appropriate physical/digital tools.
5. Develop students' ability to identify innovation opportunities, create value propositions, understand basic IPR and communicate innovative solutions effectively.

Course Outcomes:

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

CO1	Explain the principles, processes and mindset of Design Thinking for engineering problem-solving and innovation	K2
CO2	Apply empathy, observation and problem-framing techniques to identify user needs and define engineering problems	K3
CO3	Apply creative and systematic ideation techniques to generate and select innovative solution concepts	K3
CO4	Analyze solution concepts and prototypes using user feedback and appropriate design criteria for iterative improvement	K4
CO5	Analyze the innovation potential of solutions considering value proposition, feasibility, sustainability, societal impact and basic IPR aspects	K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	1	-	1	-	1	1	-	2	2	1
CO2	2	3	2	2	1	2	1	-	2	2	-	2	2	2
CO3	2	3	3	2	2	1	1	-	2	2	1	2	3	2
CO4	2	3	3	3	2	2	1	-	2	2	1	3	3	2
CO5	2	2	3	2	2	3	3	2	2	2	2	3	3	3

L - Low, M - Moderate, H – High

UNIT I—Design Thinking Foundations & Empathy

Introduction to Design Thinking; Design thinking mindset and principles; Design thinking vs. conventional engineering problem-solving; Human-centered design; Five-stage design thinking process; Creativity, curiosity and observation; Understanding users and stake holders; Empathy and user research; Interviews, observation and contextual inquiry; Empathy mapping; Personas and user journeys; Identifying explicit and

latent/unarticulated needs; Ethical considerations in user research

Practical Activities

- Observation of areal-life problem
- Conducting user interviews
- Preparing an empathy map
- Developing a persona
- Preparing a user journey map

Unit Outcome

Students will be able to **understand users, identify their needs and translate observations into meaningful design opportunities**.

UNIT II—Problem Definition, Analysis & Opportunity Identification

From observations to insights ;Data synthesis and affinity mapping; Identifying patterns and pain points; Problem statements; Point-of-View (POV) statements; "How Might We" (HMW) questions; Stakeholder mapping; 5 Whys and root-cause analysis; Problem prioritization; Need–Opportunity mapping; Problem validation; Design constraints and specifications; Social, environmental and sustainability considerations; Identifying opportunities for innovation

Practical Activities

- Affinity mapping of interview data
- Develop three alternative problem statements
- Prepare POV and HMW statements
- Stakeholder map
- Root-cause analysis
- Select and validate one problem/opportunity

Unit Outcome

Students will be able to **analyze user research, identify root causes, frame well-defined problems and recognize opportunities for innovative solutions**.

UNIT III—Creativity, Ideation &Concept Development

Creativity and innovation mindset; Divergent and convergent thinking; Brain storming and brain writing; SCAMPER; Mind mapping; Reverse brain storming; Analogical thinking; Bio mimicry; Lateral thinking; Forced connections; Morphological analysis; TRIZ —basic principles; Individual and collaborative ideation; AI-assisted ideation: opportunities and limitations; Idea clustering and screening; Impact–feasibility matrix; Concept selection; Design criteria and decision matrix

Practical Activities

- Generate 20–30ideas for a selected problem
- SCAMPER exercise
- Brain writing exercise
- Bio mimicry- based ideation
- AI-assisted idea generation and critical evaluation
- Prepare an idea-selection matrix
- Selectthetop2–3concepts

Unit Outcome

Students will be able to **generate diverse solution concepts using creative techniques and systematically select promising ideas based on defined criteria**.

UNIT IV—Prototyping, Experimentation& Validation

Concept development; Prototype mindset; Types of prototypes: Paper prototype, Physical prototype, Digital prototype, Storyboard, Role-play, Service prototype; Low-fidelity and high-fidelity prototypes; Rapid prototyping; "Fail fast, learn fast"; Minimum Viable Prototype(MVP); Design experimentation; Prototype evaluation; User testing ; Think-aloud method ; Feedback collection ; Usability and functionality testing; Iterative design ; Design critique ; Documentation of iterations ; Use of CAD, simulation and AI-assisted visualization tools

Practical Activities

- Develop a low-fidelity prototype
- Prepare a storyboard
- Build a physical/digital prototype
- Conduct user testing
- Collect structured feedback
- Modify the prototype
- Prepare an iteration log

UNIT V—Innovation, Value Creation& Communication

Innovation: meaning, characteristics and importance: Invention vs. innovation; Incremental, disruptive and radical innovation; Product, process,serviceandsocialinnovation;Technology-drivenvs.need-driveninnovation; Sustainable and frugal innovation; Innovation opportunities and emerging technologies; From prototype to innovation; Desirability, feasibility and viability; Value Proposition; Value Proposition Canvas; Introduction to BusinessModelCanvas;Customersegmentsandstakeholdervalue;Innovationvalidation;Market/uservalidation; Intellectual Property Rights — introduction; Patents, copyright, trademarks and design protection; Responsible innovation; Inclusive and sustainable innovation; Innovation ecosystem and entrepreneurship; Communicating innovative ideas; Innovation pitch

Practical Activities

1. Classify existing products/services as incremental, disruptive or radical innovations.
2. Identify three innovation opportunities from a campus/community problem.
3. Prepare a **Value Proposition Canvas**.
4. Validate the proposed innovation with potential users.
5. Prepare an introductory **Business Model Canvas**.
6. Identify possible IPR protection.
7. Prepare and deliver a **3-minute Innovation Pitch**.

Learning Resources

Textbooks:

1. Chadan Adhikari, PrabirKumar Das &Tanay Pramanik, Textbook of Design Thinking and Innovation , S. Chand Publishing, 2026.
2. Shalini Rahul Tiwari & Rohit Rajendra Swarup, Design Thinking: A Comprehensive Textbook, Wiley India, 2024

Reference Books:

1. Soni, Pavan, Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem-Solving, Penguin Random House India.
2. Jauhari, Vinnie & Sudhanshu Bhushan, Innovation Management, Oxford University Press India.

Web Resources:

1. Atal Innovation Mission, NITI Aayog–Innovation and Design Thinking Resources. https://aim.gov.in/
2. Institution's Innovation Council (IIC), Ministry of Education, Government of India, https://iic.mic.gov.in/
3. Startup India, Government of India–Innovation and Entrepreneur ship Ecosystem, https://www.startupindia.gov.in/
4. NationalInnovationFoundation–India–GrassrootsandFrugalInnovation,https://nif.org.in/
5. Stanfordd.school–DesignThinkingBootlegandDesignThinkingResources, https://dschool.stanford.edu/resources/design-thinking-bootleg
6. IDEO.org–Human-CenteredDesignandSocialInnovationResources,https://www.ideo.org/
7. IDEOU–DesignThinkingandInnovationResources,https://www.ideou.com/pages/design-thinking
8. NPTEL–Online Courses on Design, Innovation, Creativity and Entrepreneurship, https://nptel.ac.in/
9. SWAYAM–Online Courses on Innovation, Entrepreneurship and Design Thinking

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY ESC	COMPUTATIONAL THINKING AND PROBLEM SOLVING USING C (Common to EEE and ECE Branches)	L	T	C
COURSE CODE A2610020		3	0	3

Pre-requisites: NIL

Course Objectives: The main objectives of the course is to

1. Familiarize students with computers, computational thinking, and the process of algorithmic problem solving.
2. Build strong programming fundamentals using the C language, including operators, control structures, and loops.
3. Develop the ability to design and implement solutions using arrays, strings, and user-defined data types.
4. Impart working knowledge of pointers, recursion, dynamic memory allocation, functions, and file handling for building modular, reusable programs.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Apply computational thinking techniques (decomposition, abstraction, pattern recognition) to design algorithms and flowcharts for a given problem	K3
CO2	Develop C programs using appropriate operators, expressions, selection statements, and loops to implement a given logic	K3
CO3	Analyze problems involving arrays, strings, structures and unions and construct suitable C solutions	K4
CO4	Apply pointers, recursion, and dynamic memory allocation to solve computational problems efficiently	K3
CO5	Construct modular C programs using user-defined functions and perform text/binary file input-output operations	K3

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

UNIT – 1: Computational Thinking and Introduction to C

Computational Thinking: Decomposition, Pattern Recognition, Abstraction, Algorithm Design; representing solutions as algorithms, pseudocode, and flowcharts; Number Systems and Data Representation (integers, reals); Overview of Computer Organization and Program Execution.

Introduction to C: Background, Structure of a C Program, Identifiers, Keywords, Variables, Constants, Basic Data Types, Input/Output; Expressions, Operators, type of operators- arithmetic, logical , relational, assignment, conditional, increment, decrement, etc., unary, binary, ternary, Operator Precedence and Associativity, Type Conversion; Scope, Storage Classes, and Type Qualifiers.

Bitwise Operators: Logical Bitwise Operators, Shift Operators

UNIT – 2: Selection and Decision-Making: Relational and Logical Operators, Two-Way and Multi-Way Selection (if-else, switch), Nested Conditionals.
Repetition: Pre-test and Post-test Loops, Counter- and Event-Controlled Loops, for/while/do-while, break and continue, Nested Loops; Programming Applications combining Selection and Repetition.
Arrays: One-Dimensional and Two-Dimensional Arrays, Multidimensional Arrays, Array-based Problem Solving (searching, sorting, averaging).

UNIT – 3: Strings: String Representation, Standard String-Handling Functions, Arrays of Strings, String-to-Data Conversion.
User-Defined Types: typedef, Enumerated Types, Structures, Unions, and Nested Structures; Programming Applications using Structures and Arrays of Structures.
Programming Applications: Applications combining sections and repetitions

UNIT – 4: Pointers: Pointer Fundamentals, Pointer-to-Pointer, Pointer Arithmetic, Pointers and Arrays, Array of Pointers, Compatibility and l-value/r-value concepts. Dynamic Memory Allocation: malloc, calloc, realloc, free. Functions: Designing Structured/Modular Programs, Function Declaration and Definition, Parameter Passing (by value, by reference using pointers), Passing Arrays and Pointers to Functions, Standard Library Functions, Inter-Function Communication.
Recursion: Recursive vs. Iterative Solutions, Designing Recursive Algorithms, Recursion with Arrays and Pointers, Efficiency Considerations.

UNIT – 5: Preprocessor: Directives and Macros.
File I/O: Streams, Text vs. Binary Files, Standard Library File Functions, formatted and Character I/O, Sequential File Processing.

Learning Resources

Text Books:

1. Forouzan, B. A., & Gilberg, R. F. (2007). Computer science: A structured programming approach using C (3rd ed.). Cengage Learning.
2. Kernighan, B. W., & Ritchie, D. M. (1988). The C programming language (2nd ed.). Prentice Hall.

Reference Books:

1. Das, S. (2018). Computer fundamentals and programming (18th ed.). McGraw Hill Education.
2. Kamthane, A. N., & Kamthane, A. A. (2025). Programming in C (4th ed.). Pearson Education.
3. Dey, P., & Ghosh, M. (2013). Computer fundamentals and programming in C (2nd ed.). Oxford University Press.

Web References:

1. NPTEL – Programming in C, IIT Kanpur: https://onlinecourses.nptel.ac.in/noc21_cs81/preview
2. Geeks for Geeks – C Programming Language: https://www.geeksforgeeks.org/c-programming-language/
3. Programiz – Learn C Programming: https://www.programiz.com/c-programming
4. cplusplus.com – C Standard Library Reference: https://cplusplus.com/reference/clibrary/
5. TutorialsPoint – C Programming: https://www.tutorialspoint.com/cprogramming/index.html
6. W3Schools – C Tutorial: https://www.w3schools.com/c/

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY ESC	COMPUTATIONAL THINKING AND PROBLEM SOLVING USING C LAB (Common to EEE and ECE Branches)	L	T	C
COURSE CODE A2610021		0	0	1.5

Pre-requisites: Basic understanding of computer fundamentals and problem-solving concepts

Course Objectives: The main objectives of the course is to

1. Apply the principles of C language and computational thinking techniques in problem solving.
2. Design flowcharts and algorithms, and to develop the ability to trace and debug programs.
3. Design and develop C programs using arrays, strings, pointers, recursion, and functions.
4. Apply dynamic memory allocation, file operations, and preprocessor commands in program design.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Apply computational thinking to construct algorithms and flowcharts for a given problem and translate them into working C programs	K3
CO2	Develop C programs using operators, selection statements and loops to implement a specified logic	K3
CO3	Develop C programs that manipulate arrays, strings, structures and pointers to solve computational problems	K3
CO4	Construct modular programs using user-defined functions and recursion, and perform file input-output operations	K3
CO5	Analyse a C program by tracing and debugging it, and evaluate alternative implementations for correctness and efficiency	K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	1	3	-	-	1	1	-	2			
CO2	3	2	3	-	3	-	-	1	1	-	2			
CO3	3	3	3	2	3	-	-	1	1	-	2			
CO4	3	3	3	2	3	-	-	1	1	-	2			
CO5	3	3	2	2	3	-	-	1	1	-	3			

Lab Requirements (tools / software to carry out the experiments):

- C compiler: GCC (GNU Compiler Collection) — via MinGW-w64 on Windows, or the built-in gcc on Linux/macOS.
- IDE / editor: Code::Blocks, Dev-C++ or Visual Studio Code with the C/C++ extension.
- Command-line terminal to compile and run programs (gcc, ./a.out) and observe the compile–link–run stages.
- Debugger: GDB (GNU Debugger), integrated in Code::Blocks / VS Code, for tracing and step-by-step debugging.
- Operating system: Windows 10/11 or a Linux distribution (e.g., Ubuntu); any 64-bit PC with 4 GB RAM or more.

- No-install alternative: Online GDB, Programiz or Replit for quick practice and testing in a browser.

List of Experiments

Exercise 1: Getting Started with

1. Write, compile and run a C program that prints "Hello, World!" on the screen. Identify the source file, the object file and the executable produced, and record the command used at each stage.
2. Write a C program that declares variables of type int, float, char and double, reads a value for each from the user, and displays each value together with the size of its type using sizeof.
3. Write a C program to read the height and width of a rectangle from the user and compute its perimeter and are.

Exercise 2: Operators and Expressions

1. Write a C program to compute the distance between two points whose coordinates are entered by the user.
2. Write a C program that reads four integers p, q, r, s and, using relational and logical operators, prints 'Correct values' if q > r, s > p and (r + s) > (p + q); otherwise 'Wrong values'.
3. Write a C program to compute simple and compound interest for values entered by the user.

Exercise 3: Selection and Decision Making

1. Write a C program to read a character and classify it as a vowel, consonant, digit or special symbol.
2. Write a C program to find the largest of three numbers using nested if-else.
3. Write a menu-driven C program to compute the area of various geometrical shapes (circle, rectangle, triangle, square) using switch-case.

Exercise 4: Loops and Series

1. Write a C program to display the first n even natural numbers and their sum.
2. Write a C program to reverse a given integer and check whether it is a palindrome.
3. Write a C program to display the sum of the harmonic series 1 + 1/2 + 1/3 + ... up to n terms.

Exercise 5: Nested Loops and Number Patterns

1. Write a C program to print the multiplication table pyramid for numbers 1 to n using nested loops.
2. Write a C program to check whether a given number is prime, then extend it to print all prime numbers and all Armstrong numbers below.

Exercise 6: One-Dimensional Arrays

1. Write a C program to print all unique elements of an array, and implement linear search to find a given element in the array.
2. Write a C program to separate the odd and even elements of an array into two different arrays, and implement binary search to find a given element in a sorted array.
3. Write a C program to sort the elements of an array in ascending order using selection sort, and compare the efficiency of linear search vs. binary search on the sorted array by counting the number of comparisons each method takes.

Exercise 7: Matrices

1. Write a C program to perform addition of two square matrices and display the resultant matrices.
2. Write a C program to multiply two square matrices and display the resultant matrices.
3. Write a C program to find the transpose of a given matrix.

Exercise 8: Strings: Write C programs to perform the following without using string handling functions

- **Find the length** of a given string.
- **Copy** one string into another.
- **Concatenate** two strings.
- **Compare** two strings and display whether they are equal, or which one is greater.
- **Reverse** a given string (using a separate swap function to exchange characters).
- **Search for a character** in a string and display its position (or indicate if not found).
- **Count the number of vowels, consonants, and words** in a given string

Exercise 9: Pointers Fundamentals

1. Write a C program to demonstrate the use of the & (address-of) and * (value-at-address) operators.
2. Write a C program to add two numbers using pointers.
3. Write a C program to swap two values using call by reference.

Exercise 10: Pointers and Dynamic Memory

1. Write a C program to dynamically allocate memory for an array using malloc, find the largest element and the sum of all elements in it, then repeat using calloc and note the difference between the two.
2. Write a C program to count the number of vowels in a string using a pointer.

Exercise 11: User-Defined Functions

1. Write a C program to check whether a number is prime using a user-defined function.
2. Write a C program to compute the GCD and LCM of two numbers using functions.
3. Write a C program to demonstrate a function that returns a pointer.

Exercise 12: Recursion

1. Write a C program to compute the factorial and the n-th Fibonacci term using recursion.
2. Write a C program to compute the sum of digits of a number using recursion.
3. Write a C program to convert a decimal number to its binary equivalent using a recursive function.

Exercise 13: File Handling

1. Write a C program to append multiple lines at the end of an existing text file.
2. Write a C program to copy the contents of one file into another file.
3. Write a C program to count the number of characters, words and lines in a text file.

Web References:

- NPTEL – Programming in C, IIT Kanpur: https://onlinecourses.nptel.ac.in/noc21_cs81/preview
- Virtual Labs – Problem Solving Lab, IIIT Hyderabad: https://ps-iiith.vlabs.ac.in/
- GeeksforGeeks – C Programming: https://www.geeksforgeeks.org/c-programming-language/

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY ESC	BASIC ELECTRICAL CIRCUITS (For EEE only)	L	T	P	C
COURSE CODE A2610200		3	0	0	3

Pre-requisites: **Physics & Mathematics**

Course Objectives:

1. To familiarize students with standard electrical wiring systems, protective devices, and load calculation methodologies for domestic/industrial installations.
2. To impart a strong foundation in DC circuit analysis using fundamental laws, network reduction techniques, and nodal/mesh approaches for dependent and independent sources.
3. To enable students to understand electromagnetic principles, analyse magnetic circuits, and evaluate mutual inductance in coupled coils.
4. To develop the ability to perform steady-state analysis of single-phase AC circuits using phasor algebra and compute real, reactive, and apparent power with power factor correction.
5. To introduce resonance phenomena in AC networks and teach the graphical interpretation of circuit behavior through locus diagrams

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

CO	Course Outcome Statement	Cognitive Level
CO1	Design electrical wiring layouts (staircase/godown), select protective devices (MCBs, ELCBs),and estimate load for proper cable sizing**.**	K3
CO2	Analyze complex DC networks using Kirchhoff's laws, source transformation, star-delta conversion, and solve via Mesh and Nodal analysis (including dependent sources)	K4
CO3	Analyze series/parallel magnetic circuits by calculating MMF, flux, reluctance, self/mutual inductance, and interpret dot conventions with coupling coefficients.	K4
CO4	Compute RMS/average values of AC waveforms, perform steady-state phasor analysis of RLC circuits, and evaluate real, reactive, apparent, and complex power with power factor significance.	K4
CO5	Evaluate series/parallel resonance parameters (bandwidth, selectivity, Q-factor) and construct/interpret locus diagrams for RL, RC, and RLC circuits with varying R, L, or C.	K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	--	--	--	--	--	-	2	1	3
CO2	3	3	1	1	2	--	--	--	--	--	-	3	1	3
CO3	3	3	2	2	2	--	--	--	--	--	-	2	1	3
CO4	3	3	2	2	2	--	--	--	--	--	-	3	2	3
CO5	3	3	2	2	3	--	--	--	--	--	-	2	1	3
1 - Low, 2 - Moderate, 3 – High														

UNIT-I

Electrical Wiring and its Components: Types of wiring systems (cleat, casing-capping, conduit wiring)- wiring accessories — switches, sockets, fuses, MCBs, ELCBs - types of cables and conductors- wiring diagrams for staircase and godown. Load estimation and selection of wire size.

UNIT-II

Introduction to Electrical Circuits

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchhoff's laws, network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis.

UNIT-III

Magnetic Circuits

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT-IV

AC Fundamentals and Single-Phase Circuits

Periodic waveforms (determination of rms, average value and form factor), concept of phasor, phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations. Node and mesh analysis.

Steady-state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power.

UNIT-V

Resonance-Locus Diagrams

Series and parallel resonance, selectivity, bandwidth and quality factor, locus diagram- RL, RC, RLC with R, L and C variables.

Learning Resources

Textbooks:

1. Hayt,W.H.,&Kemmerly,J.E,(2018). Engineering Circuit Analysis (9th edition).McGraw-Hill Education.
2. VanValkenburg,M.E,(2019),Networkanalysis(3rdedition.).Prentice-Hall of India.

Reference Books:

1. Alexander, C. K., & Sadiku, M. N. O. (2019). Fundamentals of electric circuits(6th edition.). McGraw-Hill Education.
2. Herbert P.Richter,FredericP.Hartwell,(2014). Practical Electrical Wiring: Residential, Farm, Commercial, and Industrial (22ndedition), Park Publishing, Inc.
3. S.L.Uppal&G.C.Garg,(2018),ElectricalWiring,EstimatingandCosting,(6thedition),Khanna Publishers.

Web Resources:

1. https://nptel.ac.in/courses/108105479
2. https://nptel.ac.in/courses/108104139
3. https://nptel.ac.in/courses/117106108

V-Lab:vlab.co.in

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY ESC	BASIC ELECTRICAL CIRCUITS LAB (For EEE branch only)	L	T	P	C
COURSE CODE A2610203		0	0	3	1.5

Pre-requisites: Physics & Mathematics

Course Objectives:

1. To familiarize students with electrical wiring accessories, protective devices, and the practical assembly of a single-phase distribution board for power/energy measurement.
2. To understand and verify practical control wiring circuits (staircase/godown) and experimentally validate fundamental DC network laws.
3. To enable students to measure basic electrical parameters (V,I,P) in DC circuits and compute impedance, power factor, and choke coil parameters in AC circuits.
4. To analyze magnetic coupling between coils and evaluate the frequency response characteristics(resonance, bandwidth, Q-factor) of series and parallel RLC networks.
5. To visualise and interpret the trajectory of current/voltage phasors when circuit parameters (R, L, or C) are varied in AC circuits.

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

CO	Course Outcome Statement	Cognitive Level
CO1	Identify electrical tools, cables, switches, protective devices (MCB/ELCB), and implement a functional single-phase distribution board to measure power, energy, and power factor.	K3
CO2	Draw and verify staircase and godown wiring control diagrams, and experimentally validate Kirchhoff's Voltage Law (KVL) and Current Law (KCL) in DC circuits.	K3
CO3	Measure V,I, and P in DC circuits; compute impedance, power, and power factor for series RL, RC ,and RLC circuits; and determine the equivalent parameters of a choke coil.	K3
CO4	Determine self-inductance, mutual inductance, and coefficient of coupling for coupled coils; and evaluate resonant frequency, bandwidth, and Q-factor for both series and parallel RLC circuits.	K4
CO5	Construct and interpret the locus diagrams for RL and RC series circuits to analyse the variation of current with changing resistance or reactance.	K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	-	-	-	-	-	-	-	3	2	2
CO2	3	3	3	-	-	-	-	-	-	-	-	3	1	3
CO3	3	3	2	2	2	-	-	-	-	-	-	3	2	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	2	2	2	-	-	-	-	-	-	2	1	3
L - Low, M - Moderate, H – High														

List of Experiments

(Any10 of the following experiments are to be conducted)

1. Study various electrical tools, symbols, wiring accessories, Moving Iron, Moving Coil, Energy meter and use of a digital multimeter.
2. Study various types of electrical cables/conductors, switches, sockets, fuses, MCBs, and ELCBs with their specifications and applications.

3. Draw the wiring diagram for control of a lamp from two different locations (staircase wiring).
4. Draw and verify the wiring diagram for control of a lamp from two different locations.
5. Implementation and Testing of a Single-Phase Power Distribution Board with Main Switch, Energy Meter, MCB, and ELCB for Measurement of Power, Energy, and Power Factor.
6. Verification of Kirchhoff's voltage and current laws.
7. Measurement of voltage, current, and power in a DC circuit;
8. Calculate the impedance and power factor of a given series (i)RL(ii)RC(iii)R-L-Ccircuit.
9. Determination of parameters of a choke coil.
10. Determination of self and mutual inductances and coefficient of coupling for a pair of magnetically coupled coils.
11. Determination of resonant frequency, bandwidth, and quality factor of series RLC circuits.
12. Determination of resonant frequency, bandwidth, and quality factor of parallel RLC circuits.
13. Locus diagrams of RL and RC series circuits.

Learning Resources

Textbooks:

1. Hayt,W.H.,&Kemmerly,J.E,(2018). Engineering Circuit Analysis (9th edition.).McGraw-Hill Education.
2. VanValkenburg,M.E,(2019),Networkanalysis(3rd edition.).Prentice-Hall of India.

Reference Books:

1. Alexander, C. K., & Sadiku, M. N. O. (2019). Fundamentals of electric circuits(6th edition.). McGraw-Hill Education.
2. HerbertP.Richter,FredericP.Hartwell,(2014)PracticalElectricalWiring: Residential,Farm, Commercial, and Industrial, (22nd edition), Park Publishing, Inc.
3. S.L.Uppal&G.C.Garg,(2018),ElectricalWiring,EstimatingandCosting,(6th edition),Khanna Publishers.

Web Resources:

1. https://ec-amrt.vlabs.ac.in/List%20of%20experiments.html
2. https://bes-iitr.vlabs.ac.in/List%20of%20experiments.html

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY ESC	IT AND ELECTRONIC WORKSHOP LAB (For EEE branch only)	L	T	P	C
COURSE CODE A2610501		0	0	2	1

Pre-requisites: NIL

Course Objectives:

1. Assemble, configure, install, and maintain computer hardware, operating systems, drivers, utilities, and security software.
2. Introduce students to operating system installation, basic networking, and IT infrastructure fundamentals.
3. Use spreadsheet, presentation, diagnostic, measurement, and documentation tools to analyse data and communicate technical results.
4. Identify, test, measure, and apply electronic components and circuits using digital multimeters, function generators, DSOs, and breadboards.
5. Design, fabricate, assemble, solder, desolder, test, and troubleshoot a basic PCB-based electronic system using EDA and workshop techniques.

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

CO	Course Outcome Statement	Cognitive Level
CO1	Identify and describe the functions of standard computer hardware components, peripherals, and IT infrastructure elements.	K1
CO2	Explain the procedure for operating system installation, software configuration, and basic computer network setup.	K2
CO3	Use Excel and PowerPoint to process academic-performance data, calculate statistical measures, create charts, and prepare a structured technical presentation.	K4
CO4	Identify and test electronic components and use a DMM, function generator, DSO, and breadboard to measure signals and implement basic rectifier and switching circuits	K4
CO5	Implement a simple regulated power-supply circuit on a custom-designed PCB by applying standard EDA layout rules, executing chemical fabrication, and performing reliable component assembly	K3

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	-	2	3
CO2	1	2	1	3	2	-	-	-	-	-	-	2	3
CO3	2	3	2	3	3	-	-	-	2	1	-	1	2
CO4	2	3	2	3	3	-	-	-	-	-	-	3	3
CO 5	3	3	3	3	2	1	-	-	-	1	-	3	3

List of Experiments:

(Any 10 of the following experiments are to be conducted)

Experiment 1: PC Hardware Assembly and Component Identification

• Disassemble and reassemble a standard desktop PC.

• Identify core internal parts: motherboard, CPU, RAM modules, Switched-Mode Power Supply (SMPS), CMOS

battery, and storage drives (SSD/HDD).
• Study the functions of peripherals and standard computer hardware components.

Experiment 2: OS Installation and Drive Partitioning
• Configure BIOS/UEFI boot priority settings.
• Create a bootable USB drive, partition a storage disk, and perform a clean installation of an operating system (such as Ubuntu Linux or Windows).
• Install device drivers and perform basic OS troubleshooting. Experiment.

3: Ethernet Cable Crimping and LAN Testing
• Cut, strip, and arrange twisted-pair wires according to T568A and T568B wiring standards.
• Crimp RJ-45 connectors onto Cat6 cables to create both straight-through and crossover cables.
• Verify connections using a LAN tester and configure a small LAN with IP addressing and subnetting.
• Test network connectivity using ping and tracert commands.

Experiment 4: System Utility and Security Software Installation
• Install and configure basic system utility software (backup tools).
• Install and configure security software (antivirus, firewall).

Experiment 5: Hardware and Software Troubleshooting
• Troubleshoot common hardware faults using diagnostic tools and structured fault-isolation procedures. • Troubleshoot common software faults (boot failures, driver conflicts, application crashes).
• Use system diagnostic tools to identify and resolve system issues.

Experiment 6: Creating a Data-Driven Academic Performance Presentation using Excel and PowerPoint
• Create a student marks dataset in Excel – use gridlines, format cells, apply text formatting, and use auto fill to populate sequential data.
• Use Excel formulae – SUM, AVERAGE, STDEV, MIN, MAX, and COUNT functions with appropriate cell referencing (relative, absolute, and mixed).
• Create charts (bar charts, pie charts, line graphs) to visualize academic performance data.
• Understand PowerPoint orientation – work with slide layouts, insert and format text, apply WordArt, use bullets and numbering, and insert AutoShapes, lines, and arrows for visual enhancement.
• Create interactive elements – add hyperlinks to slides and external resources, insert images, Clip Art, audio, video, and additional objects, tables, and charts to enhance the presentation.
• Explore different slide views (Normal, Outline, Slide Sorter, Notes Page, Reading View, Slide Show) and apply design templates, background styles, textures, and hidden slides for a professional delivery.

Experiment 7: Electronic Component Familiarisation and Testing
• Study and identify active components (diodes, BJTs, MOSFETs, ICs) and passive components (resistors, capacitors, inductors).
• Use a digital multimeter (DMM) to test component functionality, check diode health, measure resistance, and verify capacitor values.
• Decode resistor color codes and verify component datasheet characteristics.

Experiment 8: Waveform Generation and Measurement with DSO
• Learn the operation of a Function Generator to generate sine, square, and triangular waves of varying frequencies.
• Use a Digital Storage Oscilloscope (DSO) to measure peak-to-peak voltage (Vpp), RMS voltage (Vrms), time

period, and frequency.

Experiment 9: Solderless Breadboard Circuit Prototyping
• Understand the internal connections of a breadboard.
• Wire a Full-Wave Bridge Rectifier circuit with a capacitor filter.
• Analyze the input AC versus filtered DC output waveforms on an oscilloscope.
• Design and test a simple switching circuit (e.g., transistor-based LED driver / relay control circuit) on a breadboard.

Experiment 10: PCB Layout Design using EDA Tools
• Introduce Electronic Design Automation (EDA) software like KiCad, EasyEDA, or Autodesk Eagle.
• Create the schematic diagram for a simple 5V regulated DC power supply (using a 7805 IC).
• Design the single-sided PCB layout for the power supply circuit.

Experiment 11: PCB Fabrication and Etching
• Transfer a printed PCB layout onto a copper-clad laminate board using the iron-on/toner-transfer method.
• Perform chemical etching using Ferric Chloride ($FeCl_3$).
• Drill component holes and test trace continuity using a multimeter.

Experiment 12: Soldering and Desoldering Techniques
• Mount and solder discrete components onto a general-purpose PCB to build an multi-pin Integrated Circuits (ICs).
• Practice desoldering multi-pin Integrated Circuits (ICs) cleanly from a scrap circuit board using a desoldering pump and wick.
• Practice through-hole component soldering and rework on a practice PCB.

Learning Resources:
Textbooks: -
1. Sai, S., & Chaturvedi, A. (2020). Basic electronics engineering: Including laboratory manual. Springer. 2. David Anfinson and Ken Quamme, IT Essentials: PC Hardware and Software Companion Guide.

Reference Books: -
1. Boylestad, R. L., & Nashelsky, L. (2013). Electronic devices and circuit theory (11th ed.). Pearson.
2. Meyers, M. (2019). CompTIA A+ certification all-in-one exam guide (10th ed.). McGraw-Hill Education.

Web Resources: -
1. https://nptel.ac.in/courses/122106025
2. Virtual Labs – Computer Organisation and Hardware: https://www.vlab.co.in/broad-area-computer science-and-engineering.

Laboratory and Tool References: -
• KiCad official documentation: KiCad Documentation docs.kicad.
• KiCad getting-started guide: Getting Started in KiCaddocs.kicad.
• KiCad learning resources: KiCad Learning Resourceskicad.
• Ubuntu desktop documentation: Ubuntu Desktop Documentation.
• Ubuntu installation tutorial: Install Ubuntu Desktop.

- Microsoft Windows installation media: Create Windows Installation Media.
- Cisco Networking Academy: Cisco Networking Academy.
- Microsoft Excel help: Excel Help and Learning.
- Microsoft PowerPoint help: PowerPoint Help and Learning.
- Microsoft Windows troubleshooting: Windows Troubleshooting.
- NIST Cybersecurity resources: NIST Cybersecurity.
- Tektronix oscilloscope resources: Oscilloscope Basics.
- Fluke digital multimeter resources: Digital Multimeter Resources.
- LTspice official website: LTspice.
- EasyEDA official website: EasyEDA.
- Autodesk Eagle resources: Autodesk Fusion Electronics.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY MNC	SPORTS AND YOGA (NON-CREDIT MANDATORY) (For EEE Branch only)	L	T	P	C
COURSE CODE A2610013		0	0	2	0

Course Objectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

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

CO1	Understand the importance of yoga and sports for Physical fitness and sound health
CO2	Demonstrate an understanding of health-related fitness components
CO3	Compare and contrast various activities that help enhance their health.
CO4	Assess current personal fitness levels.
CO5	Develop Positive Personality

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i Organizing health awareness programmes in community

ii Preparation of health profile

iii Preparation of chart for balance diet for all age groups

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth game.

Activities:

i. Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics

ii. Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

B. Tech. I Year II Semester

(DR26-COURSE STRUCTURE & SYLLABUS)

ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY HSM	ENGLISH FOR TECHNICAL COMMUNICATIONS (Common to all Branches)	L	T	P	C
COURSE CODE A2620000		3	0	0	3

Pre-requisites: Nil

COURSE OBJECTIVES:

1. Listen the authentic texts to comprehend and respond appropriately as both audience and conversant;
2. Communicate in academic and social (formal) contexts with reasonable fluency and accuracy (neutral accent, social and grammatical appropriateness);
3. Comprehend the texts of various types for academic, technical and career purposes;
4. Write for academic and professional purposes;
5. Communicate across cultures that requires a blend of cognitive, interpersonal, and linguistic skills

COURSE OUTCOMES:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Comprehend specific information, context, and central ideas from social, academic, or workplace conversations and audio-visual material.	K2
CO2	Apply appropriate social norms to bridge the gaps and collaborate effectively across diverse cultural backgrounds	K3
CO3	Examine discourse features and speech strategies to participate effectively in group discussions, informal exchanges, and short presentations on technical and general topics.	K4
CO4	Evaluate the content, limitations and ethical aspects of AI tools in communication and language learning, and apply them to create concise, accurate essays/summaries.	K5
CO5	Construct well-organized paragraphs, essays, critical reviews, and other professional documents suited to academic and workplace contexts.	K6

Remember; K1- Understand; K2- Apply; K3- Analyze; K4- Evaluate; K5- Create

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

Correlation levels 1, 2 or 3 as defined below
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correction

UNIT 1

Effective Communication: Exploring Channels and Methods Vocabulary: Roots, Prefixes, and Suffixes Homonyms

Grammar: Articles, Prepositions, Tenses.

Reading: Definition and Importance, Skills and Sub-Skills of Reading

Writing: Cohesion and Coherence, Paragraph Writing.

Listening: Listening for main ideas and supporting details, Note-taking

Speaking: Introducing self and others, describing people and objects, JAM

UNIT 2

Eco-Consciousness: Negotiating for a Sustainable Future Vocabulary: Contractions, Phrasal Verbs, Idioms & Phrases

Grammar: Subject-Verb Agreement, Conditional Sentences

Reading: Reading for Inference, Point of View, Tone and Perspective.

Writing: Note making, Summarizing, Paraphrasing.

Listening: Listening to various texts and comprehension

Speaking: Role-plays, Extempore.

UNIT 3

Disruptive Technologies: Ethical Implications and Future Prospects Vocabulary: One-Word Substitutes, Commonly Confused Words

Grammar: Degrees of Comparison, Active and Passive Voice, Question Tags.

Reading: Reading the extracts/articles/ essays of the News Papers, Journals and literary texts.

Writing: Paraphrasing, Letter Writing

Listening: Listening to stories, news, documentaries and discussions.

Speaking: Debate, Group Discussions

UNIT 4

Entrepreneurship and Start-Up Culture: Emerging Trends Vocabulary: Business/ Profession/ Career/ Job-related Vocabulary.

Grammar: Sentence Synthesis, Simple, Compound and Complex Sentences.

Reading: Reading various texts for global understanding

Writing: Email Writing, Data Interpretation, Report Writing.

Listening: Listening to debates and discussions.

Speaking: Power Point Presentations by Individuals and Teams.

UNIT 5

Ethical Leadership: Integrating Social Responsibility and Core Values Vocabulary: Advanced Vocabulary for GRE/TOEFL/ IELTS/CAT etc.

Grammar: Sentence Synthesis, Para Jumbles.

Reading: Reading texts for global comprehension.

Writing: Book/Film Reviews, Social Media Etiquette

Listening: Listening to the talks/speeches by the eminent personalities

Speaking: Team Discussions and Presentations

LEARNING RESOURCES:

Textbook:

- Chekuri, T., &Perumalla, R. K. (2026). NextGen English for engineers: A course book for technical English communication. Cengage.
- Coelho, P. (2020). The alchemist. Harper Collins. (Non-Detailed Text)

Reference Books:

- Technical Communication (2nd Ed.) by M. Raman & S. Sharma. Oxford University Press, 2012.
- Effective Technical Communication by M.A. Rizvi, Tata McGraw-Hill, 2005.
- English for Engineers and Technologists, Orient Blackswan 2010 (Combined edition, Vol.1 &2).
- The Oxford Guide to Writing and Speaking by John Seely, Oxford University Press, 2004.

Web Resources:

- eGyanKosh. (n.d.). National digital repository. **https://egyankosh.ac.in/**
- Read Theory. (n.d). Adaptive reading comprehension practice. **https://readtheory.org/**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY BSC	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to all Branches)	L	T	P	C
COURSE CODE A2620001		3	0	0	3

Pre-requisites: Mathematics of 10+2 / Intermediate level (algebra, matrices and basic calculus

Course Objectives:

- To prepare the student to calculate gradient, surface and volume integrals by applying standard theorems.
- This course is aimed to provide the learner with several methods for solving differential equation and partial differential equations.

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

CO	Course Outcome Statement	Cognitive Level
CO1	Model simple physical problems involving rate as first order differential equations and solve the resulting equation	K4
CO2	Apply differential equation techniques to formulate and solve homogeneous and non-homogeneous differential equations, solve simultaneous linear differential equations, and apply these methods to model and analyze L-C-R circuit problems and simple harmonic motion	K3
CO3	Solve partial differential equations that model physical processes	K4
CO4	Apply the knowledge of gradient, divergence and curl and interpret the physical meaning of different operators	K3
CO5	Compute the work done against a field, circulation and flux using vector calculus methods	K4

Remember; K1- Understand; K2- Apply; K3- Analyze; K4- Evaluate; K5- Create

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

Correlation levels 1, 2 or 3 as defined below
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correction

UNIT-I: DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE

Exact equations and equations reducible to exact form (integrating factor), Linear differential equations – Bernoulli's equations. Orthogonal Trajectories, Applications: Newton's Law of cooling –Law of natural growth and decay-Electrical circuits.

UNIT-II: LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS)

Definitions, Homogeneous and non-homogeneous, Complementary function, Particular integral, General solution, Method of variation of parameters-Wronskian. Simultaneous linear equations, Applications to L-CR Circuit problems and Simple Harmonic motion

UNIT-III: PARTIAL DIFFERENTIAL EQUATIONS

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, Solutions of first order linear equations using Lagrange's method, Non-linear partial differential equations using Charpit's Method. Homogeneous Linear Partial differential equations with constant coefficients. .

UNIT-IV: VECTOR DIFFERENTIATION

Scalar and Vector point functions, Vector operator Del, Gradient and applications, Directional derivative, Divergence-Solenoidal and Curl-Irrotational Field - Scalar Potential, Vector identities**.**

UNIT-V: VECTOR INTEGRATION

Line integral–Circulation–Work done by the force, Surface integral-flux,Green's theorem in a plane (without proof), Stoke's theorem (without proof), Volume integral, Divergence theorem (without proof) and their applications.

LEARNING RESOURCES:

Text Books:

1. Grewal,B.S.(2024). Higher Engineering Mathematics, 45th Edition.KhannaPublishers.
2. Kreyszig,E.(2025). Advanced Engineering Mathematics, 11th Edition.JohnWiley&Sons.

Reference Books:

1. Ramana,B.V.(2017).Higher Engineering Mathematics. McGraw Hill Education.
2. James,G.(2018).Advanced Modern Engineering Mathematics.5thEditionPearsonpublishers.
3. Dass,H.K.(2022).Advanced Engineering Mathematics, 22nd Edition. S.Chand Publications.

Web Resources:

- https://mathworld.wolfram.com/First-OrderOrdinaryDifferentialEquation.html
- https://en.wikipedia.org/wiki/Differential_equation
- https://en.wikipedia.org/wiki/Partial_differential_equation
- https://en.wikipedia.org/wiki/Vector_calculus
- https://en.wikipedia.org/wiki/Vector_calculus

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY MNC	NSS / COMMUNITY SERVICE (Common to CE, EEE, ME, ECE and IT Branches)	L	T	P	C
COURSE CODE A2620003		0	0	2	0

Course Objectives:

- The objective of introducing this course is to impart discipline, character, fraternity, team work social consciousness among the students and engaging them in selfless service.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Understand the importance of discipline, character and service motto.	K2
CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques	K3
CO3	Explore human relationships by analyzing social problems.	K4
CO4	Determine to extend their help for the fellow beings and down trodden people.	K5
CO5	Develop leadership skills and civic responsibilities.	K6

Remember; K1- Understand; K2- Apply; K3- Analyze; K4- Evaluate; K5- Create

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

Correlation levels 1, 2 or 3 as defined below
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correction

UNIT-I ORIENTATION

General Orientation on NSS/NCC/Scouts Guides/Community Service activities, career guidance.

Activities:

Conducting–icebreaking sessions-expectations from the course-knowing personal talents and skills
Conducting orientations programs for the students–future plans-activities-releasing roadmap etc.
Displaying success stories-motivational biopic-award winning movies on societal issues etc.
Conducting talent show in singing patriotic songs-paintings-any other contribution.

UNIT-II NATURE &CARE ACTIVITIES

Best out of waste competition.
Poster and signs making competition to spread environmental awareness.
Recycling and environmental pollution article writing competition.
Organising Zero-waste day.
Digital Environmental awareness activity via various social media platforms.
Virtual demonstration of different eco-friendly approaches for sustainable living.
Write a summary on any book related to environmental issues.

UNIT-III COMMUNITY SERVICE ACTIVITIES

Conducting One Day Special Camp in a village contacting village-area leaders-Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.

Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,

Conducting consumer Awareness Explaining various legal provisions etc.

Women Empowerment Programmes –Sexual Abuse, Adolescent Health and Population Education.

Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

- Nirmalya Kumar Sinha &Surajit Majumder, *A Text Book of National Service Scheme* Vol;I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
- *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
- Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e2008
- Masters G.M.,JosephK.and NagendranR."Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
- RamAhuja.*Social Problems in India*, Rawat Publications, NewDelhi.

General Guidelines:

Institutes must assign slots in the Time table for the activities.

Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

Evaluated for a total of 100marks

A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, to tolling to 90 marks.

A student 'shall be evaluated by the concerned teacher for 10marks by conducting viva voce on the subject.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY HSM	ENGLISH FOR TECHNICAL COMMUNICATIONS AND MOODLES LAB (Common to all Branches)	L	T	P	C
COURSE CODE A2620004		0	0	3	1.5

Pre-requisites: Nil

COURSE OBJECTIVES:

1. Develop active listening skills and the traits of an effective listener using lab activities and Ai-based listening tools.
2. Develop speaking and presentation skills through structured practice and AI-speech coaching tools.
3. Apply reading techniques and analyze the texts to strengthen comprehension and employability.
4. Apply writing techniques for technical and professional letters, emails, resumes and report writing to enhance employability.

COURSE OUTCOMES:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Apply a variety of strategies to interpret and comprehend spoken texts/discourse using contextual clues.	K3
CO2	Apply appropriate reading strategies to interpret content/material related to engineering and technology domain.	K3
CO3	Participate in discussions and presentations on general and technical topics.	K3
CO4	Possess an ability to write clearly on topics related to technology and workplace communication.	K3
CO5	Choose functional language, cohesive devices and skills of organization to express clearly in speaking.	K3
CO6	Demonstrate proficiency in using Moodle LMS and digital tools for learning, communication, research, presentations, assignments, quizzes, discussions, and academic activities with integrity, responsible AI use, and professional online behavior.	K3

Remember; K1- Understand; K2- Apply; K3- Analyze; K4- Evaluate; K5- Create

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	3	-	1	-	-
CO2	-	-	-	-	-	-	-	1	3	-	3	-	-
CO3	-	-	-	-	-	-	-	3	3	-	2	-	-
CO4	-	-	-	-	-	-	-	2	3	-	3	-	-
CO5	-	-	-	-	-	-	-	3	3	-	2	-	-
CO6	-	-	-	-	3	-	-	2	3	-	3	-	-

Correlation levels 1, 2 or 3 as defined below
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correction

Part– A

List of Experiments for English for Technical Communication Lab

(Choose any 10 experiments from Part A)

1. Phonetics & Accent Neutralization

- **Sound Lab Drills:** Students record minimal pairs (e.g., /p/– /b/, /t/ – /d/) and compare waveforms using free apps like Voice Recorder.
- **Pronunciation Clinics:** Peer-correction circles where each student reads a short passage focusing on stress and intonation.
- **IPA Treasure Hunt:** Students receive IPA transcriptions, identify the underlying words, and practice pronouncing them accurately.
- **Shadowing Practice:** Students mimic short audio/video clips (newsreaders, documentary narrators) to improve rhythm and reduce mother-tongue influence (MTI).

2. Introducing Self and Others

- **Speed Networking:** Students rotate every 2 minutes and introduce themselves concisely to a new partner.
- **Identity Cards:** Each student prepares a "professional identity card" and introduces another student based on the card's details.
- **Role-Based Introductions** — Introduce yourself in various specific roles: as a student, intern, job applicant, club member, etc.

3. Brief Talk in Formal/Informal Contexts, JAM / Extempore

- **JAM Box** — A box filled with random topics; students pick one topic and speak extemporaneously for 60 seconds.
- **Context Switch** — Students speak on the exact same topic twice: once formally (e.g., presenting at a seminar) and once informally (e.g., chatting with friends).
- **Prompt Cards** — Situational prompts such as: *"Convince your friend to join a club"* or *"Address a class meeting."*

4. Listening Comprehension

- **Audio Quizzes** — Play short audio clips (e.g., public announcements, professional interviews) and answer multiple-choice questions (MCQs).
- **Gap-Fill Listening** — Provide partially blank transcripts; students listen to the recording and fill in missing words.
- **Error Spotting** — Students listen to a narration and actively identify factual inconsistencies or logical errors.

5. Audio-Based Note Taking & Narrating Events

- **Event Reconstruction** — Play an audio clip describing an incident; students reconstruct the event in 5–6 concise bullet points.
- **Timeline Creation** — Students listen to a narrative or technical process description and construct a chronological timeline.
- **Peer Narration** — One student listens to an audio track and narrates the content to a partner, who takes detailed notes.

6. Process Description & Paragraph Writing (Technical Lab Context)

- **Lab-to-Paragraph** — Following a lab experiment, students write a structured process description using appropriate sequence markers (e.g., *first, subsequently, finally*).
- **Flowchart-to-Paragraph** — Convert a technical flowchart or process diagram into a coherent, well-structured paragraph.

- **Reverse Engineering** — Provide a completed technical paragraph; students deconstruct it back into sequential step-by-step instructions and verify accuracy.

7. Group Discussions & Deliberations – Coming to Consensus

- **Consensus Challenge** — Groups deliberate and must unanimously agree on a single solution to a given problem (e.g., *"Best way to reduce campus waste"*).
- **Fishbowl GD** — An inner circle carries out the discussion while an outer circle observes, evaluates, and provides feedback.
- **Ranking Task** — Groups rank a list of items (e.g., *"Top key skills for employability"*) and justify their final consensus.

8. Micro Presentations (2–5 Minutes)

- **One-Slide Presentation** — Students design a single visual slide and present on their topic for 3 minutes.
- **Teach a Concept** — Students explain a fundamental technical idea in simple terms (e.g., *"How Wi-Fi works"*).
- **Object Talk** — Students bring a physical object and present its core function, history, or underlying mechanism.

9. Explaining Concepts – Technical Text-Based

- **Concept Simplification** — Students read a complex technical paragraph and rewrite it clearly for a lay audience.
- **Peer Teaching** — Students teach a key concept from their specific engineering discipline to a partner from a different discipline.
- **Diagram Explanation** — Students analyze a technical diagram and explain its components and workflow verbally.

10. Presenting Logical Arguments – Debates

- **Two-Minute Debates** — Fast-paced, structured debates featuring timed opening arguments and rebuttals.
- **Evidence Hunt** — Students gather empirical data, statistics, or real-world examples to substantiate their stance before debating.
- **Role-Based Debates** — Students debate a topic from assigned perspectives (e.g., *environmental advocate, policymaker, tech industry executive*).

11. Talking About Social Issues & Data Interpretation

- **Data Talk** — Provide data charts or graphs (e.g., *literacy rates, carbon emissions*); students analyze the trends and present key insights verbally.
- **Issue Circles** — Small groups deliberate on a pressing social issue and formulate one actionable, practical solution.
- **Poster-to-Speech** — Students convert a dense visual infographic into a concise 2-minute oral presentation.

12. Interviews – Formal & Semi-Formal

- **Mock Interview Panels:** Students face a panel of peers acting as interviewers.
- **Resume-based Q&A:** Students ask each other questions based on their resumes.
- **Situational Interviews:** Semi-formal scenarios (e.g., club membership, internship, volunteer role).

Part B
(Any 4 Experiments in Part B)

Moodle Learning Management System: Digital Learning & Academic Skills

Course Objectives:

- To become familiar with Moodle LMS and online learning.
- To develop basic digital and academic skills needed for engineering students.
- To learn effective online communication and collaboration.
- To develop skills in assignments, quizzes, presentations, and refresher modules.
- To practice academic integrity and the responsible use of digital technology.

Course Description:

Moodle Learning Management System: Digital learning to enhance Academic Skills. Students familiarize themselves with Moodle LMS and online learning, communication, and collaboration. They develop skills in assignments, quizzes, presentations, and online interviews. They exercise academic integrity and the responsible use of digital technology, adopting tools such as Grammarly, ChatGPT, CultureWizard, Quizlet AI, and Google Speech-to-Text to enhance their respective skills.

List of Experiments

Experiment 1: Introduction to Moodle LMS

- Introduction to Moodle
- Student login and profile management
- Moodle dashboard and course navigation
- Accessing announcements and course materials
- Notifications and calendars

Experiment 2: Learning Through Moodle

- Accessing PDFs, videos, web resources, and lecture materials
- Downloading and organizing study materials
- Moodle lessons and learning activities
- Tracking course completion
- Managing deadlines and study schedules

Experiment 3: Assignments, Quizzes, and Assessments

- Understanding assignment instructions
- Creating and uploading assignments
- File formats and file naming conventions
- Online quizzes and question types
- Viewing marks and teacher feedback
- Resubmission and revision strategies

Experiment 4: Digital Communication and Collaboration

- Moodle forums and discussions
- Academic email etiquette
- Online communication and netiquette
- Group activities and peer learning
- Collaborative learning tools
- Digital presentation skills

Experiment 5: Academic Skills for Engineering Students

- Effective note-taking techniques
- Reading and understanding technical material
- Time management and study planning
- Problem-solving and critical thinking
- Basic research and information-search skills
- Preparing technical reports and presentations
- Introduction to citations and referencing

Experiment 6: Academic Honesty

- Plagiarism and how to avoid it
- Copyright and fair use principles
- Responsible use of AI tools
- Digital privacy and cybersecurity basics
- Evaluating reliable online information
- Professional behavior in online environments
- Practical activities

Experiment 7: Students can complete activities such as:

- Create and update a Moodle profile
- Download course material and organize it into folders
- Submit an assignment through Moodle
- Attempt an online quiz
- Participate in a Moodle discussion forum
- Upload a revised assignment after receiving feedback
- Prepare a short technical presentation

Course Materials & Resources

Lab Manual

- Propel: A Course Book for Technical English Communication. Cengage Publishers, 2026.

Reference Books

1. Raman, Meenakshi, and Sangeeta Sharma. *Technical Communication.* Oxford University Press, 2018.
2. Taylor, Grant. *English Conversation Practice.* Tata McGraw-Hill Education India, 2016.
3. Hewings, Martin. *Cambridge Academic English (B2).* Cambridge University Press, 2012.
4. Sethi, J., and P. V. Dhamija. *A Course in Phonetics and Spoken English* (2nd ed.). Kindle, 2013.
5. Richards, Jack C., Jonathan Hull, and Susan Proctor. *Interchange Level 3 Student's Book with Self-study DVD-ROM* (Vol. 3). Cambridge University Press, 2012.

Web Resources

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. British Council Online English
5. Let's Talk Podcast
6. mmmEnglish with Emma (YouTube)
7. Arnel's Everyday English (YouTube)
8. engVid with Adam (YouTube)
9. EnglishClass101 (YouTube)
10. Speak English With Tiffani (YouTube)
11. BBC Learning English (YouTube)
12. Learn English with Let's Talk - Free English Lessons (YouTube)
13. English Language Club (YouTube)
14. TED-Ed (YouTube)
15. Oxford Online English (YouTube)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY HSM	CHEMISTRY FOR ELECTRICAL SYSTEMS (For EEE branch only))	L	T	P	C
COURSE CODE A2620009		3	0	0	3

Pre-requisites: Nil

COURSE OBJECTIVES:

1. To analyze corrosion mechanisms in electrical infrastructure and develop protection strategies.
2. To understand electrochemical energy storage and conversion for power and mobility applications.
3. To study electrical materials (conductors, insulators, semiconductors, magnetic materials) and their chemistry.
4. To study methods for production greener technologies.
5. To understand quantum chemistry concepts relevant to electronic systems.

COURSE OUTCOMES:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Apply electrochemistry principles and evaluate corrosion mechanisms in electrical infrastructure and design appropriate protection strategies for cables, substations, and grounding systems.	**K3,K5**
CO2	Analyze electrochemical energy-storage systems (batteries, supercapacitors, fuel cells) and select suitable technologies for power and mobility applications.	**K3,K4**
CO3	CO3. Analyze and select electrical and electronic materials (conductors, semiconductors, insulators, polymers, nanomaterials) based on their chemical and physical properties.	**K3,K4**
CO4	CO4. Apply green chemistry and sustainability principles to evaluate renewable-energy technologies, energy efficient electrical systems, e-waste management and environmentally friendly electrical materials.	**K3,K5**
CO5	CO5. Apply quantum-chemistry concepts for materials and energy analysis relevant to electrical engineering.	**K3,K5**

Remember; K1- Understand; K2- Apply; K3- Analyze; K4- Evaluate; K5- Create

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	2	2	1	1	2	1			
CO2	3	3	2	2	2	2	1	-	-	1	2			
CO3	3	3	3	2	3	1	1	2	2	1	2			
CO4	3	3	3	2	3	1	1	2	2	1	3			
CO5	3	2	1	2	1	-	-	-	-	-	2			

UNIT 1: Electrochemistry and Corrosion

- Galvanic and electrolytic cells, electrode potential, Electro-chemical series and its uses, Nernst equation and problems, potentiometry (redox reactions). Conductometric titrations.
- Corrosion: Definition, chemical and electrochemical corrosion; Pilling-Bedworth rule, Galvanic corrosion, differential aeration corrosion, pitting, stress corrosion, Galvanic series, factors affecting corrosion.

- Protective techniques: Selection and proper design, corrosion inhibitors, cathodic protection (sacrificial anodic and impressed-current protection), Anodic protection. Galvanizing (hot-dip, electro-galvanizing); electroplating and electroless plating (nickel and copper).Underground-cable and grounding-system corrosion: stray-current corrosion, earth-electrode and grid corrosion; corrosion in substations, battery terminals, and cooling systems of electrical machines.

UNIT II Energy storage devices

- Primary batteries: Dry cell, Lithium battery, sodium-air batteries (construction, working and applications), zinc-air battery, secondary batteries: lead-acid, Ni-Cd, lithium-ion, sodium ion batteries (construction, charging-discharging reactions and applications). Battery management systems (main functions, basic working, Battery protection).
- Fuel cells: Types of fuel cells (construction, working, applications).
- Supercapacitors: Definition, working principle (EDLC, pseudo-capacitors, hybrid supercapacitors), applications.
- Hybrid batteries: Definition, basic principle, applications.

UNIT III: Electrical & Electronic Materials

- Conductors: Classification and applications of copper, aluminium, silver, and alloys (brass, bronze); resistivity, conductivity, temperature coefficient.
- Semiconductors: Band theory; intrinsic and extrinsic semiconductors (Si, Ge, GaAs); n-type (P, As) and p-type (B, Al) doping.
- Organic semiconductors: Definition, types (organic molecular semiconductors and organic polymer semiconductors), applications.
- Insulators: Solid insulators, liquid insulators, gaseous insulators.
- Polymers: Thermoplastics and thermosetting plastics — cross-linked polyethylene (XLPE), PVC, PTFE, PEEK, polyimide, epoxy resin, silicone rubber (preparation, properties, applications).
- Nanomaterials: Graphene, carbon nanotubes, nanocomposites (one preparation method and applications).

UNIT IV: Green energy technology and its sustainability

Chemistry in Green hydrogen synthesis: Introduction, methods of producing green hydrogen (steam methane reforming, electrolysis, partial oxidation and biomass gasification), Role of catalysts in hydrogen gas production. Importance of Sustainability: Basic concepts of Renewable energy (solar, wind, hydroelectric, geothermal, tidal), Energy efficient electrical systems, Smart Grids, Electric vehicles, E-waste management, Ecofriendly electronic materials.

UNIT V Quantum Chemistry

- Fundamentals of quantum chemistry: Black-body radiation, photoelectric effect, wave-particle duality, de Broglie wave equation, Heisenberg's uncertainty principle.
- Fundamentals of quantum mechanics: Schrödinger wave equation, significance of Ψ and Ψ^2; quantum numbers; particle in a one-dimensional box.
- Molecular orbital theory: bonding in homo- and hetero-nuclear diatomic molecules; energy-level diagrams of O_2, N_2, HF and CO.

- π-molecular orbitals of butadiene and benzene; calculation of bond order.

Learning Resources

Textbooks

1. Jain, P. C., & Jain, M. (2020). Engineering Chemistry (17th ed.). Dhanpat Rai Publishing Company.
2. Agarwal, S. (2026). Engineering Chemistry (5th ed.). Cambridge University Press.

Reference Books

1. Linden, D., & Reddy, T. B. (Eds.). (2001). Handbook of batteries (3rd ed.). McGraw-Hill.
2. Roberge, P. R. (2008). Corrosion engineering: Principles and practice. McGraw-Hill.
3. Shikha, A., & Sharma, R. K. (2019). Engineering Chemistry. Krishna Prakashan Media.

Web Resources

- IEEE Standards Association. (n.d.). IEEE standards. https://standards.ieee.org
- International Electrotechnical Commission. (n.d.). IEC standards for electrical equipment. https://www.iec.ch
- International Renewable Energy Agency. (n.d.). Renewable energy technologies. https://www.irena.org
- U.S. Department of Energy. (n.d.). Energy storage database. https://www.energy.gov
- Bureau of Indian Standards. (n.d.). BIS standards. https://www.services.bis.gov.in

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY BSC	CHEMISTRY FOR ELECTRICAL SYSTEMS LAB (For EEE Branch only)	L	T	P	C
COURSE CODE A2620014		0	0	3	1.5

Course Objectives:

1. To provide hands-on experience in determining fundamental constants and semiconductor band-gap energy through optical and photoelectric experiments.
2. To train students in conductometric, potentiometric and cell-based electrochemical measurement techniques.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Understand Determination of the EMF of a Daniel cell and verification of the Nernst equation.	K3
CO2	Measure conductivity and pH of water/soil samples and perform conductometric and potentiometric titrations to determine acid-base and redox characteristics.	K3
CO3	Apply photocatalytic degradation techniques for dye removal, demonstrating a chemistry-based approach to wastewater treatment.	K4
CO4	Assess the quality of cement through iron content estimation, fineness(sieve analysis),and setting time (Vicat apparatus) tests.	K3
CO5	Estimate the Iron and Calcium in cement sample by colorimeter.	K3

Remember; K1- Understand; K2- Apply; K3- Analyze; K4- Evaluate; K5- Create

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

Correlation levels 1, 2 or 3 as defined below
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correction

LISTOF EXPERIMENTS

(Any **TEN** of the following listed experiments)
(Out of which any **TWO** experiments may be conducted in virtual mode)

1. Verify Beer–Lambert's law and determine the molar absorptivity of a colored solution (e.g.,KMnO4or CuSO4)using a UV-Visible spectrophotometer.
2. To determine the concentration of Fe^{2+}/Fe^{3+}in a given water or l each liquor sample by colorimetry.
3. Identify functional groups present in a given or ganic or mineral-bound sample from its IR spectrum. (virtual lab)
4. Determine the value of Planck's constant using a set of LEDs of different colors (or a photoelectric effect apparatus).

5. Calculate and plot allowed energy levels of an electron confine one-dimensional box of varying length using the particle-in-a-box model. (virtual Lab)
6. Synthesizepolyanilinebyoxidativepolymerizationandqualitativelytestitsconductivity.
7. Determine the average molecular weight of a given polymers ample using an Ostwald/Ubbelohde viscometer.
8. Construct a Zn–Cu galvanic cell and measure its EMF, comparing it with the theoretical value from standard electrode potentials.
9. Determine the corrosion rate of a mild steel coupon immersed in simulated mine water(acidic solution).
10. Assemble a simple Zn–carbon(or lead-acid)cell and measure its voltage and approximate capacity.
11. Determinetheconcentrationofanacidsolutionbyconductometrictitration.
12. Synthesize silver nanoparticles using a plant extract (green synthesis route) and confirm formation via the surface plasm on resonance (SPR) peak.
13. Adsorption capacity of a nanomaterial (e.g., activated carbon nanoparticles or nano-iron oxide) for removal of a dye or metal ion from water.
14. Particle Size Estimation of Colloidal Nanoparticles (Tyndall Effect and Color-Based Study)
15. Determination of a strong acid against a strong base by using potentiometer.
16. Determination of a strong acid against a strong base by using pH meter.
17. Redox titration by using potentiometer.
18. Determination of strength of an acid in Pb-Acid battery.

REFERENCE:

"Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY ESC	ENGINEERING GRAPHICS LAB (Common to CE, ME & EEE Branches)	L	T	P	C
COURSE CODE A2620018		0	1	3	2.5

Pre-requisites: Nil

Course Objectives: The course aims to

1. Develop spatial visualization and graphical communication skills for representing engineering objects, components, structures and systems.
2. Introduce the principles, conventions and standards of engineering graphics, including geometrical constructions, scales, dimensioning, projections and sectional representation.
3. Develop the ability to visualize and represent three-dimensional engineering entities through orthographic, isometric, sectional and surface-development techniques.
4. Develop proficiency in computer-aided engineering graphics, including 2D drafting, 3D modelling, visualization and generation of engineering drawings.
5. Enable students to communicate engineering design information effectively through freehand sketches, conventional drawings and digital CAD models across different engineering disciplines.

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

COs	Course Outcome Statement	Cognitive level
CO1	Apply standard engineering graphics principles and conventions to prepare accurate sketches and engineering drawings.	K 1
CO2	Visualize and represent three-dimensional objects and systems using appropriate projection, orthographic, isometric, sectional, and surface-development techniques.	K 3
CO3	Interpret and transform engineering representations by converting between 2D drawings, 3D views, and physical objects.	K 3
CO4	Use CAD tools to create, modify, and communicate 2D drawings and 3D models with appropriate dimensions, annotations, symbols, and features.	K 3
CO5	Communicate engineering design information effectively through graphical representations, CAD models, and engineering drawings for multidisciplinary engineering applications.	K4

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

SECTION A – Manual Engineering Drawing.

Exp.	Practical Exercise
1	Fundamentals of Engineering Drawing: Lines, lettering, dimensioning, geometrical constructions, symbols and standard drawing conventions
2	Engineering Curves: Construction and applications of ellipse, parabola, hyperbola, cycloid, involute and other commonly used engineering curves
3	Projection of Points and Straight Lines: Projection of points in different quadrants and straight lines in different orientations
4	Projection of Planes: Projection of simple planes parallel, perpendicular and inclined to reference planes
5	Projection of Solids and Engineering Objects: Projection of basic solids and simple engineering objects in different orientations
6	Orthographic and Isometric Views: Conversion between orthographic and isometric representations of simple engineering objects and systems
7	Sections of Solids and Engineering Objects: Sectional views and true shapes of simple solids and objects
8	Development of Surfaces: Development of surfaces of prismatic, cylindrical, pyramidal, conical and other developable forms

SECTION B – Computer-Aided Engineering Graphics (CAD)

Exp.	Practical Exercise
9	Introduction to 2D CAD: Drawing setup, basic drawing and editing commands, layers, dimensions, text, symbols and hatching, Construction of polygons, circles, arcs, ellipse and other engineering curves using CAD.
10	2D CAD – Orthographic Views: Preparation of front, top, side and other appropriate views of simple engineering objects

Learning Resources:

Textbooks:

1. Bhatt, N. D., & Panchal, V. M. (2023). Elementary engineering drawing (53rd ed.). Charotar Publishing House.
2. Narayana, K. L., Kannaiah, P., & Reddy, K. V. (2020). Engineering graphics (2nd ed.). Scitech Publications.

Reference Books:

1. Venugopal, K., & Prabhu Raja, V. (2019). Engineering drawing and graphics (5th ed.). New Age International.
2. Gopalakrishna, K. R. (2018). Engineering drawing (Vols. 1–2). Subhas Stores.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY PCC	ELECTRICAL CIRCUIT ANALYSIS (For EEE)	L	T	P	C
COURSE CODE A2620200		3	0	0	3

Pre-requisites: Basic Electrical Circuits

Course Objectives:

1. To equip students with network theorem skills for simplifying and solving linear circuits under both DC and AC excitations.
2. To develop competency in analyzing balanced and unbalanced three-phase AC systems including phase/line relationships and power measurement.
3. To enable students to solve transient behaviour of first- and second-order DC circuits using classical differential equations and Laplace transforms.
4. To extend transient analysis skills to AC circuits using differential equation and Laplace transform approaches.
5. To introduce two-port network parameters and their interrelations for cascaded system modelling.

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

CO1	Apply Superposition, Thevenin, Norton, MPT, Reciprocity, Millman, and Compensation theorems to simplify linear DC and AC networks	K3
CO2	Analyse balanced/unbalanced three-phase star/delta circuits, compute line/phase quantities, and measure power using the two-wattmeter method.	K4
CO3	Analyse and evaluate the transient response of first-and second-order DC circuits using differential equations and Laplace transforms.	K4
CO4	Analyze and evaluate the transient response of first-and second-order AC circuits using differential equations and Laplace transforms.	K4
CO5	Determine Z, Y, ABCD, Hybrid and g parameters of two-port networks, derive their interrelations, and analyse cascaded connections.	K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	--	--	--	--	--	-	3	2	3
CO2	3	3	2	2	2	--	--	--	--	--	-	3	3	3
CO3	3	3	2	2	2	--	--	--	--	--	-	3	2	3
CO4	3	3	2	2	2	--	--	--	--	--	-	3	2	3
CO5	3	3	2	2	2	--	--	--	--	--	-	3	2	3
1 - Low, 2 - Moderate, 3 – High														

UNIT-I

Network theorems (DC & AC Excitations)

Superposition theorem, Thevenin'stheorem, Norton'stheorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

UNIT-II

Three-phase AC circuits

Phase sequence, star and delta connection of sources and loads, relation between line and phase voltages and currents, Balanced and Unbalanced Three-phase circuits, analysis of balanced three-phase circuit:

measurement of active and reactive power. Analysis of three-phase unbalanced circuits: Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three-phase power.

UNIT-III

Transient Analysis in DC Circuits

Transient response of first-order (R-L,R-C)and second-order (R-L-C) circuits using differential equations. Transient response of first-order (R-L, R-C) and second-order (R-L-C) circuits using Laplace transforms.

UNIT-IV

Transient Analysis in AC circuits

Transient response of first-order (R-L,R-C)and second-order (R-L-C) circuits using differential equations. Transient response of first-order (R-L, R-C) and second-order (R-L-C) circuits using Laplace transforms.

UNIT-V

Two Port Networks

Two-port network parameters–Z,Y,ABCD, hybrid , cascaded networks.

Learning Resources

Textbooks:

1. Hayt,W.H.,&Kemmerly,J.E.(2018).Engineering circuit analysis (9thed.).McGraw-Hill Education.
2. Alexander, C. K., & Sadiku, M. N. O. (2019). Fundamentals of electric circuits(6th ed.). McGraw Hill Education.

ReferenceBooks:

1. VanValkenburg,M.E.(2019).Networkanalysis(3rded.).Prentice-Hall of India.
2. Boylestad,R.L.(2019).Introductory circuit analysis(13thed.).Pearson Education.

Web Resources:

1. https://nptel.ac.in/courses/108105479
2. https://nptel.ac.in/courses/108104139
3. https://nptel.ac.in/courses/117106108

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY PCC	ELECTRICAL CIRCUIT ANALYSIS LAB (For EEE Branch only)	L	T	P	C
COURSE CODE A2620202		0	0	3	1.5

Pre-requisites: Basic Electrical Circuits

Course Objectives:

1. To experimentally validate the foundational DC circuit analysis techniques and the most frequently used linear network theorems.
2. To experimentally verify DC network theorems
3. To determine the condition for maximum power delivery to a load and to extract all standard two-port network parameters for circuit modelling.
4. To enable students to measure active power, power factor, and reactive power in three-phase AC circuits under both balanced and unbalanced loading conditions using the two-wattmeter method.

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

CO	Course Outcome Statement	Cognitive Level
CO1	Verify mesh analysis, Nodal analysis, Superposition theorem, and Thevenin's & Norton's theorems on linear DC resistive networks.	K3
CO2	Verify Thevenin's &Norton's theorems and the Maximum Power Transfer theorem on DC resistive networks.	K3
CO3	Apply Millman's theorem to parallel source networks and experimentally verify Compensation and Reciprocity theorems.	K3
CO4	Determine the Z,Y, H, and ABCD parameters of given two-port networks.	K4
CO5	Measure active power, power factor (for balanced/unbalanced loads), and reactive power (for balanced loads) in three-phase circuits using the two-wattmeter method.	K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	--	--	--	--	--	--	3	2	3
CO2	3	3	3	2	2	--	--	--	--	--	--	3	3	3
CO3	3	3	3	2	2	--	--	--	--	--	--	3	2	3
CO4	3	3	3	2	2	--	--	--	--	--	--	3	2	3
CO5	3	3	3	2	2	--	--	--	--	--	--	3	2	3
1 - Low, 2 - Moderate, 3 – High														

List of Experiments

(Any10of the following experiments are to be conducted)

1. Verification of mesh and nodal analysis.
2. Verification of superposition theorem.
3. Verification of Thevenin's and Norton's theorems
4. ApplicationofMillman'stheoremtoacircuitwithmultipleparallelvoltagesources.
5. Verification of the compensation theorem.
6. Verification of the reciprocity theorem.
7. Verification of the maximum power transfer theorem.

8. Determination of open-circuit(Z)and short-circuit(Y)parameters.
9. Determination of hybrid(H)and transmission (ABCD)parameters.
10. Measure power and power factor in a 3-phase load by the two-wattmeter method for balanced loads.
11. Measure power and power factor in 3-phase load by the two-wattmeter method for unbalanced loads.
12. Measurement of 3-phase reactive power for a balanced load.

Learning Resources

Textbooks:

1. Hayt,W.H.,&Kemmerly,J.E.(2018).Engineering Circuit Analysis (9th ed.).McGraw-Hill Education.
2. Alexander, C. K., & Sadiku, M. N. O. (2019). Fundamentals of electric circuits(6th ed.). McGraw Hill Education.

Reference Books:

1. Van Valkenburg,M.E.(2019).Network analysis(3rded.).Prentice-Hall of India.
2. Boylestad,R.L.(2019).Introductorycircuitanalysis(13thed.).Pearson Education.

Web Resources:

1. https://www.multisim.com/content/KpFNZUsUdN2X76G4XqX7NE/lab-3-kirchhoffs-laws-and-mesh-and-nodal-analysis-1/
2. https://asnm-iitkgp.vlabs.ac.in/List%20of%20experiments.html
3. http://vlabs.iitkgp.ac.in/asnm/#

'DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CATEGORY PCC	SEMICONDUCTOR DEVICES (For EEE Branch only)	L	T	P	C
COURSE CODE A2620400		3	0	0	3

Pre-requisites: Nil

Course Objectives:

1. To introduce the construction and characteristics of a PN junction diode.
2. To develop the ability to analyze and design basic diode rectifier, filter, and voltage-regulation circuits.
3. To emphasize the construction and characteristics of bipolar transistors
4. To emphasize the construction and characteristics of field-effect transistors
5. To familiarize students with special-purpose semiconductor and optoelectronic devices used in electrical systems.

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

CO	Course Outcome Statement	Cognitive Level
CO1	Understand the formation, characteristics, approximations, and electrical behavior of PN junction diodes	K2
CO2	Apply diode characteristics and circuit concepts to analyze rectifiers, filters, Zener voltage regulators and basic DC power supplies.	K3
CO3	Analyze the construction, characteristics, operating regions, configurations, and applications of bipolar junction transistors and transistor-based voltage regulators.	K4
CO4	Analyze the construction, characteristics, transfer characteristics, and applications of JFETs and MOSFETs and compare their performance with BJTs.	K4
CO5	Explain the operation and applications of power semiconductor devices, thyristors, UJT, DIAC,TRIAC, and optoelectronic devices including LEDs, photodiodes, and solar cells.	K2

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	1	–	–	–	–	–	–	2	1
CO2	3	3	2	–	2	–	–	–	–	–	–	2	3
CO3	3	3	2	–	2	–	–	–	–	–	–	3	3
CO4	3	3	2	–	2	–	–	–	–	–	–	3	3
CO 5	3	2	1	–	1	–	–	–	–	–	–	3	3

UNIT-I

PN Junction Diode: PN junction formation and depletion region; diode V-I characteristics; diode approximations (ideal, second, and third approximation); effect of temperature on diode behavior.

PN junction formation and depletion-region analysis; diode current (Shockley) equation and its derivation; junction and diffusion capacitance; diode small-signal (AC) resistance.

UNIT-II

Diode Circuits — Rectifiers, Filters and Voltage Regulation: Half-wave and full-wave rectifiers; bridge rectifier; ripple factor and rectification efficiency; capacitor filters; Zener diode characteristics and basic

voltage-regulator design; elementary DC power-supply design, Zener-regulator performance analysis — line regulation, load regulation, and output resistance.

UNIT-III

Bipolar Junction Transistors — Construction and Characteristics: BJT construction and operation; CE, CB, CC configurations; current components; input/output characteristics; active, cutoff, and saturation regions; qualitative operating-point concept; Voltage transfer characteristics of BJT device; Transistor based voltage regulator design (Series and Shunt).

UNIT-IV

Field Effect Transistors — Construction and Characteristics: JFET construction and characteristics; MOSFET (enhancement and depletion type) construction and characteristics; transfer characteristics; comparison of BJT and FET (input impedance, noise, typical applications). MOSFET non-ideal effects

UNIT-V

Special Semiconductor and Optoelectronic Devices: Power BJT, Power MOSFET, Second breakdown of BJT, SCR construction, operation, and triggering; UJT and its relaxation-oscillator/triggering application; brief introduction to DIAC and TRIAC; LED and photodiode operation; solar (photovoltaic) cell basics.

Learning Resources:

Text Books:

1. Ben G. Streetman, Sanjay Banerjee (2015), Solid State Electronic Devices (7th Edition), Pearson.
2. Donald A Neaman, Semiconductor Physics and Devices-Basic Principles (4th Edition), Mcgraw-Hill.

Reference Books:

1. Millman, J., & Halkias, C. C. (2010). Electronic devices and circuits (2nd ed.). McGraw-Hill Education.
2. Ned Mohan, Tore M. Undeland, William P. Robbins (2022), Power electronics, 3ed: Converters, Applications and Design. Wiley.
3. S. M. Sze, Y. Li, and K. K. Ng (2021), Physics of Semiconductor Devices, 4th ed. Hoboken, NJ, USA: John Wiley & Sons.
4. R. S. Ramshaw (1993), Power Electronics Semiconductor Switches, 2nd ed. London, U.K.: Springer.

Web Resources:

1. https://nptel.ac.in/courses/117106091
2. https://nptel.ac.in/courses/108106181