Department of Electronics and Communication Engineering

A.Y:2026-27

Board of Studies

DR26 Regulations

Course Structure & Syllabus

B. Tech - I Semester and II Semester

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))
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Department of Electronics and Communication Engineering

Course Structure

B. Tech. I Year I Semester

S. No	Category	Course Code	Course Title	L/D	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	ESC	A2610020	Computational Thinking and Problem Solving using C	3	0	0	3
4	ESC	A2610201	Principles of Electrical and Mechanical Engineering	3	0	0	3
5	ESC	A2610022	AI Tools and Applications	0	1	3	2.5
6	BSC	A2610009	Applied Physics for Electrical and Electronics Lab	0	0	3	1.5
7	ESC	A2610500	IT and Electronic Workshop Laboratory	0	0	2	1
8	ESC	A2610205	Principles of Electrical and Mechanical Engineering Laboratory	0	0	3	1.5
9	ESC	A2610021	Computational Thinking and Problem Solving using C Lab	0	0	3	1.5
10	MNC	A2610014	Universal Human Values–II	2	0	0	0
Total				**14**	**1**	**14**	**20**

B. Tech. I Year II Semester

S. No.	Category	Course Code	Course 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	BSC	A2620006	Applied Chemistry	3	0	0	3
4	ESC	A2620500	Data Structures and Algorithms using C and Python	0	1	3	2.5
5	PCC	A2620201	Network Analysis	3	0	0	3
6	ESC	A2620020	Fundamentals of Quantum Technologies	3	0	0	3
7	HSM	A2620004	English for Technical Communications and MOODLES Lab	0	0	3	1.5
8	BSC	A2620011	Applied Chemistry Laboratory	0	0	3	1.5
9	PCC	A2620203	Network Analysis Laboratory	0	0	3	1.5
10	MNC	A2620003	NSS/Community Service	0	0	2	0
Total				**15**	**1**	**14**	**22**

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:

1.	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.
2.	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.	K2, K3, K5
CO2	Develop and use of matrix algebra techniques that are needed by engineers for practical applications.	K2, K3, K5
CO3	Utilize mean value theorems for real life problems.	K2, K3, K5
CO4	Solve problems involving functions of several variables using partial differentiation, total derivatives, Taylor/ Maclaurin series, Jacobians, and optimization techniques including Lagrange multipliers.	K2, K3, K5
CO5	Apply double, triple integrals to solve problems involving their applications	K2, K3, K5
Cognitive Level: 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	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-
1- Low, 2 - Moderate, 3 - High													

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.KhannaPublishers.
2. Kreyszig, E. (2025). Advanced Engineering Mathematics,11th Edition. John Wiley & Sons.

Reference Books:

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

Web Resources:

- https://en.wikipedia.org/wiki/System_of_linear_equations
- https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
- https://www.math.hmc.edu/calculus/tutorials/eigenstuff/
- https://en.wikipedia.org/wiki/Quadratic_form
- https://en.wikipedia.org/wiki/Calculus
- https://en.wikipedia.org/wiki/Partial_derivative
- https://www.whitman.edu/mathematics/calculus_online/section14.03.html
- https://en.wikipedia.org/wiki/Multiple_integral
- http://tutorial.math.lamar.edu/Classes/CalcIII/MultipleIntegralsIntro.aspx

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CATEGORY **BSC**	**Applied Physics for Electrical and Electronics** (Common to EEE & 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's equations and electromagnetic field concepts to antenna-based systems.	**K3**
Cognitive Level: 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	-	-	-	-	-	-	-	-	-	-
1- Low, 2 - Moderate, 3 - High													

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)–dependence of Fermi energy on carrier concentration and temperature –Drift and diffusion currents – Einstein's equation – Hall effect – Hall coefficient – Applications of Hall effect.

UNIT-IV: Introduction to Quantum Mechanics & Quantum Computing

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 textbook 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:

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

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CATEGORY **ESC**	**Computational Thinking and Problem-Solving using C** (Common to EEE & ECE Branches)	**L**	**T**	**P**	**C**
COURSE CODE **A2610020**		**3**	**0**	**0**	**3**

Pre-requisite: Mathematics and logical reasoning at 10+2 level. No prior programming experience is assumed.

Course Objectives:

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
Cognitive Level: 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	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	-	-	-	1	-	1	-	-
1- Low, 2 - Moderate, 3 - High													

UNIT – I: 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 – II

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 – III

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 – IV

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 – V

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:

Textbooks:

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:

- NPTEL. (n.d.). Programming in C. https://onlinecourses.nptel.ac.in/noc21_cs81/preview
- GeeksforGeeks. (n.d.). C programming language. https://www.geeksforgeeks.org/c-programming language/
- Programiz. (n.d.). Learn C programming. https://www.programiz.com/c-programming
- Cplusplus.com. (n.d.). C standard library reference. https://cplusplus.com/reference/clibrary/

- TutorialsPoint. (n.d.). C programming. https://www.tutorialspoint.com/cprogramming/index.html
- W3Schools. (n.d.). C tutorial. https://www.w3schools.com/c/

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CATEGORY **ESC**	**AI Tools and Applications** (Common to CE, ME & ECE Branches)	**L**	**T**	**P**	**C**
COURSE CODE **A2610022**		**0**	**1**	**3**	**2.5**

Pre-requisites: Nil

Course Objectives:

1.	To familiarize students with the landscape of AI tools and their underlying working principles.
2.	To develop competence in prompt engineering for effective interaction with generative AI systems.
3.	To enable students to apply AI tools for data analysis, visualization, and interpretation.
4.	To train students in using AI-assisted tools for coding, writing, and productivity tasks.
5.	To instill awareness of ethical, legal, and societal considerations in AI tool usage.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Recall the categories, capabilities, and limitations of major AI tools (text, image, code, data).	**K2**
CO2	Explain the principles of prompt engineering and how generative AI models process instructions.	**K3**
CO3	Apply AI tools to solve first-year engineering problems in analysis, writing, and coding tasks.	**K3**
CO4	Analyze AI-generated outputs for accuracy, bias, and reliability before use.	**K4**
CO5	Evaluate the ethical, academic-integrity, and societal implications of AI tool use, justifying appropriate usage choices.	**K5**
Cognitive Level: 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	-	-	-	-	1	-	-
CO2	2	2	-	-	3	1	-	1	-	2	1	-	-
CO3	3	3	2	2	3	1	1	-	1	2	2	-	-
CO4	2	3	2	3	3	2	2	3	1	2	2	-	-
CO5	1	2	2	2	2	1	3	3	2	3	2	-	-
1- Low, 2 - Moderate, 3 - High													

UNIT I: Introduction to AI and the AI Tools Landscape

What is AI, Machine Learning, and Generative AI — basic definitions and how they relate to one another. Core categories of AI tools: conversational/text, code assistants, data-analysis tools, image-generation tools, and writing/productivity tools.

How large language models process and generate responses (conceptual, non-mathematical overview). Criteria for selecting the right AI tool for a given task — accuracy needs, cost, data sensitivity, and output format.

Setting up accounts and workspaces; understanding free-tier versus paid-tier capabilities and limitations.

Widely Used AI Tools by Application (for classroom coverage):

Category	Example Tools	Typical Application
Conversational/ General-Purpose AI	ChatGPT, Claude, Gemini, Perplexity	Writing, research, coding help, file/data analysis, cited web search
AI Coding Assistants	GitHub Copilot, Cursor, Claude Code	In-IDE code completion, AI-native editing, multi-file agentic coding
Data Analysis Tools	ChatGPT (Advanced Data Analysis), Microsoft Copilot in Excel, Julius AI	Upload a dataset, generate statistics/charts, spreadsheet formulas via natural language
Image Generation	Midjourney, DALL·E 3, Stable Diffusion / Flux	Illustrations, concept art, design mockups
Writing & Productivity	Grammarly, Gamma, Fathom, Notion AI	Grammar/style checking, slide generation, meeting summaries, task automation
Audio, Video & Presentation (optional)	Eleven Labs, Runway/Sora, Synthesia	Text-to-speech, AI video generation, script-to-video presentations

Teacher Practical Examples (for classroom demonstration):

1. Live comparison of the same general engineering query (e.g., "explain the engineering design process") answered by two different AI chatbots, highlighting differences in response style and accuracy.
2. Walkthrough of an AI tool's interface — settings, conversation history, file upload, and model selection — using a common platform.

Student Exercise Problems (for practice):

1. Create accounts on two AI platforms and compare their responses to a simple engineering question (e.g., "explain the difference between analysis and design").
2. Prepare a one-page comparison chart of five AI tools by category and primary use case.
3. Write a short reflection identifying one task in your daily academic life where an AI tool could help.

UNIT II: Prompt Engineering and Generative AI Tools

Anatomy of a good prompt — context, clear instruction, desired format, and constraints. Zero-shot, few-shot, and chain-of-thought prompting techniques and when to use each. Role-based and context-setting prompts (e.g., asking the AI to respond as a reviewer, tutor, or domain expert). Iterative prompt refinement — diagnosing a poor AI response and rewriting the prompt to fix it. Using generative AI for brainstorming, summarizing, and drafting technical content.

Teacher Practical Examples (for classroom demonstration):

1. Refine a vague prompt (e.g., "explain project scheduling") into a precise one step-by-step, showing output improvement at each stage.
2. Demonstrate few-shot prompting by providing examples to guide the AI toward a specific output format (e.g., a formatted comparison table).

Student Exercise Problems (for practice):

1. Write three versions of a prompt (basic, detailed, role-based) for the same task and compare outputs.
2. Use an AI tool to summarize a one-page technical article and verify the summary against the original.
3. Draft a chain-of-thought prompt to solve a multi-step numerical/logical problem (e.g., a unit conversion or estimation problem) and check the reasoning.

UNIT III: AI Tools for Data Analysis and Visualization

AI-assisted spreadsheet and dataset analysis using natural-language commands. Natural-language querying of datasets to extract summary statistics and insights. AI tools for generating charts, graphs, and visual

summaries from tabular data. Interpreting AI-generated statistical summaries correctly and recognizing their limitations. Identifying and correcting errors or misinterpretations in AI-generated data analysis.

Teacher Practical Examples (for classroom demonstration):

1. Upload a small dataset (e.g., class attendance or survey data) to an AI tool and generate a summary-statistics report and chart using natural-language commands.
2. Show an example where an AI tool misinterprets data (e.g., treats a numeric code as text), and demonstrate how to verify and correct it.

Student Exercise Problems (for practice):

1. Use an AI tool to clean and summarize a small sample dataset (e.g., class attendance or marks data).
2. Generate three different chart types from the same dataset using AI prompts and justify which is most appropriate.
3. Cross-check one AI-generated statistical claim manually and report any discrepancy found.

UNIT IV: AI Tools for Coding, Writing, and Productivity

AI coding assistants — code generation, explanation, and debugging support for simple programs.

AI writing assistants for reports, emails, and technical documentation. AI tools for scheduling, note-taking, and meeting/lecture summarization. AI-assisted presentation and slide-outline generation from a topic prompt. Integrating AI tools into an efficient day-to-day academic and engineering workflow.

Teacher Practical Examples (for classroom demonstration):

1. Use an AI coding assistant to generate a simple program (e.g., a temperature converter), then intentionally introduce a bug and have the AI debug it.
2. Generate a presentation outline and speaker notes from a topic prompt using an AI writing/productivity tool.

Student Exercise Problems (for practice):

1. Use an AI coding tool to write and debug a simple program for a given problem statement.
2. Draft a formal email or short report using an AI writing assistant, then manually edit it for accuracy and tone.
3. Generate a slide outline for a 5-minute seminar topic using an AI tool and refine it.

UNIT V: Ethics, Reliability, and Emerging Trends

Bias and hallucination in AI outputs, and techniques for detecting and fact-checking them. Academic integrity and appropriate citation of AI assistance in coursework and submissions. Data privacy and security considerations, including obligations under India's Digital Personal Data Protection Act, 2023 (DPDP Act), when uploading personal or institutional data. Copyright and intellectual property considerations in AI-generated text and image content. Emerging trends — multimodal AI and AI agents — and their implications for future engineering practice.

Teacher Practical Examples (for classroom demonstration):

1. Show a documented case of AI hallucination (a fabricated fact or citation) and demonstrate how to fact check it.
2. Walk through an example of properly citing AI assistance in an academic submission per institutional guidelines.
3. Walk through a worked example of checking whether AI-generated text or image output raises a copyright/IP concern (e.g., close paraphrasing of a source).

Student Exercise Problems (for practice):

1. Identify and document a hallucination or bias instance produced by an AI tool on a factual query.
2. Draft an "AI usage declaration" for a hypothetical assignment, citing tools and extent of use appropriately.
3. Review the data-handling/privacy policy of one AI tool used in this course and identify one DPDP Act, 2023 compliance consideration relevant to student data.

LEARNING RESOURCES:

Text Books:

1. Marr, B. (2024). Generative AI in practice: 100+ amazing ways generative artificial intelligence is changing business and society. Wiley.
2. Mollick, E. (2024). Co-intelligence: Living and working with AI. Portfolio/Penguin.

Reference Books:

1. Selwyn, N. (2022). Education and technology: Key issues and debates (3rd ed.). Bloomsbury.
2. Susskind, R., & Susskind, D. (2022). The future of the professions: How technology will transform the work of human experts (Updated ed.). Oxford University Press.
3. Russell, S., & Norvig, P. (2021). Artificial intelligence: A modern approach (4th ed.). Pearson

Web Resources:

- Google. (n.d.). Google AI essentials. Grow with Google. https://grow.google/ai-essentials/
- OpenAI. (n.d.). OpenAI documentation and guides. https://platform.openai.com/docs
- Anthropic. (n.d.). Prompt engineering overview. Claude Docs. https://docs.claude.com/en/docs/build-with-claude/prompt engineering/overview
- UNESCO. (2023). Guidance for generative AI in education and research. https://unesdoc.unesco.org/
- AICTE. (2025). AICTE inputs on Artificial Intelligence — Year of AI initiative. https://www.aicte.gov.in/downloads/initiatives/AICTE%20inputs%20on%20Artificial%20Intelligence%20-compre hensive.pdf
- Ministry of Electronics and Information Technology, Government of India. (2023). Digital Personal Data Protection Act, 2023. https://www.meity.gov.in/content/digital-personal-data-protection-act-2023.

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CATEGORY **ESC**	**Principles of Electrical and Mechanical Engineering (For ECE Branch)**	**L**	**T**	**P**	**C**
COURSE CODE **A2610201**		**3**	**0**	**0**	**3**

PART-A
Principles of Electrical Engineering

Pre-requisite: Nil.

Course Objectives:

1.	To introduce the fundamentals of electricity billing, electrical safety, shock protection, fuse and MCB operation, and the construction and operating principles and performance of DC machines.
2.	To provide knowledge of the construction, operation, losses, efficiency, and testing of Single-Phase Transformers.
3.	To develop an understanding of the operating principles, types of three-phase induction motors, BLDC motors, stepper motors, and DC servo motors.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Explain the fundamentals of electricity billing, electrical safety, shock protection, fuse and MCB operation, and the construction, operating principles, and performance of DC machines.	K2
CO2	Analyze the construction, operation, losses, efficiency, and performance of single-phase transformers using OC and SC tests and determine their efficiency and voltage regulation.	K4
CO3	Analyze the operating principles and types of three-phase induction motors, BLDC motors, stepper motors, and DC servo motors.	K4
Cognitive Level: 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	-	-	1	-	-	1	-	-	-	-	-
CO2	3	2	-	2	2	-	-	1	-	-	-	-	-
CO3	3	3	-	2	2	-	-	1	-	-	-	-	-
1- Low, 2 - Moderate, 3 - High													

UNIT - I

Electricity Billing, Safety and DC Machines Electricity Bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Types of Tariff, Calculation of electricity bill for domestic consumers; Equipment Safety Measures: Working principle of Fuse and Miniature Circuit Breaker (MCB).

Electric Shock, Safety Precautions to avoid shock; DC Machines: Principle of operation of DC generator; Principle of operation of DC motor, types, torque equation, applications of DC Motors, losses and efficiency, Swinburne's test, speed control methods – simple numerical problems.

UNIT - II

Transformers

Construction and Principle of operation of single phase transformer, EMF equation, Losses, OC & SC tests – predetermination of efficiency and regulations- simple numerical problems.

UNIT – III

Motors

Three Phase Induction Motor: Production of Rotating Magnetic field, Principle of operation of three phase induction motor, Types: slip ring and squirrel cage motors; BLDC Motor: Principle of operation of BLDC motor, Types of constructions, Surface mounted and interior type permanent magnet DC Motors, Electronic Commutation-Principle of operation of Stepper Motor and DC Servo motor.

LEARNING RESOURCES:

Textbooks:

1. Ed Hughes, (2016), Electrical & Electronic Technology, 12th Edition, Pearson Education
2. Vincent Del Toro, (2015), Electrical Engineering Fundamentals, 2nd Edition, Pearson Education.
3. Electrical Safety, Fire Safety Engineering and Safety Management by Sunil S.Rao, R.K.Jain and Prof. H.L.Saluja, Khanna Publishers,1997,2nd Edition.

Reference Books:

1. Mehta, V. K., & Mehta, R. (2008). Principles of electrical engineering and electronics. S. Chand Publishing.
2. K. Venkataraman, (2008), Special Electrical Machines, Universities Press (India) Private Limited.
3. V. K. Mehta, Rohit Mehta, (2022), Principles of Power Systems, S. Chand Publishing.

Web Resources:

- https://nptel.ac.in/courses/108105155
- https://nptel.ac.in/courses/108105131

PART-B
Basic Mechanical Engineering for Electronics Engineers

Pre-requisite: Nil.

Course Objectives:

1.	Understand the basic principles of mechanical motion, sensors, actuators, robotics and industrial automation relevant to Electronics and allied engineering applications.
2.	Understand the fundamentals of thermodynamics, thermal management, 3D printing and additive manufacturing and their engineering applications.
3.	Familiarize themselves with automotive electronics, electric and hybrid vehicles, energy sources and energy management in modern engineering systems

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Explain the basic principles of kinematics, sensors, actuators, robotics, and PLC-based automation and their applications in electronic and automated systems.	K2
CO2	Explain the basic principles of thermodynamics, heat transfer, thermal management, heat sinks, 3D printing, and additive manufacturing and their applications.	K2
CO3	Describe the role of electronics in automobiles, electric and hybrid vehicles, and explain the basic concepts of energy sources, energy conservation, and energy management.	K2
Cognitive Level: 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	–	–	1	2	–	–	1	3	1	–	–
CO2	1	1	1	–	1	3	2	2	3	3	2	–	–
CO3	1	2	1	1	1	2	1	1	3	3	2	–	–
1- Low, 2 - Moderate, 3 - High													

UNIT- I

Mechanical Systems, Sensors, Actuators and Robotics Kinematics of Machinery: Basic concepts of links, joints and mechanisms; types of motion; degrees of freedom; basic applications in machines and robotics. **Sensors and Transducers**: Basic principles and applications of temperature, pressure, force, displacement, proximity, speed and vibration sensors; basic sensor characteristics. **Actuators:** Basic principles and applications of DC motors, stepper motors and servo motors; introduction to pneumatic and hydraulic actuators. **Basic Principles of Robotics**: Introduction to robotics; basic components of a robot; links, joints, degrees of freedom and robot configurations; end-effectors; applications in electronics and automation. **PLC and Ladder Logic:** Introduction to PLC; basic architecture and working; input/output devices; sensors and actuators; basic ladder logic, timers and counters; simple industrial applications.

UNIT- II

Thermal Management and Additive Manufacturing Basic Thermodynamics: Basic concepts of temperature, heat, work and thermodynamic systems; Zeroth, First and Second Laws of Thermodynamics; simple engineering applications. **Heat Transfer and Thermal Management**: Basic concepts of conduction, convection and radiation; heat generation and cooling of electronic components. **Heat Sinks**: Principle and types of heat sinks; thermal interface materials; natural and forced cooling; applications in processors, LEDs, power electronics and batteries.

3D Printing and Additive Manufacturing: Basic principles and working of 3D printing; basic additive manufacturing processes, advantages, limitations and applications.

UNIT- III

Automotive Electronics and Energy Automotive Electronics: Basic principles of electric and hybrid vehicles, Role of electronics in automobiles; Electronic Control Unit (ECU), automotive sensors and actuators; ABS, airbags and basic vehicle monitoring systems. **Energy Sources:** Conventional and renewable energy sources; solar, wind, hydro, biomass, nuclear and fossil fuels; basic energy conversion concepts, Energy Management: Energy conservation and efficiency.

Note: The subject is intended to provide only basic knowledge of Mechanical Engineering and its applications relevant to Electronics engineering discipline. The evaluation shall be intended to test only the basic knowledge and fundamental understanding of engineering concepts.

LEARNING RESOURCES:

Textbooks:

1. Wicker, J., & Lewis, K. (n.d.). An introduction to mechanical engineering. Cengage Learning India Pvt. Ltd.
2. Kuttan, A. K. K. (n.d.). Robotics. I.K. International Publishing House Pvt. Ltd.
3. Gibson, I., Rosen, D., & Stucker, B. (n.d.). Additive manufacturing technologies. Springer.

Reference Books:

1. Rattan, S. S. (n.d.). Theory of machines. McGraw Hill Education.
2. Groover, M. P. (n.d.). Automation, production systems, and computer-integrated manufacturing. Pearson.
3. Rajput, R. K. (n.d.). Engineering thermodynamics. Laxmi Publications.
4. Holman, J. P. (n.d.). Heat transfer. McGraw Hill.
5. Denton, T. (n.d.). Automobile electrical and electronic systems. Routledge.
6. Twidell, J., & Weir, T. (n.d.). Renewable energy resources. Routledge.

Web Resources:

- **https://www.ni.com/en.html**
- **https://nptel.ac.in/courses/112107298**

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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**

Pre-requisite: NIL

Course Objectives:

1.	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**
Cognitive Level: 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	-	-	-	-
1- Low, 2 - Moderate, 3 - High													

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:

Text Books:

1. Applied Physics Lab Manual (DR26) by Dr. D. Vijay, Asst. Prof. in Physics, G. Sri Lakshmi, Asst. Prof. in Physics, Dept. of BS&H, DNRCET

References:

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

Web Resources:

- V-Lab: vlab.co.in

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CATEGORY ESC	IT and Electronic Workshop Laboratory (For ECE Branch)	L	T	P	C
CC: A2610500		0	0	2	1

Part -A
IT Workshop

Pre-requisites: NIL

Course Objectives: The course is designed to

1.	To introduce the internal parts of a computer, peripherals, I/O ports, and connecting cables.
2.	To demonstrate configuring the system as dual boot with Windows and other operating systems such as Linux and BOSS.
3.	To teach basic command-line interface commands on Linux.
4.	To teach the usage of the Internet for productivity and self-paced lifelong learning.
5.	To introduce compression, multimedia, antivirus tools, and office tools such as word processors, spreadsheets, and presentation tools.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Perform hardware troubleshooting	**K3**
CO2	Understand hardware components and interdependencies	**K3**
CO3	Safeguard computer systems from viruses and worms	**K4**
CO4	Prepare documents and presentations	**K6**
CO5	Perform calculations using spreadsheets	**K4**

Cognitive Level: 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	3	-	-	-	1	2	2	-	-
CO2	3	3	2	3	2	-	-	-	1	1	2	-	-
CO3	3	2	2	3	3	-	-	2	1	1	2	-	-
CO4	2	2	3	2	3	-	-	-	2	3	2	-	-
CO5	2	3	2	2	3	-	-	-	1	2	1	-	-
1- Low, 2 - Moderate, 3 - High													

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also, students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a project certificate. Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

Task 3: Creating project abstract Features to be covered: -Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task 2: Calculating GPA -. Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.
Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT
Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.
• Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"
Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
• Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."
Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
• Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

LEARNING RESOURCES:
Reference Books:
1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition.
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition.
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition.

Part -B
Electronic Workshop

Pre-requisites: NIL

Course Objectives: The course is designed to

1.	To familiarize students with electronic components, their specifications, symbols, packages, applications, and identification methods.
2.	To develop practical skills in using electronic testing instruments and commonly used tools for measurement, testing, soldering, and troubleshooting.
3.	To provide hands-on experience in circuit diagram preparation, data-sheet interpretation, estimation, costing, and the use of EDA tools.
4.	To develop practical skills in PCB design, fabrication, soldering, crimping, interconnection, and SMT-based circuit assembly.
5.	To enable students to assemble, test, analyze, and demonstrate basic electronic circuits and measure electrical parameters using CRO and other laboratory instruments.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Identify and interpret the specifications, symbols, packages, and applications of various electronic components and select suitable components for a given circuit.	**K2**
CO2	Use electronic testing instruments and tools to test components, measure electrical parameters, and troubleshoot basic electronic circuits.	**K3**
CO3	Design and fabricate basic printed circuit boards and demonstrate appropriate soldering, crimping, interconnection, and SMT assembly techniques.	**K3**
CO4	Analyze electronic circuits using CRO and other measurement instruments and determine parameters such as phase difference from Lissajous figures.	**K4**
CO5	Assemble, test, and demonstrate basic electronic circuits and use EDA tools for circuit design, simulation, and documentation.	**K3**

Cognitive Level: 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	3	-	-	-	1	1	-	3	3
CO2	3	3	2	3	3	-	-	-	2	1	2	3	3
CO3	3	3	3	2	3	-	2	-	2	1	2	3	3
CO4	3	3	2	3	3	-	-	-	2	3	-	3	3
CO5	3	3	2	3	3	-	-	-	1	2	2	3	3
1- Low, 2 - Moderate, 3 - High													

LIST OF EXPERIMENTS:

(Any Eight experiments shall be performed from the above list).

1. Familiarization and identification of electronic components with specifications, including functionality, type, size, colour coding, package, symbol, cost, etc. [Active, Passive, Electrical, Electronic, Electro mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sinks, etc.].

2. Study of CRO and use of CRO to generate litigious figures there by calculating the phase between to sinusoidal signal of same frequency.

3. Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA tools such as Dia or XCircuit. Interpretation of data sheets of discrete components and ICs, estimation, and costing.

4. Familiarization and application of testing instruments and commonly used tools such as multimeter, function generator, power supply, DSO, soldering iron, de-soldering pump, pliers, cutters, wire strippers, screwdrivers, tweezers, crimping tool, hot-air soldering and de-soldering station, etc.

5. Testing of electronic components such as resistors, capacitors, diodes, transistors, and JFETs using a multimeter.

6. Study and practice of interconnection methods and soldering techniques using breadboard, wire wrapping, crimping, and soldering. Study of soldering types, selection of materials, safety precautions, and soldering practice on connectors and general-purpose PCBs.

7. Study of Printed Circuit Boards (PCB), including types, single-sided, double-sided, PTH, and processing methods. Design and fabrication of a single-sided PCB for a simple circuit using manual etching with ferric chloride and drilling.

8. Assembling of electronic circuits using SMT (Surface Mount Technology) stations.

9. Assembly, testing, and demonstration of electronic circuits on general-purpose PCBs. Any two circuits from the following:
   - Fixed voltage power supply using transformer, rectifier diode, capacitor filter, and Zener/IC regulator.
   - Square-wave generation using IC 555 timer.
   - Sine-wave generation using IC 741 op-amp.
   - RC-coupled amplifier using BC107 transistor.

10. Introduction to EDA tools such as KiCad or XCircuit.

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CATEGORY **ESC**	**Principles of Electrical and Mechanical Engineering Laboratory** (For ECE Branch)	**L**	**T**	**P**	**C**
COURSE CODE **A2610205**		**0**	**0**	**3**	**1.5**

PART – A
Principles of Electrical Engineering Lab

Pre-requisites: Nil

Course Objectives:

1.	To develop practical skills in obtaining the magnetization characteristics of a DC shunt generator and implementing armature-voltage and flux-control methods for DC-shunt-motor speed regulation.
2.	To develop the ability to determine DC-machine efficiency using Swinburne's test and evaluate the efficiency and voltage regulation of a single-phase transformer using OC and SC test results.
3.	To develop practical competence in analyzing the performance characteristics of three-phase induction motors and determining the voltage regulation of three-phase alternators using the synchronous-impedance method.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Identify electrical wiring components and determine domestic electrical energy consumption.	**K3**
CO2	Determine the efficiency of a DC machine using Swinburne's test and implement armature voltage and flux-control methods for speed control of a DC shunt motor.	**K3**
CO3	Evaluate the efficiency and voltage regulation of a single-phase transformer using OC and SC test results and simulate BLDC motor speed control using Hall-effect sensors and analyze the motor response under different operating conditions.	**K4**
Cognitive Level: 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	3	-	-	1	-	-	-	-	-
CO2	3	3	-	2	3	-	-	1	-	-	-	-	-
CO3	3	3	-	2	3	-	-	1	-	-	-	-	-
1- Low, 2 - Moderate, 3 - High													

List of Experiments
(Any 5 of the following experiments are to be conducted)

1. Study various types of electrical cables/conductors, switches, sockets, fuses, MCBs and Energy meter with their specifications and applications.
2. Determination of Electrical Energy Consumption in Domestic Premises.
3. Speed control of DC shunt motor by armature voltage method.
4. Speed control of DC shunt motor by flux control method.
5. Predetermination of efficiency of a DC Machine by conducting Swinburne's test.
6. Predetermination of efficiency, regulation of a single-phase transformer by conducting OC & SC tests.

LEARNING RESOURCES:

Textbooks:

1. Ed Hughes, (2016), Electrical & Electronic Technology, 12th Edition, Pearson Education.
2. Vincent Del Toro,(2015), Electrical Engineering Fundamentals, 2nd Edition, Pearson Education.
3. Electrical Safety, Fire Safety Engineering and Safety Management by Sunil S.Rao, R.K.Jain and Prof. H.L.Saluja, Khanna Publishers,1997,2nd Edition.

Reference Books:

1.Mehta, V. K., & Mehta, R. (2008). Principles of electrical engineering and electronics. S. Chand Publishing.
2. K.Venkataraman, (2008), Special Electrical Machines, Universities Press (India) Private Limited.
3. V. K. Mehta, Rohit Mehta, (2022), Principles of Power Systems, S. Chand Publishing.

Web Resources:

- https://em-coep.vlabs.ac.in/List%20of%20experiments.html
- https://nptel.ac.in/courses/108105155
- https://nptel.ac.in/courses/108105131

PART – B
Principles of Mechanical Engineering Laboratory

Pre-requisites: Nil

Course Objectives:

1.	Develop basic hands-on skills in mechanical systems, sensors, actuators, robotics and PLC-based automation relevant to Electronics and allied engineering applications.
2.	Gain practical knowledge of thermal management, heat sinks, 3D printing and additive manufacturing through laboratory experiments.
3.	Develop basic practical skills in automotive electronics and energy monitoring/management through hands on experiments.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Demonstrate and apply basic mechanical, sensor, actuator, robotics, and PLC concepts through practical experiments	**K3**
CO2	Perform basic experiments related to thermal management, heat sinks, 3D modelling, and 3D printing	**K3**
CO3	Identify and demonstrate basic automotive sensors and actuators and perform simple energy monitoring and management experiments	**K4**
Cognitive Level: 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	2	2	2	3	1	1	1	2	2	2	3	3
CO2	2	2	2	2	3	2	2	1	2	2	2	3	2
CO3	2	2	2	3	3	2	2	2	2	2	2	3	3
1- Low, 2 - Moderate, 3 - High													

List of Experiments

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

1. **Study of Basic Mechanical Components and Mechanisms**
   Identification and demonstration of links, joints, gears, bearings, shafts and simple mechanisms.

2. **Study of Kinematics of a Simple Mechanism**
   Demonstration of different types of motion, degrees of freedom and measurement of displacement/velocity of a simple mechanism.

3. **Temperature Sensor Response at Different Temperatures**
   Study the response of a temperature sensor at low, room and elevated temperatures.

4. **Measurement of Speed Using a Sensor**
   Measurement of rotational speed using an IR, Hall-effect or optical sensor.

5. **DC Motor as an Actuator**
   Control of speed and direction of a DC motor and study its application as an actuator.

6. **Stepper Motor and Servo Motor as Actuators**
   Demonstration and control of stepper and servo motors for precise position control.

7. **Basic Robot Operation**
   Study the components of a robotic system and demonstrate basic movements of a robot or robotic arm.

8. **Basic Robot Kinematics**
   Demonstration of robot joint movement, degrees of freedom and basic forward kinematics using a simple robotic arm or simulation.

9. **Study of Heat Transfer and Thermal Management**
   Demonstrate conduction, convection and radiation and observe temperature variation using suitable sensors.

10. **Energy Monitoring and Management**
    Measure electrical energy consumption of selected loads using an energy meter/smart energy meter and study energy efficiency and conservation.

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CATEGORY **ESC**	**Computational Thinking and Problem Solving Using C Lab** (Common to EEE & ECE Branches)	**L**	**T**	**P**	**C**
COURSE CODE **A2610021**		**0**	**0**	**3**	**1.5**

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

Course Objectives:

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**
Cognitive Level: 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	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	3	3	-	-	1	1	-	2	-	-
CO5	3	3	2	2	3	-	-	1	1	-	3	-	-
1- Low, 2 - Moderate, 3 - High													

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: OnlineGDB, 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 size of.
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.

LEARNING RESOURCES:

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/
- Geeks for Geeks – C Programming: https://www.geeksforgeeks.org/c-programming-language/

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CATEGORY **MNC**	**Universal Human Values -II** (Common for all Engineering branches)	**L**	**T**	**P**	**C**
COURSE CODE **A2610014**		**2**	**0**	**0**	**0**

Pre-requisites: Nil

Course Objectives:

1.	To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2.	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3.	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Define the terms like Natural Acceptance, Happiness and Prosperity.	K1, K2
CO2	Identify one's self, and one's surroundings (family, society nature).	K1, K2
CO3	Apply what they have learnt to their own self in different day-to-day settings in real life.	K3
CO4	Relate human values with human relationship and human society.	K4
CO5	Justify the need for universal human values and harmonious existence.	K5
CO6	Develop as socially and ecologically responsible engineers.	K3, K6
Cognitive Level: 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	-	2	-	-
CO2	-	-	-	-	-	2	2	3	2	1	2	-	-
CO3	-	-	-	-	-	2	1	3	3	2	3	-	-
CO4	-	-	-	-	-	3	1	3	3	2	2	-	-
CO5	-	-	-	-	-	3	2	3	2	2	3	-	-
CO6	1	1	2	-	-	3	3	3	3	2	3	-	-
1- Low, 2 - Moderate, 3 - High													

UNIT- I:

Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education); Understanding Value Education; Practice Session PS1 Sharing about Oneself; self-exploration as the Process for Value Education; Continuous Happiness and Prosperity – the Basic Human Aspirations; Practice Session PS2 Exploring Human Consciousness; Happiness and Prosperity – Current Scenario; Method to Fulfill the Basic Human Aspirations; Practice Session PS3 Exploring Natural Acceptance.

UNIT- II:

Harmony in the Human Being: Understanding Human being as the Co-existence of the self and the body.; Distinguishing between the Needs of the self and the body; Practice Session PS4 Exploring the difference of Needs of self and body; The body asana Instrument of the self; Understanding Harmony in the self; Practice Session PS5Exploring Sources of Imagination in the self; Harmony of the self with The body; Programme to ensure self-regulation and Health; Practice Session PS6Exploring Harmony of self with the body.

UNIT- III

Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction; 'Trust' – the Foundational Value in Relationship; Practice Session PS7 Exploring the Feeling of Trust; 'Respect' – as the Right Evaluation; Practice Session PS8 Exploring the Feeling of Respect; Other Feelings, Justice in Human-to-Human Relationship; Understanding Harmony in the Society; Vision for the Universal Human Order; Practice Session PS9 Exploring Systems to fulfil Human Goal.

UNIT- IV

Harmony in the Nature/Existence: Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature; Practice Session PS10 Exploring the Four Orders of Nature; Realizing Existence as Co-existence at All Levels; The Holistic Perception of Harmony in Existence; Practice Session PS11 Exploring Co-existence in Existence.

UNIT -V

Implications of the Holistic Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values; Definitiveness of (Ethical) Human Conduct; Practice Session PS12 Exploring Ethical Human Conduct; A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order; Competence in Professional Ethics; Practice Session PS13 Exploring Humanistic Models in Education;HolisticTechnologies,ProductionSystemsandManagementModels-TypicalCaseStudies;
Strategies for Transition towards Value-based Life and Profession; Practice Session PS14 Exploring Steps of Transition towards Universal Human Order.

Practice Sessions for UNIT I– Introduction to Value Education; PS1 Sharing about One self; PS2 Exploring Human Consciousness; PS3 Exploring Natural Acceptance.

Practice Sessions for UNIT II – Harmony in the Human Being; PS4 Exploring the difference of Needs of self and body; PS5 Exploring Sources of Imagination in the self; PS6 Exploring Harmony of self with the body.
Practice Sessions for UNIT III–Harmony in the Family and Society; PS7 Exploring the Feeling of Trust; PS8 Exploring the Feeling of Respect; PS9 Exploring Systems to fulfil Human Goal.

Practice Sessions for UNIT IV – Harmony in the Nature (Existence); PS10 Exploring the Four Orders of Nature; PS11 Exploring Co-existence in Existence.

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics; PS12 Exploring Ethical Human Conduct; PS13 Exploring Humanistic Models in Education; PS14 Exploring Steps of Transition towards Universal Human Order.

LEARNING RESOURCES:

Text book and Teachers Manual:

The Textbook

1. R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

The Teacher's Manual

2. R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. Jeevan Vidya: Ek Parichaya, ANagaraj, JeevanVidyaPrakashan,Amarkantak,1999.
2. Human Values,A.N. Tripathi, New Age Intl. Publishers,NewDelhi,2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth –by Mohandas Karamchand Gandhi
5. Small is Beautiful-E.F Schumacher.
6. Slow is Beautiful-Cecile Andrews
7. Economy of Permanence-J C Kumar appa
8. Bharat Mein Angreji Raj– Pandit Sunderlal
9. Re discovering India-by Dharampal
10. Hind Swaraj orIndian Home Rule-by Mohandas K.Gandhi
11. India Wins Freedom- Maulana Abdul Kalam Azad
12. Vivekananda-Roma in Roll and (English)
13. Gandhi-Roma in Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Teacher preparation with aminimumexposuretoatleastone8-dayFacultyDevelopment Program on Universal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf

3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

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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**
Cognitive Level: 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	-	-
1- Low, 2 - Moderate, 3 - High													

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- II

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 -III

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- IV

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- V

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/**

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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:

1.	To prepare the student to calculate gradient, surface and volume integrals by applying standard theorems.
2.	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**
Cognitive Level: 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	-	-	-	-	-	-	-	-	-	-	-
1- Low, 2 - Moderate, 3 - High													

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-Z.

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 EngineeringMathematics.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

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CATEGORY **BSC**	**Applied Chemistry** (For ECE Branch)	**L**	**T**	**P**	**C**
COURSE CODE **A2620006**		**3**	**0**	**0**	**3**

Pre-requisites: Nil

Course Objectives:

1.	Understand the fundamentals of quantum chemistry, including wave-particle duality, quantum numbers, and molecular orbital theory relevant to computing materials.
2.	Comprehend the chemistry and electronic properties of semiconductor and superconductor materials and the chemical processes involved in semiconductor-device fabrication.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Apply quantum chemistry principles to analyze electronic systems and predict molecular-orbital properties	K3, K4
CO2	Analyze spectroscopic techniques for material characterization and interpret spectral data for molecular identification	K3, K4
CO3	Evaluate semiconductor materials and chemical fabrication processes relevant to electronic-device manufacturing.	K3, K4
CO4	Analyze energy-storage systems and electrochemical principles for communication-device power management	K3, K4
CO5	Design advanced materials solutions using nanotechnology principles and AI-assisted tools for nano electronics	K4
Cognitive Level: 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	-	-
CO2	3	3	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	-	-	-	-	2	-	-
CO4	3	3	-	-	-	-	-	-	-	-	2	-	-
CO5	3	2	-	-	-	-	-	-	-	-	2	-	-
1- Low, 2 - Moderate, 3 - High													

UNIT- I: Quantum Chemistry

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

UNIT -II: Spectroscopy-Instrumental Methods and Applications

Electromagnetic spectrum, UV-Visible spectroscopy:

Beer-lambert law, principle, instrumentation, chromophore, auxochrome, bathochromic shift, hypsochromic shift, applications.

Infrared (IR) spectroscopy: Introduction, principle, instrumentation and applications. Microwave spectroscopy: Introduction, principle, instrumentation and applications. MRI: Working principle,

applications.

UNIT -III: Chemistry of Electronic Materials (Metals and Polymers)

Band theory of semiconductors, Intrinsic and extrinsic semiconductors, Preparation of pure and doped semiconductors, photoconductors (Se)-working principle of Xerox machine, silicon dioxide (SiO_2) formation and properties. Chemistry of compound semiconductors: GaAs, InP, SiC. Photolithography Basic principle, applications

Superconductors: Characteristics, types, applications.

Polymers: Thermoplastics and Thermosetting Plastics, PTFE, Bakelite, Compounding of plastics, conducting polymers: p and n type conducting polymers, photo resist polymers (definition, applications), structure and applications of PMMA (Poly methyl methacrylate), Polyimide, BCB (Benzo cyclobutene), PBO (Poly benzoxazole)

UNIT -IV: Electrochemistry and Energy Storage Devices

Galvanic and electrolytic cells, redox reactions, electrode potential, Nernst equation and problems. Primary batteries: Dry cell, Lithium battery, sodium-air batteries (construction, working and applications), zinc-air battery, secondary batteries: lead-acid, Ni-Cd, Ni-hydride, lithium-ion, sodium-ion batteries (construction, charging-discharging reactions and applications). Battery management systems (main functions, basic working, Battery protection).Fuel cells: PEMFC, DMFC (working, advantages, applications). Super capacitors: EDLC, pseudo-capacitors, hybrid super capacitors.

UNIT -V: Chemistry of Nanomaterials

Introduction to Nano chemistry Carbon nanomaterials: Fullerenes, carbon nanotubes (CNTs), Graphene; synthesis method [chemical vapor deposition (CVD)], Applications. Quantum dots: Synthesis, properties, applications in displays and real time applications. Metallic nanoparticles: Preparation (**sol-gel process**) and applications of gold, silver, and copper nanoparticles. Applications in nanoelectronics, interconnects, sensors (optical and biosensors), memory devices. Spintronics materials: Magnetic nanoparticles, topological insulators.

LEARNING RESOURCES:

Textbooks:

1. Jain, P. C., & Jain, M. (2020). Engineering Chemistry (17th ed.). Dhanpat Rai Publishing Company.
2. Agar wal, 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. Rao, C. N. R., Müller, A., & Cheetham, A. K. (Eds.). (2007). The chemistry of nano materials: Synthesis, properties and applications (Vols. 1–2). Wiley-VCH.
3. Sharma, B. K., & Gaur, H. (2019). Engineering chemistry. Krishna Prakashan Media.

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CATEGORY **PCC**	**Network Analysis** (For ECE Branch)	**L**	**T**	**P**	**C**
COURSE CODE **A2620201**		**3**	**0**	**0**	**3**

Pre-requisite: Basic Electrical Engineering, Engineering Mathematics.

Course Objectives:

1.	To introduce basic laws, mesh and nodal analysis techniques for solving electrical circuits.
2.	To impart knowledge on applying appropriate theorems for electrical circuit analysis.
3.	To explain transient behaviour of circuits in time and frequency domains.
4.	To introduce open-circuit, short-circuit, transmission, and hybrid parameters and their interrelationships.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Understand basic electrical circuits with nodal and mesh analysis.	K2
CO2	Analyze the circuit using network simplification theorems.	K5
CO3	Find the transient response and steady-state response of a network.	K3
CO4	Analyze electrical networks in the Laplace domain.	K4
CO5	Compute the parameters of a two-port network.	K3
Cognitive Level: 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	2	-	-	-	1	2	3	-	-
CO2	3	3	2	2	2	-	-	-	-	1	3	-	-
CO3	3	3	2	1	2	-	-	-	-	1	3	-	-
CO4	3	3	2	2	2	-	-	-	1	2	3	-	-
CO5	3	3	3	2	2	-	-	-	1	2	3	-	-
1- Low, 2 - Moderate, 3 - High													

UNIT -I

Introduction

Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality with examples. Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegen's - problem solving using dependent sources also.

UNIT -II

Transients &Laplace Transform

Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Laplace transform: introduction, Laplace

transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.

UNIT- III

Steady State Analysis of A.C Circuits

Impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving using Laplace transforms also.

UNIT -IV

Resonance

Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies. Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

UNIT-V

Two-Port Networks

Two-port Networks: Relationship of two-port networks, Z-parameters, Y-parameters, Transmission line parameters, h- parameters, Relationships Between parameter Sets, Parallel & series connection of two-port networks, cascading of two-port networks, problem solving using dependent sources, Image and iterative impedances. Image and iterative transfer constants. Insertion loss. Attenuators and pads. Lattice network and its parameters. Impedance matching networks.

LEARNING RESOURCES:

Textbook:

1. Van Valkenburg M.E., Network Analysis, Revised3rdEdition, Prentice Hall of India,2019.
2. Hayt W.H., Kemmerly J., and Durbin S.M., Engineering Circuit Analysis, 9th Edition, McGraw-Hill, 2020

Reference Books:

1. Roy Choudhury D., Networks and Systems, New Age International Publications,2013.
2. Edminister J. and Nahvi M., Electric Circuits, Schaum's Outline Series, 7th Edition, Tata McGraw Hill,2017.
3. Ryder J.D., Network Lines and Fields,2nd Edition,PHI.
4. Alexander C.K.and Sadiku M.N.O., Fundamentals of Electric Circuits, McGraw-Hill Education.

Web Resources & NPTEL Links;

1. NPTEL: Network Analysis–https://nptel.ac.in/courses/108104002
2. MIT OpenCourseWare–Circuits and Electronics:https://ocw.mit.edu/courses/6-002
3. FalstadCircuitSimulator(freeonline):https://www.falstad.com/circuit
4. Python/GoogleColab:https://colab.research.google.com
5. PartSimFree Circuit Simulator:https://www.partsim.com
6. Scilab(freeMATLABalternative):https://www.scilab.org

Recommended Free& Open-Source AI/Computational Tools

1. Python (NumPy, SciPy, Matplotlib)–FREE on Google Colab for circuits imulation and Laplace transform analysis.
2. Scilab (free, open-source)–Formatrix-basedcircuitandtwo-portnetworkcomputations.
3. Falstad Circuit Simulator (free, open-source)–For interactive circuitv is ualisation and transient analysis.
4. Part Sim (free online)– SPICE-based circuit simulation for verification.
5. ChatGPT/Gemini(freetiers)–AI/LLMtoolsforconceptexplanationandstep-by-stepproblem walkthrough.
6. NPTEL Video Lectures–Free network analysis and circuit theory course.

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CATEGORY ESC	Fundamentals of Quantum Technologies (Common to CE & ECE Branches)	L	T	P	C
COURSE CODE A2620020		3	0	0	3

Pre-requisites: Nil

Course Objectives: The course is designed to

1.	Introduce the fundamental concepts of classical and quantum mechanics, including Hamiltonian mechanics, phase space, quantum postulates, operators, state vectors, and time evolution.
2.	Develop an understanding of quantum phenomena such as superposition, entanglement, spin, angular momentum, quantum statistics, and their applications to fundamental physical systems.
3.	Familiarize students with statistical physics, quantum information concepts, entropy, decoherence, noise, and basic quantum information formalisms.
4.	Introduce the principles of computational complexity and quantum computing complexity classes, with an overview of their relevance to quantum information and post-quantum cryptography.

Course Outcomes:

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

CO1	Explain the principles of Hamiltonian mechanics and the historical development, postulates, and mathematical foundations of quantum mechanics.	**K2**
CO2	Apply quantum mechanical operators, state-vector formalism, and time-evolution principles to analyze fundamental systems such as the particle in a box, harmonic oscillator, and hydrogen atom.	**K3**
CO3	Analyze quantum phenomena including superposition, entanglement, spin, angular momentum, coherent states, and quantum statistics of bosons and fermions.	**K4**
CO4	Analyze the principles of statistical physics and quantum information, including Gibbs principle, Shannon entropy, decoherence, noise, and density-operator formalism.	**K4**
CO5	Evaluate basic computational complexity concepts and quantum complexity classes, and relate them to quantum information processing and post-quantum cryptography.	**K5**

Cognitive Level: 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	1	-	-	-	-	1	1	2	2
CO2	3	3	2	2	2	-	-	-	1	1	1	3	3
CO3	3	3	2	3	2	-	-	-	1	1	1	3	3
CO4	3	3	2	3	2	1	2	-	1	1	1	3	3
CO5	2	3	2	2	3	1	1	1	1	2	2	3	3
1- Low, 2 - Moderate, 3 - High													

UNIT-I: Brief overview of classical physics (This segment is meant for the student to understand what a Hamiltonian is, which will feature later in quantum mechanics) : Hamiltonian function and Hamilton's equations, Phase-space description of a system, Connection and Equivalence with Newton's laws for simple systems – free particle, particle moving in a conservative potential, examples of Harmonic oscillator, hydrogen atom Historical evolution of quantum mechanics: Planck's quantum hypothesis, Photo electric effect, Atomic spectra, Bohr's quantisation principle, De Broglie's Wave particle duality.

UNIT-II: Postulates of Quantum Mechanics: State vectors and Hilbert Space, Dirac Bra-Ket notation, Measurables and Hermitian Operators, Unitary Transformations, Schrodinger Equation and Time evolution of quantum states, Measurement Postulate, Schrodinger, Heisenberg and Interaction pictures, Eigen values, Expectation values and Matrix elements, Heisenberg's Uncertainty principle.

UNIT-III: Density operator formalism of quantum mechanics – pure and mixed states; Superposition and Entanglement in quantum mechanics; No cloning theorem; Applications of postulates –Particle in a box, Hydrogen atom, Harmonic Oscillator Number states, ladder operators and Coherent states of a harmonic oscillator; Spin and Angular momentum – spin half particles; Rabi problem of a spin-half particle in a rotating magnetic field; Bosons and Fermions.

UNIT-IV: Statistical Physics: Quick review of first and second laws of thermodynamics, Thermal Equilibrium and Gibbs principle, Applying Gibbs principle to Classical and Quantum harmonic oscillators, Bosons and Fermions and Quantum statistics – Fermi-Dirac and Bose-Einstein distributions.

UNIT-V: Digital communication and information: Quantifying information in terms of Shannon entropy; Basic ideas of quantum information; Decoherence and noise; Introductory ideas of Kraus operators Brief overview of Computational Complexity: Qualitative ideas of a Turing machine: Types of Turing machines; Time and Space complexity – P vs NP, PSPACE; Quantum complexity classes – Q, EQP, BQP, BPP, QMA; Post Quantum Cryptography (PQC).

LEARNING RESOURCES:

Text Books: -

1. Introduction to Quantum Mechanics, Griffiths D. J., 3rd Edition, Cambridge University Press (2024).

Reference Books: -

1. Introduction to Electrodynamics, Griffiths D. J., 4th edition, Cambridge University Press (2020).
2. Principles of Quantum Mechanics, Shankar, R., 2nd edition, Springer (2014).
3. Quantum Information Science – Manenti R., Motta M., 1st Edition, Oxford University Press (2023).
4. Quantum computation and quantum information – Nielsen M. A., and Chuang I. L., 10th Anniversary edition, Cambridge University Press (2010).
5. A Pathak, Elements of Quantum Computation and Quantum Communication, Boca Raton, CRC Press (2015).
6. Information Theory, Robert B. Ash, Dover Publications (2003).
7. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage India Pvt. Ltd. (2014).
8. Statistical Mechanics, Pathria R. K., Paul D. Beale, 4th edition, Academic Press, (2021).

Web Resources: -

- **https://quantum.cloud.ibm.com/learning/en/courses/basics-of-quantum-information?utm_source=chatgpt.com**
- **https://learning.quantum.ibm.com/course/quantum-business-foundations/quantum-computing-fundamentals?utm_source=chatgpt.com**
- **https://quantum.cloud.ibm.com/learning/en/courses/foundations-of-quantum-error-correction?utm_source=chatgpt.com**

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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: The course is designed to

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**
Cognitive Level: 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	-	-
1- Low, 2 - Moderate, 3 - High													

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

LEARNING 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:

- www.esl-lab.com
- www.englishmedialab.com
- www.englishinteractive.net
- British Council Online English
- Let's Talk Podcast
- mmmEnglish with Emma (YouTube)
- Arnel's Everyday English (YouTube)
- engVid with Adam (YouTube)
- EnglishClass101 (YouTube)
- Speak English With Tiffani (YouTube)
- BBC Learning English (YouTube)
- Learn English with Let's Talk - Free English Lessons (YouTube)
- English Language Club (YouTube)
- TED-Ed (YouTube)
- Oxford Online English (YouTube)

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CATEGORY **BSC**	**Applied Chemistry Laboratory** (For ECE Branch)	**L**	**T**	**P**	**C**
COURSE CODE **A2620011**		**0**	**0**	**3**	**1.5**

Pre-requisites: Nil.

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	Apply quantum chemistry principles to analyze electronic systems and predict molecular-orbital properties.	K3, K4
CO2	Analyze spectroscopic techniques for material characterization and interpret spectral data for molecular identification	K3, K4
CO3	Evaluate semiconductor materials and chemical fabrication processes relevant to electronic-device manufacturing	K3, K4
CO4	Analyze energy-storage systems and electro chemical principles for communication-device power management	K3, K4
CO5	Design advanced materials solutions using nano technology principles and AI-assisted tools for nanoelectronics	K4

Cognitive Level: 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	-	-
CO2	3	3	-	-	-	-	-	-	-	-	2	-	-
CO3	3	3	-	-	-	-	-	-	-	-	2	-	-
CO4	3	3	-	-	-	-	-	-	-	-	2	-	-
CO5	3	2	-	-	-	-	-	-	-	-	2	-	-

1- Low, 2 - Moderate, 3 - High

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. Synthesize polyaniline by oxidative polymerization and qualitatively test its conductivity.
7. Determine the average molecular weight of a given polymers ample using an Ostwald/ Ubbelohde viscometer.
8. Construct a Zn- 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(orlead-acid) cell and measure its voltage and approximate capacity.
11. Determine the concentration of an acid solution by conduct microtitration.
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:

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

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CATEGORY **PCC**	**Network Analysis Laboratory** (For ECE Branch)	**L**	**T**	**P**	**C**
COURSE CODE **A2620203**		**0**	**0**	**3**	**1.5**

Pre-requisites: Basic Electrical Engineering, Engineering Mathematics.

Course Objectives:

1.	To provide hands-on experience in analysing electrical circuits using KCL, KVL, mesh analysis, nodal analysis, and network theorems through hardware and simulation tools.
2.	To develop skills in analysing transient and steady-state responses of first-order and second-order electrical circuits.
3.	To familiarise students with frequency response, resonance, Q-factor, bandwidth, and the effects of circuit parameters on network performance.
4.	To develop practical knowledge of two-port network parameters, including Z, Y, H, and ABCD parameters, and their applications.
5.	To develop the ability to design and analyse passive low-pass and high-pass filters for specified cutoff frequencies using hardware and simulation software.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Apply KCL, KVL, mesh analysis, nodal analysis, and network theorems to analyse and verify electrical circuits using hardware and simulation tools	K3
CO2	Analyse the transient and steady-state responses of first-order and second-order RL, RC, and RLC circuits for different circuit parameters	K4
CO3	Analyse the frequency response, resonance characteristics, Q-factor, and bandwidth of series and parallel RLC circuits	K4
CO4	Determine and analyse Z, Y,H, and ABCD parameters of two-port networks and evaluate their frequency response	K4
CO5	Design and evaluate first-order and second-order passive low-pass and high-pass filters for specified cutoff frequencies using hardware and simulation software	K6
Cognitive Level: 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	2	-	-	-	1	1	-	-	-
CO2	3	3	2	3	2	-	-	-	1	1	-	-	-
CO3	3	3	2	3	2	-	-	-	1	1	-	-	-
CO4	3	3	2	3	2	-	1	-	1	1	1	-	-
CO5	3	3	3	3	3	-	-	-	2	1	-	-	-
1- Low, 2 - Moderate, 3 - High													

List of Experiments

At least ten experiments need to be performed using both Hardware and Simulation Software and the result need to be verified.

1. To study components of a circuit and verify KCL and KVL.
2. To verify mesh and nodal analysis for AC circuits.
3. To verify the superposition, Thevenin's & Norton theorems for AC circuits.

4. To verify the maximum power transfer theorem for AC circuits.
5. To verify Thevenin's theorem for two networks of the same topology.
6. To study DC transients in RL, RC, and RLC circuits.
7. To study frequency response of various 1st order RL&RC networks.
8. To study the transient andsteadystateresponseofa2ndorder using RLC Components by varying its various parameters and studying their effects on responses.
9. To find the Q factor and bandwidth of a series and parallel resonant circuit.
10. Determination of open circuit(Z)and short circuit(Y)parameters.
11. Determination of hybrid(H)and transmission (ABCD)parameters.
12. To measure two-port parameters of a twin-T network and study its frequency response.
13. To design the first order lowpass, High pass filters using passive components for different cutoff frequencies.
14. To design the second-order low-pass and high-pass filters using passive components for different cutoff frequencies.

Hardware Requirements:

Regulated power supplies, Analog/Digital Function Generators, digital multimeters, Decade Resistance Boxes/Rheostats, Decade Capacitance Boxes, Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components.

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CATEGORY **ESC**	**Data Structures and Algorithms using C and Python** (For ECE Branch)	**L**	**T**	**P**	**C**
COURSE CODE **A2620500**		**0**	**1**	**3**	**2.5**

Pre-requisite: Basic knowledge of Problem Solving and Programming in C.

Course Objectives:

1.	Introduce students to fundamental programming concepts using Python and strengthen their computational problem-solving skills.
2.	Develop an understanding of fundamental data structures, their representations, operations and applications.
3.	Provide hands-on experience in implementing data structures and algorithms using both C and Python.
4.	Develop the ability to analyze algorithms using time and space complexity and compare alternative solutions.

Course Outcomes:

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

CO	Course Outcome Statement	Cognitive Level
CO1	Explain and implement fundamental programming constructs, functions, recursion, and basic data structures using Python.	K2
CO2	Explain and apply arrays, linked lists, stacks, and queues to solve computational problems	K3
CO3	Implement and analyze trees, heaps, graphs, and hashing techniques using C and Python.	K3
CO4	Implement searching and sorting algorithms and analyze their time and space complexity.	K3
CO5	Select and apply suitable data structures and algorithms to solve practical engineering problems	K5
Cognitive Level: 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	-	3	-	-	-	-	-	2	-	-
CO2	3	3	3	2	3	-	-	-	-	-	2	-	-
CO3	3	3	3	2	3	-	-	-	-	-	2	-	-
CO4	3	3	3	3	3	2	-	-	-	-	2	-	-
CO5	3	3	3	3	3	2	-	-	-	-	3	-	-
1- Low, 2 - Moderate, 3 - High													

Unit -I

Introduction to Python Programming:

Features and applications of Python, Python interpreter and execution environment, Variables, constants and data types, Operators and expressions, Input and output statements, Conditional statements, for and while loops, Nested loops, Strings and string operations, Lists, tuples, sets and dictionaries, Functions and parameter passing, Recursion, Modules and packages, Basic exception handling, Introduction to classes and objects, Introduction to built-in data structures.

Lab Experiments

1. Write a Python program to demonstrate variables, data types and operators.
2. Write a Python program to find the largest and smallest among given numbers.
3. Write a Python program to check prime numbers and generate Fibonacci series.
4. Write a Python program to find factorial using iteration and recursion.
5. Write a Python program to reverse a number and check whether it is a palindrome.
6. Write a Python program to perform list operations.
7. Write a Python program to perform matrix addition and multiplication.
8. Write a Python program demonstrating strings, tuples, sets and dictionaries.
9. Write a Python program using user-defined functions.
10. Write a Python program demonstrating recursion.

UNIT – II

ARRAYS, ALGORITHM ANALYSIS AND LINKED LISTS

Introduction to data structures, Need for data structures, Classification of data structures, Linear and non-linear data structures, Abstract Data Types.

Introduction to algorithms, Time and space complexity, Big-O, Omega and Theta notations, Arrays and their representation, Array traversal, Insertion and deletion, Searching and updating, Two-dimensional arrays, Sparse matrices/

Introduction to linked lists, singly linked lists, Linked-list operations, Applications of linked lists

Experiments using C

1. Implement array traversal, insertion, deletion and updating.
2. Implement sparse matrix representation.
3. Implement a singly linked list.
4. Perform insertion and deletion in a singly linked list.
5. Search for an element in a singly linked list.
6. Reverse a singly linked list.

Experiments using Python

1. Implement array/list traversal, insertion, deletion and updating
2. Implement sparse matrix representation using lists.
3. Implement a singly linked list using a class.
4. Perform insertion and deletion in a singly linked list.
5. Search for an element in a linked list.
6. Reverse a singly linked list.

UNIT – III

Linked Lists, Stacks and Queues Linked Lists:

linked lists Doubly linked lists, Circular linked lists, Insertion and deletion operations, Applications of Stacks: Stack ADT, Push, pop and peek operations, Stack using arrays, Stack using linked lists, Applications of stacks- Parentheses matching, Infix, prefix and postfix expressions, Infix-to-postfix conversion, Postfix expression evaluation

Queues: Queue ADT, Queue operations, Queue using arrays, Queue using linked lists, Circular queues, Applications of queues.

Experiments using C

1. Implement a doubly linked list.
2. Implement a circular linked list.
3. Implement a stack using an array.
4. Implement a stack using a linked list.
5. Implement a queue using an array.

6. Implement a queue using a linked list.
7. Implement a circular queue.
8. Check balanced parentheses using a stack.
9. Convert an infix expression to postfix.
10. Evaluate a postfix expression

Experiments using Python

1. Implement a doubly linked list using classes.
2. Implement a circular linked list.
3. Implement a stack using a list.
4. Implement a stack using a user-defined class.
5. Implement a queue using a list/class.
6. Implement a circular queue.
7. Check balanced parentheses using a stack.
8. Convert an infix expression to postfix.
9. Evaluate a postfix expression.

UNIT – IV

Trees and Heaps

Introduction to non-linear data structures, Tree terminology, Root, parent, child, leaf, level and height, Binary trees, Binary tree representation, Tree traversals- Preorder, Inorder, Postorder, Binary Search Trees- BST insertion, BST searching, BST deletion, Introduction to heaps, Min heap, Max heap, Heap insertion and deletion, Heapify, Heap sort Applications of trees and heaps.

Experiments using C

1. Create a binary tree using structures and pointers.
2. Implement preorder traversal.
3. Implement inorder traversal.
4. Implement postorder traversal.
5. Implement a Binary Search Tree.
6. Implement insertion and searching in a BST.
7. Implement deletion in a BST.
8. Implement a min heap.
9. Implement a max heap.
10. Implement heap sort.

Experiments using Python

1. Create a binary tree using classes.
2. Implement preorder traversal.
3. Implement inorder traversal.
4. Implement postorder traversal.
5. Implement a Binary Search Tree.
6. Implement insertion and searching in a BST.
7. Implement deletion in a BST.
8. Implement a min heap.
9. Implement a max heap.
10. Implement heap sort.

UNIT – V

Graphs, Hashing, Searching and Sorting Graphs;

Introduction to graphs, Graph terminology, Directed and undirected graphs, Weighted and unweighted graphs, Adjacency matrix, Adjacency list, Breadth First Search, Depth First Search, Applications of graphs Hashing: Introduction to hashing, Hash functions, Hash tables, Collision handling, Linear probing,

Quadratic probing, Separate chaining Searching: Linear search, Binary search, Comparison of searching algorithms Sorting: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, algorithms

Experiments using C

1. Represent a graph using an adjacency matrix.
2. Represent a graph using an adjacency list.
3. Implement Breadth First Search.
4. Implement Depth First Search.
5. Implement hashing using linear probing.
6. Implement linear search
7. Implement binary search.
8. Implement bubble sort.
9. Implement selection sort.
10. Implement insertion sort.
11. Implement merge sort.
12. Implement quick sort.

Experiments using Python

1. Represent a graph using an adjacency matrix.
2. Represent a graph using an adjacency list.
3. Implement Breadth First Search.
4. Implement Depth First Search.
5. Implement hashing using linear probing.
6. Implement hashing using separate chaining.
7. Implement linear search.
8. Implement binary search.
9. Implement bubble sort.
10. Implement selection sort.
11. Implement insertion sort.
12. Implement merge sort.
13. Implement quick sort.

LEARNING RESOURCES:

Text Books:

1. Reema Thareja, Data Structures Using C, 3rd Edition, Oxford University Press, 2023
2. Michael T. Goodrich, Roberto Tamassia and Michael H. Goldwasser, Data Structures and Algorithms in Python, 1st Edition, Wiley, 2013.
3. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, Universities Press.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, 3rd/4th Edition, MIT Press.
2. Brad Miller and David Ranum, Problem Solving with Algorithms and Data Structures Using Python, Franklin, Beedle & Associates.
3. Wing, J. M. (2006). Computational thinking. Communications of the ACM, 49(3), 33–35. https://doi.org/10.1145/1118178.1118215.

Web References:

- Python Software Foundation. (n.d.).The Python tutorial.https://docs.python.org/3/tutorial/
- W3Schools. (n.d.).Python tutorial.https://www.w3schools.com/python/
- NPTEL. (n.d.). Programming, data structures and algorithms using Python.https://nptel.ac.in

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CATEGORY **MNC**	**NSS/Community Service** (Common for all Branches)	**L**	**T**	**P**	**C**
COURSE CODE **A2620003**		**0**	**0**	**2**	**0**

Pre-requisite: Nil

Course Objectives:

1.	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**
Cognitive Level: 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	-	-
1- Low, 2 - Moderate, 3 - High													

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 avillage 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., Joseph K. and Nagendran R. "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.

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