AR-25

COURSE STRUCTURE

AND

DETAILED SYLLABUS OF

ELECTRICAL AND ELECTRONICS ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2025-2026)

ADITYA INSTITUTE OF TECHNOLOGY ANDMANAGEMENT
(AUTONOMOUS)

Approved by AICTE, Accredited by NBA & NAAC,
Recognised under 2(f)12(b) of UGC

Permanently Affiliated to JNTUGV, Vizianagaram K.Kotturu,
Tekkali, Srikakulam-532 201, Andhra Pradesh.

VISION OF THE INSTITUTE

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

MISSION OF THE INSTITUTE

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that efficiency for employability increases on a continued basis.

VISION OF THE DEPARTMENT

The department of Electrical and Electronics Engineering is committed to innovation and excellence in teaching, research, service and provide programs of the high quality, collaborative efforts with industry to produce world class engineering professionals.

MISSION OF THE DEPARTMENT

M1. To inculcate value based, socially committed professionalism to the cause of overall development of students and society.

M2. Cultivate the spirit of entrepreneurship and the connection between engineering and business that encourages technology commercialization.

M3. Improve continuously the engineering pedagogical methods employed in delivering its academic programs.

M4. Evolve thoughtfully in response to the needs of industry, society and the changing world.

PROGRAM EDUCATIONAL OBJECTIVES

On successful completion of under graduation in Electrical and Electronics Engineering, the graduates are expected to attain the following program educational objectives.

PEO1: The graduates would be employed as a practicing engineer in fields such as design, research, development, testing and manufacturing.

PEO2: The graduates would be engaged in lifelong self-directed learning to maintain and enhance professional skills and to undertake higher studies.

PEO3: The graduates will be able to create new methods to meet the society needs or to become an entrepreneur with their gained knowledge and confidence.

PEO4: The graduates will be able to exhibit their communication skills, team spirit, leadership skills and ethics with social responsibility.

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering, fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO-PROGRAM SPECIFIC OUTCOMES

PSO1: Ability to exhibit the basics of Engineering to identify, formulate, design and solve complex problems of Electrical and Electronics Engineering.

PSO2: Practice the application of appropriate techniques of hardware and software tools in power systems, power Electronics and Industrial Automation.

PSO3: To Exhibit success in higher studies and competitive examinations in the field of Multi-Disciplinary Environments.

INCUCTION PROGRAMME

S. No.	Course Name	Category	L-T-P-C
1	Physical Activities--Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counseling	MC	2-0-2-0
3	Orientation to all branches — career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch—corresponding labs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills—focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

Aditya Institute of Technology and Management, Tekkali
AR-25 – COURSE STRUCTURE (1st B.Tech.)
(Proposed for EEE)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B.Tech. (1stSem)	MC	25MCS101	Induction Program	3 weeks			0
	BH	25BHT102	Linear Algebra & Calculus	2	1	0	3
	BH	25BHT104	Engineering Physics	3	0	0	3
	ES	25EST101	Basic Electrical Engineering	3	0	0	3
	ES	25EST106	Computer Programming	3	0	0	3
	ES	25ESL103	CAED Lab	0	0	3	1.5
	ES	25ESL104	Engineering Workshop	0	0	3	1.5
	BH	25BHL102	Engineering Physics Lab	0	0	3	1.5
	ES	25ESL101	Basic Electrical Engineering Lab	0	0	3	1.5
	ES	25ESL105	Computer Programming Lab	0	0	3	1.5
	MC	25MCS102	NSS/NCC/Scouts &Guides/Community Service	0	0	1	0.5
Total				**11**	**1**	**16**	**20**

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B.Tech. (2ndSem)	BH	25BHT101	Communicative English	3	0	0	3
	BH	25BHT103	Differential Equations and Vector Calculus	2	1	0	3
	BH	25BHT106	Chemistry	3	0	0	3
	ES	25EST105	Basic Engineering Mechanics	3	0	0	3
	PC	25ECT101	Electronic Devices and Circuits	3	0	0	3
	PC	25ECL101	Electronic Devices and Circuits Lab	0	0	3	1.5
	BH	25BHL101	Communicative English Lab	0	0	3	1.5
	BH	25BHL104	Chemistry Lab	0	0	3	1.5
	MC	25MCS103	Health and Wellness, Yoga and Sports	0	0	1	0.5
	BH	25BHS104	Design Thinking and Sustainable Development	1	0	2	2
Total				**15**	**1**	**12**	**22**
Mandatory Socially Relevant Internship using Design Thinking and Sustainable Development of 02 weeks duration							

LINEAR ALGEBRA & CALCULUS
(Common for all branches)

Subject Code: 25BHT102	L	T	P	C
	2	1	0	3

Course Objectives:

The objectives of this course are to:

1. Understand and apply fundamental concepts of matrices, including rank, inverse, and solutions of linear systems using direct and iterative methods.
2. Explore linear and orthogonal transformations, eigen values, eigenvectors, and apply the Cayley-Hamilton theorem and canonical forms.
3. Gain proficiency in calculus through the application of Mean Value Theorems and function approximations using Taylor's and Maclaurin's series.
4. Analyze and apply techniques in multi variable calculus including partial differentiation, Jacobian and optimization using Lagrange multipliers.
5. Apply double and triple integration techniques for calculating areas, volumes and other applications in engineering contexts.

Course Outcomes:

On successful completion of this course, students will be able to:

- **CO1:** solve systems of linear equations and analyze matrices using rank, inverse, and elimination methods.
- **CO2:** analyze and simplify matrices using eigenvalues, eigenvectors and the Cayley-Hamilton theorem.
- **CO3:** apply mean value theorems and function expansions to approximate and interpret real-valued functions.
- **CO4:** use multi-variable calculus to find partial derivatives and solve optimization problems.
- **CO5:** compute and apply double and triple integrals to evaluate areas and volumes in engineering contexts**.**

UNIT–I: Matrices:
Rank of a matrix by echelon form and normal form; inverse of non-singular matrices using Gauss-Jordan method. System of linear equations: Solving homogeneous and non-homogeneous systems using Gauss elimination method and Gauss-Seidel iteration method.

UNIT–II: Linear Transformation and Orthogonal Transformation:
Eigen values and eigenvectors and their properties (without proof); diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding the inverse and powers of a matrix using the Cayley-Hamilton Theorem. Quadratic forms: Nature of quadratic forms; reduction of quadratic forms to canonical form using orthogonal transformation.

UNIT–III: Calculus:
Mean Value Theorems: Rolle's Theorem, Lagrange's Mean Value Theorem and Cauchy's Mean Value Theorem with geometrical interpretations.Taylor's and Maclaurin's Theorems with remainders (without proof); problems and applications based on the above theorems.

UNIT–IV: Partial Differentiation and Applications (Multivariable Calculus):
Partial derivatives, total derivatives, chain rule, change of variables; Taylor's and Maclaurin's series expansion for functions of two variables; Jacobians; maxima and minima of functions of two variables; method of Lagrange multipliers.

UNIT–V: Multiple Integrals (Multivariable Calculus):
Double integrals – change of variables (Cartesian and Polar coordinates); change of order of integration. Triple integrals – cylindrical and spherical coordinates. Applications of double integrals (Area) and triple integrals (Volumes).

Text Books*:*

1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, JohnWiley & Sons, 2018.
3. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2018.

Reference Books:

1. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham & M.V.S.S.N.Prasad, Engineering Mathematics-I, S.Chand Publisher, 2020.
2. R.K. Jainand S.R.K. Iyengar, Advanced Engineering Mathematics, 5/Ed, Alpha Science International Ltd.,2021 (9^{th} reprint).
3. Michael Greenberg, Advanced Engineering Mathematics, 9^{th}edition, Pearson edn.

ENGINEERING PHYSICS
(Common for all branches)

Subject Code: 25BHT104	L	T	P	C
	3	0	0	3

Course Objectives

To introduce the basic concepts of physical optics phenomena, such as interference and diffraction. Understanding of the concepts of quantum mechanics and semiconductor physics, as well as dielectric and magnetic materials, that lead to potential applications in emerging micro devices.

Course Outcomes: The students will be able to

CO-1: Understand the phenomenon of interference and diffraction of light, enabling precise analysis of optical instruments.

CO-2: Acquire foundational insight into the quantum nature of the particles and electronic properties of the semiconductors.

CO-3: Develop insight into the dielectric and magnetic properties of materials

CO-4: Analyze the crystal structures by X-ray diffraction techniques.

CO-5: Apply the basic knowledge of lasers and fiber optics to analyze their construction.

UNIT-I: WAVE OPTICS 10 hrs

Interference: Introduction - Principle of superposition and its Analytical treatment - Interference of light - Interference in thin films (Reflection Geometry) - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction –difference between interference and diffraction – difference between Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & Diffraction Grating (N-slit) – Maximum number of orders possible – determination of wavelength of laser.

Unit-II: QUANTUM MECHANICS ANDSEMICONDUCTORS 10hrs

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrödinger's time-independent wave equations– Particle in a one-dimensional infinite potential well.

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors and Extrinsic semiconductors - Drift and diffusion currents – Einstein's equation - Hall effect and its Applications.

UNIT-III: DIELECTRICS AND MAGNETIC MATERIALS 8hrs

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius-Mossotti equation.

Magnetic Materials: Introduction - Magnetic dipole moment – Magnetization-Magnetic susceptibility and permeability - Classification of magnetic materials: Dia, Para, Ferro, Antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT IV: CRYSTALLOGRAPHY & X-RAY DIFFRACTION 10 hrs

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC

X-ray diffraction: Miller indices – separation between successive (hkl) planes - Bragg's law - X-ray Diffractometer – crystal structure determination by Laue method and Powder method.

Unit – V: LASERS& OPTICAL FIBER 10 hrs

LASERS: Introduction - Characteristics of Lasers - Principles of Laser: Absorption, Spontaneous emission, stimulated emission, principle of lasing action, population inversion, pumping, Types of Lasers: Helium-Neon Laser [Four Level System] –semiconductor laser - Applications of Lasers.

OPTICAL FIBER: Introduction - Construction of Optical Fiber - Principle of Optical Fiber: Total Internal Reflection - Numerical Aperture and Acceptance Angle - Classification of optical fibers based on refractive index profile - Applications of Optical Fibers in Communication.

Text Books

1. "A Text book of Engineering Physics" - M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S.Chand Publications, 11th Edition 2019.
2. "Engineering Physics" - D. K. Bhattacharya and Poonam Tandon, Oxford press (2015).
3. "Engineering Physics" - P. K. Palanisamy SciTech publications.

Reference Books

1. "Fundamentals of Physics" - Halliday, Resnick and Walker, John Wiley &Sons.
2. "Engineering Physics" - M.R. Srinivasan, New Age international publishers (2009).
3. "Engineering Physics" - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
4. "Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
5. "Semiconductor physics and devices:Basic principle" - A. Donald, Neamen, Mc GrawHill.
6. "Engineering Physics" - B.K. Pandey and S. Chaturvedi, Cengage Learning
7. "Solid state physics" – A.J.Dekker ,Pan Macmillan publishers
8. "Introduction to Solid State Physics" - Charles Kittel ,Wiley

BASIC ELECTRICAL ENGINEERING
(Common for ECE & EEE)

Subject Code: 25EST101	L	T	P	C
	3	0	0	3

Course Objectives:

- To introduce the basic knowledge of electric circuits.
- To illustrate knowledge with network reduction techniques.
- To analyze AC circuits.
- To become familiar with magnetic circuits.
- To become familiar with DC Machines.

Course Outcomes:

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

CO 1. To summarize different electrical circuits.
CO 2. To construct network reduction techniques
CO 3. To outline the basics of AC circuits.
CO 4. To examine magnetic circuits.
CO5. To describe DC Machines.

Unit -I

Introduction to Electric Circuits: Basic definitions, Electrical circuit elements (R, L and C), Classification of Network elements, Voltage and current sources Independent and dependent sources, Ohm's Law, Series & Parallel circuits, Source transformation,

Unit -II

Network Reduction Techniques: Kirchhoff's Laws, Star-Delta transformation, Nodal Analysis, Mesh analysis -Problems associated with this concept.

Unit -III

AC Circuits: Sinusoidal voltage and currents, concept of cycle, time period, frequency, instantaneous, peak, average, R.M.S. values, peak factor and form factor, phase difference, lagging, leading and in phase quantities and phasor representation. Study of A.C circuits of pure resistance, inductance and capacitance and corresponding voltage- current phasor diagrams. Analysis of single-phase ac circuits consisting of RL, RC, RLC combinations, real power, reactive power, apparent power, power factor, simple problems.

UNIT-IV

Magnetic Circuits:

Basic definitions of magnetic flux, flux density, Reluctance, Magneto motive force (M.M.F), magnetic field intensity. Comparison between magnetic and electrical circuits, inductively coupled circuits, self and mutual inductances, coefficient of coupling, dot convention- Series aiding and opposing and parallel aiding and opposing, simple problems.

Unit -V

DC Generators:

Fleming's right-hand rule, statically and dynamically induced EMF's, Generator-Principle of Operation, Construction, EMF equation, Classification of D.C generators.

DC Motors:

Fleming's left hand rule, Motor-principle of operation, Torque equation, Classification of D.C Motors Speed Control Methods, Operation of 3pointstarter.

Text Books

1. D.P.KothariandI.J.Nagrath,"BasicElectricalEngineering",TataMcGrawHill,2010.
2. Schaum's Outline of Basic Electrical Engineering (SCHAUMS' ENGINEERING) by J. J. Cathey (Author), Syed A. Nasar (Author).

Reference Books

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Electrical Engineering Fundamentals, 2e by Vincent Deltoro.

COMPUTER PROGRAMMING

Subject Code: 25EST106	L	T	P	C
	3	0	0	3

Course Objectives

- To provide a strong foundation in problem solving and programming is using the C language.
- This course introduces number systems, core programming concepts, control structures, arrays, functions, pointers, structures, and file handling.
- Emphasis is on writing efficient, modular, and error-free programs suitable for real-world applications.

Course Outcomes

Upon successful completion of this course, students will be able to:

1. Explore number systems and develop basic C programs using algorithms, flowcharts, and simple I/O operations.
2. Apply decision-making, looping, and branching statements to solve conditional and repetitive problems.
3. Use arrays and strings for data storage and manipulation.
4. Design modular programs using functions and apply pointer concepts for dynamic and memory optimized programs.
5. Devise programs to manage and store complex data using structures and files.

Unit–I

Introduction to Number System: Number Systems - Binary, Decimal, Octal, and Hexadecimal Systems, and Conversions

Introduction to Programming: Introduction to components of the Computer system, Algorithm, Flow chart, Program development steps, C Tokens, Data Types, Operator precedence and associativity, Expression Evaluation, Structure of C program, simple programs using formatted and unformatted I/O statements, preprocessor directives.

Unit–II

Control Structures:

Decision statements: if, if-else, nested if, if-else-if ladder, and switch case.

Iterative statements: while, do-while, for, nested loops.

Branching Statements: Break and continue.

Unit–III

Arrays: Definition, Types of Arrays, declaration, initialization, Operations on arrays.

Strings: Fundamentals, declaration, initialization, accessing string, String manipulation.

Unit–IV

Functions: Definition and use, Declaration, Types of Functions, Parameter passing (Call by value and call by reference), Passing Arrays, Recursion, Recursion vs. Iteration, function Vs Macro, Storage classes.

Pointers: Definition, Declaration, Initialization, Pointer arithmetic, functions and pointers, Pointer to pointer, arrays and pointers, Pointers as Function Arguments, DMA.

Unit–V

Structures, Unions and File Handling

Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrays with in structures, pointer to structure, passing structure to function, nested structures, self-referential structures, bit fields.

File Handling: Purpose, Types of files, file opening modes, closing a file, file I/O, Error Handling, Random Access to Files, Command line arguments.

Text Books:

1. B. W. Kernighan and D. M. Ritchie, The C Programming Language, 2nd ed., Englewood Cliffs, NJ, USA: Prentice-Hall, 1988.
2. Y.Kanetkar, Let UsC,20th ed., New Delhi, India: BPB Publications,2024.
3. N.Kamthane, Programming in C, 3rded.,New Delhi,India:Pearson Education,2015.

Reference Books

1. E.Balagurusamy, Programming in ANSIC,9thed.,NewDelhi,India:McGraw-HillEducation, 2024.
2. B.S.Gottfried, Programming with C,2nded.,NewYork,NY,USA:McGraw-HillEducation,2006.

Resource Links

1. https://www.programiz.com/c-programming
2. https://www.geeksforgeeks.org/c/c-programming-language/
3. https://www.tutorialspoint.com/cprogramming/index.htm

CAED LAB

(Common for ECE, EEE, CSE, CSM, CSD, IT, and CSC)

Subject Code: 25ESL103	L	T	P	C
	0	0	3	1.5

COURSE OBJECTIVES:

- To introduce students to AutoCAD tools for creating precise 2D and 3D drawings applicable across multiple engineering disciplines.
- To develop skills in editing, organizing, and annotating technical drawings as per standard drafting practices.
- To enable students to represent objects through projections, orthographic, and isometric techniques.

COURSE OUTCOMES:

Upon the completion of this course, the students will be able to

CO1: Configure the AutoCAD environment by setting drawing units, limits, and scales, and develop precise 2D geometries using appropriate drawing and basic modify commands for accurate technical representation.

CO2: Apply advanced modify commands along with hatching techniques to create complex 2D layouts and incorporate dimensioning and annotations as per industry drafting standards

CO3: Organize technical drawings using multi-layer management and generate accurate projections of points and lines in simple positions to enhance clarity and readability

CO4: Produce orthographic projections of planes and 3D objects by applying correct projection methods to achieve precise multi-view drawings suitable for engineering documentation

CO5: Design simple 3D models and convert them into fully annotated 2D views, developing complete, domain specific technical drawings suitable for real-world engineering applications

Syllabus:

Introduction to AutoCAD Environment: Overview of CAD software, Configuring drawing units, limits, scales, and setting up templates for standardized work. Introduction to layers, line types, colors, and object properties.

Basic Drawing Commands: Creating fundamental 2D geometries using commands such as Line, Polyline, Circle, Arc etc. Methods of coordinate entry including absolute, relative, and polar coordinates.

Modify Commands – Basic & Advanced: Using modify tools such as Move, Copy, Rotate, Mirror, Trim, Extend, Fillet, Chamfer, Scale, and Offset to refine drawings. Advanced editing using Array (rectangular and polar), Break, Stretch, and other productivity-enhancing commands.

Hatching, Dimensioning, and Annotation: Applying hatch patterns and gradients for sectional views. Dimensioning techniques including linear, aligned, angular, radial, and ordinate dimensions. Adding text annotations using standard drafting conventions as per BIS/ISO standards.

Layer Management & Drawing Organization: Creating and managing multiple layers with appropriate line types, line weights, and colors for organizing complex technical drawings.

Projection of Points, Lines, and Planes: Representing points and lines in simple positions. Creating projections of planes in simple orientations.

Orthographic Projections of Solids: Creating front, top, and side views from given 3D objects. Converting pictorial representations into multi-view orthographic drawings with correct dimensions and annotations.

Basic 3D Modelling: Introduction to creating simple 3D objects such as blocks, cylinders, cubes, and cones. Viewing and visualizing 3D models from multiple perspectives. Generating orthographic views from 3D solids for engineering documentation.

Final Integrated CAD Design Project: Designing and developing a real-world object relevant to the specific engineering domain including complete annotations and dimensions.

List of experiments

1. Setting drawing units, limits, and scales and creating basic 2D geometries (lines, circles, polygons, arcs) using drawing commands. **CO1**
2. Creation of complex 2D geometries using modified commands (move, copy, rotate, mirror, trim, extend, fillet, chamfer, scale, offset). **CO1**
3. Creation of complex 2D geometries using advanced modified commands (array, break, stretch etc.) **CO2**
4. Creating hatch patterns and gradients for sectional views and apply dimensioning and annotating to a given drawing. **CO2**
5. Creating multi-layered drawings with assigned properties. **CO3**
6. Creating projection of points and lines in simple positions. **CO3**
7. Creating projection of planes in simple positions. **CO4**
8. Creating orthographic projection of given 3D objects (front, top, and side views). **CO4**
9. Creating a simple 3D object (e.g., block, cylinder, cube, cone) and generating its orthographic views. **CO5**
10. Drawing and dimensioning a real-world object relevant to the specific engineering domain (e.g., Basic device casing for ECE, Simple circuit layout for EEE, Network rack layout for CSE, etc.) **CO5**

Text Books

1. Tickoo, S. (2024). *AutoCAD 2025 for engineers & designers*. CADCIM Technologies.
2. Shih, R. H. (2024). *AutoCAD 2025 tutorial: First level 2D fundamentals*. SDC Publications.

ENGINEERING WORKSHOP
(Common for ME, CE, ECE, and EEE)

Subject Code: 25ESL104	L	T	P	C
	0	0	3	1.5

COURSE OBJECTIVES:

- The Engineering Workshop Practice for engineers is a training lab course spread over entire semester. The modules include training on different trades like Fitting, Carpentry, Black smithy etc., which makes the students to learn how various joints are made using wood and other materials.

COURSE OUTCOMES:

Upon the completion of this course, the students will be able to

CO1: Make half-lap, mortise & tenon, corner dovetail or bridle wooden joints

CO2: Develop sheet metal into objects like square tray, taper side tray, conical funnel or elbow pipe

CO3: Fabricate metal plates into a straight, square, dovetail or V-fit joints

CO4: Forge MS rod to round or round to square cross-section, or into L- or S- bend.

CO5: Construct wiring system for staircase or a godown, parallel and series or tube light wiring.

List of experiments

I. Wood Working: Familiarity with different types of wood and tools used in wood Working.

Tasks to be performed:
i. Half - Lap joint **ii.** Corner Dovetail joint **iii.** Mortise and Tenon joint **iv.** Bridle joint

II. Sheet Metal Working: Familiarity with different types sheet metal and tools used in sheet metal work, development of sheet metal jobs from sheet metal & knowledge of basic concepts of soldering.

Tasks to be performed:
i. Square Tray **ii.** Taper side Tray **iii.** Conical Funnel **iv.** Elbow Pipe.

III. Fitting: Familiarity with different types of metals & tools used in fitting.

Tasks to be performed:
i. "V" – fitting **ii.** Square fitting **iii.** Dovetail fitting **iv.** Semi Circular fitting

IV. Forging: Familiarity with different types of metals to be forged and the tools used in forging. Knowledge of different types of furnaces like coal fired, electrical furnaces etc.

Tasks to be performed:
i. Round M.S rod to Square bar **ii.** L- bend from given M.S. Rod.
iii. S- bend from given M.S. Rod. **iv.** Heat treatment tests like annealing, normalizing etc.

V. House wiring

Tasks to be performed:

i. Series & Parallel wiring connection **ii.** Staircase wiring connection

iii. Godown Lighting **iv.** Tube light connection

Text Books

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

References

1. Elements of Workshop Technology, Vol.I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers,Mumbai.2007,14thedition
2. Workshop Practice by H. S.Bawa,Tata-McGrawHill,2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P. A.; Atul Prakashan, 2021-22.

ENGINEERING PHYSICS LAB
(Common for all branches)

Subject Code: 25BHL102	L	T	P	C
	0	0	0	3

Course Objectives

Applying the basic concepts of optical phenomena like interference and diffraction for verifying dimensions of thin objects, recognising the importance of the energy gap in the study of electrical properties of semiconductors, and investigating the parameters and applications of lasers and optical fibers through experiments.

Course Outcomes: The students will be able to

CO-1: Verify the microscopic dimensions of the objects by applying principles of interference and diffraction.

CO-2: Acquire a practical understanding of semiconductor physics by analyzing electronic Properties of the semiconductors.

CO-3: Analyze the induced magnetic field in a current-carrying circular coil.

CO-4: Corroborate the mechanical properties of the materials

CO-5: Evaluate the characteristics of the lasers and fiberoptics

List of Experiments

1. Determination of the radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of the thickness of a thin object using wedge shaped film.
3. Determination of wave lengths of different spectral lines in the mercury spectrum using a diffraction grating in normal incidence configuration.
4. Determination of the width of a slit using the diffraction phenomenon.
5. Determination of the temperature coefficient of a thermistor.
6. Determination of the energy band gap of a given semiconductor
7. To study the V-I characteristics of a pn junction diode in forward and reverse biasing conditions.
8. Magnetic field along the axis of a current-carrying circular coil by Stewart Gee's Method.
9. DeterminationofaccelerationduetogravityandradiusofGyrationbyusingacompound pendulum.
10. Determination of the rigidity modulus of the material of the given wire using the Torsional pendulum
11. Determination of the wave length of Laser light using a diffraction grating.
12. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using the Hall effect.
14. Sonometer: Verification of laws of stretched string.
15. Determination of the Frequency of the electrically maintained tuning fork by Melde's experiment.

16. Determination of crystal structure and lattice parameter of a given crystal using powder diffraction data.
17. Determination of Young's modulus of the given beam by non-uniform bending.
18. Determination of dielectric constant using the resonance method.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

References:

- A Text book of Practical Physics-S. Balasubramanian, M.N. Srinivasan, S.Chand Publishers, 2017.

Web Resources

- www.vlab.co.in
- https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

BASIC ELECTRICAL ENGINEERING LAB
(Common for ECE & EEE)

Subject Code: 25ESL101	L	T	P	C
	0	0	0	3

Course Objective:
To introduce the verification of the basic circuit laws related to electrical engineering and performance of D.C. Machines.

Course Outcomes:
Students will be able to
CO 1. Demonstrate various basic electrical laws.
CO 2. Examine the behaviour of series RL circuit.
CO 3. Demonstrate speed control DC motor & Characteristics of generator.
CO 4. Explain Fan and tube light connection.
CO 5. Examine tariff calculation.

List of Experiments:
1. Verification of Ohm's law
2. Verification of the total resistance of the series and parallel connected circuits
3. Verification of Kirchhoff's Current law
4. Verification of Kirchhoff's Voltage law.
5. Determination of power factor for series RL circuit.
6. Energy meter reading and tariff calculation with lamp load.
7. Speed control of D.C. Shunt motor.
8. Magnetization characteristics of DC shunt generator.
9. Experimental study and practical demonstration of fan wring and operation.
10. Practical demonstration of tube light wiring and starter circuit in a florescent lamp setup.

Additional Experiments:
11. Study and demonstration of 3-point Starter for DC shunt motor.
12. Load Test on DC Shunt Generator.

COMPUTER PROGRAMMING LAB
(Common for all branches)

Subject Code: 25ESL105	L	T	P	C
	0	0	3	1.5

Course Objectives

- To equip students with hands-on programming skills using the C language by solving a variety of real-life and algorithmic problems.
- The course emphasizes the use of control structures, arrays, functions, pointers, structures, and file handling through practical implementation.
- It aims to develop logical thinking and modular coding practices aligned with foundational computing principles.

Course Outcomes

Upon successful completion of this course, students will be able to:

- Apply basic C programming constructs such as variables, data types, operators, and input/output operations to solve simple problems.
- Develop programs using control structures to implement decision making and iterative tasks.
- Demonstrate the usage of arrays to solve problems related to lists of elements.
- Implement modular and memory optimized programs using functions and pointers.
- Design programs using structures and file handling techniques to manipulate stored data.

List of Experiments

1. Write the C programs to perform the following
   a) Simple and compound interest calculation
   b) Find the maximum of 3values using the conditional operator.
   c) Inter changing values of two variables.
2. Write the C programs to perform the following
   a) Demonstrate the precedence and associativity among operators using single expression
   b) Demonstrate the type casting operations
   c) Demonstrate different format specifies on different data types
3. Write C programs for the following using decision making statements
   a) Find roots of quadratic equation.
   b) Find the max and min of three numbers using if-else.
   c) Determine type of character (vowel, consonant, digit, specialcharacter).
4. Write the C programs to perform the following
   a) Read a number and display in reverse.
   b) Check for Armstrong number property
   c) Convert a binary number (entered as an integer) into its decimal equivalent.
5. Write a menu-driven C program using switch-case and loops to display:
   a) Prime numbers in a given range
   b) Fibonacci series
   c) Different patterns like Pascal triangle
6. Implement the following using arrays
   a) Largest and smallest from a list of elements.
   b) Program for Linear Search.
   c) Program for arranging elements.

7. Implement the following using arrays
   a) To count the total number of duplicate elements in anarray.
   b) Matrix addition
   c) Matrix multiplication
8. Write a program in C using functions
   a) Implementation of strong number property.
   b) Implementation of call by value and call by reference
   c) Demonstratethestringoperationswithandwithoutlibraryfunctions(length,reverse,copy, concatenation, compare)
9. Write the C programs to perform the following
   a) GCD using recursion and non-recursion.
   b) Demonstrate working of macros vs functions.
10. Write the C programs to perform the following
   a) Find the sum and average of the list of elements using DMA Functions
   b) Demonstrate pointer arithmetic.
11. Write the C programs to perform the following
   a) Passing structure as a parameter to a function
   b) Nested structures.
12. Write the C programs to perform the following
   a) Count the number of lines, words, and characters in a file using command line arguments.
   b) Merging the contents of two files into a new file.

Text Books

1. B.W.Kernighan and D.M.Ritchie, The C Programming Language,2nded.,EnglewoodCliffs,NJ, USA: Prentice-Hall, 1988.
2. Y.Kanetkar, Let UsC,20thed.,NewDelhi,India:BPBPublications,2024.
3. N.Kamthane, Programming in C,3rded.,NewDelhi,India:PearsonEducation,2015.

Reference Books

1. E.Balagurusamy, Programming in ANSIC,9thed.,NewDelhi,India:McGraw-HillEducation, 2024.
2. B.S.Gottfried,Programming with C,2nded.,NewYork,NY,USA:McGraw-HillEducation,2006.

Reference Links

1. https://www.programiz.com/c-programming
2. https://www.geeksforgeeks.org/c/c-programming-language/
3. https://www.tutorialspoint.com/cprogramming/index.htm

NSS/NCC/Scouts & Guides/Community Service
(Common for all branches)

Subject Code: 25MCS102	L	T	P	C
	0	0	1	0.5

Course Objectives

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

Course Outcomes

Up on successful completion of this course, students will be able to:

1. Understand the importance of discipline, character and service motto.
2. Solve some societal issues by applying acquired knowledge, facts, and techniques.
3. Explore human relationships by analyzing social problems.
4. Determine to extend their help for the fellow beings and down trodden people.
5. Develop leader ship skills and civic responsibilities.

Unit – I Orientation

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

Activities:

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

Unit – II Nature & Care

Activities:

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

Unit – III Community Service

Activities:

1. Conducting One Day Special Campina village contacting village-area leaders-Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc.
2. Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
3. Conducting consumer Awareness. Explaining various legal provisions etc.
4. Women Empowerment Programmes Sexual Abuse, Adolescent Health and Population Education.
5. Any other programmes in collaboration with local charities, NGOs etc.

Reference Books

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I,VidyaKutirPublication,2021(ISBN978-81-952368-8-6)
2. Red Book-National Cadet Corps–Standing Instructions VolI & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. DavisM.L.andCornwellD.A.,―IntroductiontoEnvironmentalEngineering‖,McGrawHill,New York 4/e 2008
4. Masters G.M.,Joseph K.and Nagendran R.―Introduction to Environmental Engineering and Science‖, Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines

1. Institutes must assign slots in the Time table for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines

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

COMMUNICATIVE ENGLISH
(Common for all branches)

Subject Code: 25BHT101	L	T	P	C
	3	0	0	3

Course Objectives:

The main objective of introducing this course, communicative English, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and as to make them industry-ready.

Course Outcomes

By the end of this course, learners will be able to:

1. **Identify** and **comprehend** the main ideas, supporting details, and context from literary texts and audio materials. *(Remembering, Understanding)*
2. **Demonstrate** the ability to participate in conversations and discussions by **expressing** ideas clearly on familiar and academic topics. *(Applying, Analyzing)*
3. **Compose** grammatically accurate sentences, paragraphs, and emails using appropriate structure and punctuation. *(Applying, Creating)*
4. **Apply** reading strategies such as skimming, scanning, and inference to **analyze** written texts effectively. *(Applying, Analyzing)*
5. **Use** a range of vocabulary, including synonyms, antonyms, and technical terms, to **enhance** both spoken and written communication. *(Understanding, Applying)*

Instructions:

1. There adding texts can be given as podcasts to the students so that their listening skills can be enhanced.
2. While listening and reading to the text can be given as home work, the class work for the Student's can be to discuss and critically evaluate the texts based on the context, purpose or writing the text and understanding it from the author's as well as reader's point of view.
3. Reading as habit for both academic and non-academic (pleasure) purposes has to be inculcated in the students. So training has to be given in intensive and extensive reading strategies.
4. Writing for both academic(assignments, examinations, reports, e-mails/letters etc)
5. The writing tasks given in the class are to be self and peer evaluated by the students before they are finally graded by the faculty. Note: Please note that the texts given here are just contexts for teaching various language skills and sub skills. The students' ability to use language cannot be confined to comprehending or using the language related to the given texts (textbooks).The given texts can be used only for practice.
6. All the activities to develop language skills have to be integrated and interconnected, within each unit and across the units.

UNIT- I

Lesson: **HUMAN VALUES: Luck by Mark Twain (Short story)**

Listening: Identifying the topic, the context and specific pieces of information by Listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of Information.

Writing: Capital Letters and Punctuation; Commonly Misspell Words (That has to be part of the bridge course- 2 weeks before the actual academic Programme starts)

Grammar: Verbs; Tenses; Types of Sentences

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root-words, One word Substitutes

UNIT-II

Lesson: **NATURE: Ode to the West wind by P B Shelly (Poem)**

Listening: Answering a series of questions about main ideas and supporting ideas after Listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Structure of a paragraph - Paragraph Writing (specific topics)

Grammar: Use of Articles; Prepositions; Active & Passive Voice

Vocabulary: Homonyms, Homophones, Homographs.

UNIT-III

Lesson: ***BIOGRAPHY: The Knowledge Society – A P J Abdul Kalam)***

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.

Reading: Reading a text in detail by making basic inferences-recognizing and interpreting, Specific Context clues; strategies to use text clues for comprehension

Writing: Writing structured essays on specific topics.

Grammar: Adjectives; Degrees of Comparison; Clauses and Phrases

Vocabulary: Compound words, Collocations.

UNIT-IV

Lesson: ***INSPIRATION: Like a Tree, Unbowed by Wangari Maathai***

Listening: Making predictions while listening to conversations/ transactional dialogues Without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/ Patterns/ relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters; E-Mail
Grammar: Direct & Indirect speech; Cohesive devices-linkers; Formation of Simple, Compound and Complex Sentences.
Vocabulary: Words often confused and Jargons.

UNIT-V

Lesson: **MOTIVATION: The Secret of Work – Swami Vivekananda**

Listening: Identifying key terms, understanding concepts and answering a series of relevant
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension.
Writing: Summarizing, Product Description Paraphrasing
Grammar: Editing short texts–identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition,OrientBlackSwan, 2023 (Units 1,2 & 3)

Reference Books:

1. Professional Communicative English, Maruti Publications,2019
2. Epitome of Wisdom, Maruti Publications, 2013
3. Infotech English, Maruti Publications, 2021
4. English Essentials, Maruti Publications, 2014
5. Bailey, Stephen .Academic writing: A Hand book for International Students.Routledge,2014.
6. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge UniversityPress,2019.
7. Lewis, Norman. Word Power Made Easy-The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources*:*

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common for all branches)

Subject Code: 25BHT103	L	T	P	C
	2	1	0	3

Course Objectives:

The objectives of this course are to:

1. Develop understanding of first-order and first-degree differential equations and their real-world applications.
2. Introduce methods to solve higher-order linear differential equations with constant coefficients and apply them to engineering systems.
3. Equip students with techniques for forming and solving partial differential equations relevant to physical processes.
4. Provide knowledge of vector differentiation operators—gradient, divergence and curl—and their physical interpretations.
5. Enable students to evaluate vector integrals and apply the fundamental vector theorems (Green's, Stoke's and Divergence) in practical scenarios.

Course Outcomes:

On successful completion of this course, students will be able to:

- **CO1:** apply first-order differential equations to model and solve problems in growth and electric circuits.
- **CO2:** solve higher-order linear differential equations.
- **CO3:** use Lagrange's method to solve partial differential equations arising from physical and engineering problems.
- **CO4:** calculate and interpret the gradient, divergence and curl of vector fields and verify standard identities.
- **CO5:** evaluate line and surface integrals and apply vector calculus theorems to real-world applications

UNIT–I: Differential Equations of First Order and First Degree:

Exact differential equations and equations reducible to exact form; linear differential equations; Bernoulli's equations.

Applications: Newton's Law of Cooling, Law of Natural Growth and Decay and Electrical Circuits.

UNIT–II: Linear Differential Equations of Higher Order (with Constant Coefficients):

Definitions of homogeneous and non-homogeneous equations; complementary function; general and particular integrals; method of variation of parameters.

Application: L–C–R Circuit.

UNIT-III: Partial Differential Equations:

Introduction and formation of partial differential equations by eliminating arbitrary constants and arbitrary functions; solutions of first-order linear equations using Lagrange's method.

UNIT-IV: Vector Differentiation:

Scalar and vector point functions; vector operator Del; Del applied to scalar point functions – Gradient; Del applied to vector point functions – Divergence and Curl; vector identities.

UNIT–V: Vector Integration:

Line integral -Work done, surface integral- Flux. Integral theorems- Green's Theorem, Stoke's Theorem and Divergence Theorem (without proof).

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2018.
2. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers,2017.
3. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2017.

Reference Books:

1. Dennis G.Zill and Warren S.Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2018.
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn.
3. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham & M.V.S.S.N.Prasad, Engineering Mathematics-I, S.Chand Publisher, 2020.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd., 2021 (9th reprint).

CHEMISTRY

(Common to CSE, CSM, CSD, IT, CSC, ECE and EEE)

Subject Code: 25BHT106	L	T	P	C
	3	0	3	3

C**ourse Objectives:**

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods and spectroscopic techniques.

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

CO1: Demonstrate the importance of water for society and industrial needs.

CO2: Summarize the concepts of Instrumental methods and distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques

CO3: Compare the materials of construction for battery and electrochemical sensors.

CO4: Demonstrate the preparation, properties, and applications of thermoplastics, thermosetting, elastomers, conducting polymers and bio-degradable polymers.

CO5: Apply the principle of Band diagrams in the application of conductors and semiconductors.

UNIT I Water Technology

Soft and hard water, Estimation of hardness of water by EDTA Method, Numerical Problems on Temporary and Permanent Hardness - Disadvantages of Hard Water**,** Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment –Ion-exchange processes, Desalination of brackish water- Reverse osmosis (RO) and electrodialysis. Wastewater treatment-Block diagram (primary, secondary, tertiary).

UNIT II Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law-Statements. UV-Visible Spectroscopy, Instrumentation, electronic transition, Definition of Chromophore – Definition of Auxochrome – Absorption and Intensity Shifts, IR spectroscopy- Instrumentation fundamental modes and Fingerprint Region. NMR – Principle - Equivalent and Non-Equivalent Protons - Chemical Shift- Splitting – Coupling Constant.

UNIT III Electrochemistry and Applications:

Electrodes - Electrochemical cell, Nernst equation, cell potential (EMF) calculations and numerical problems (EMF), potentiometry- potentiometric titrations (redox titrations), conductometric titrations (acid-base titrations). Electrochemical sensors (definition and working principle), reference electrodes – calomel electrode – NHE (or) SHE.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries - working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell, Polymer Electrolyte Membrane Fuel cells (PEMFC)-working of the cells.

UNIT IV Polymer Chemistry:

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, Tacticity in polymers, Coordination polymerization.

Plastics –Thermoplastics and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, Polyester resin(PET).

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – Polyacetylene, polyaniline – mechanism of conduction and applications.

Biodegradable polymers - Introduction- Polyl Lactic Acid (PLA)-Applications.

UNIT V Modern Engineering materials:

Semiconductors –Introduction**,** Basic concepts (Salient features of band theory-Definition semiconductor-Elemental semiconductors **-**intrinsic semiconductor and extrinsic semiconductors), applications.

Superconductors – Introduction- Basic Concept (Preparation of $YBa_2Cu_3O_{7-y}$ by ceramic method), Properties- applications.

Supercapacitors: Introduction, Principle & Mechanism of Supercapacitors - Applications.

Nanomaterials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.

2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008

3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

BASIC ENGINEERING MECHANICS

Subject Code: 25EST105	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To develop an understanding of the principles of statics and the ability to analyze problems using static equilibrium equations
- To introduce the basic principles of mechanics applicable to rigid bodies in equilibrium
- To develop the fundamentals of engineering mechanics and problem solving skills essential for mechanical engineering
- To teach the basic principles of mechanics applicable to the motion of particles and rigid bodies.

COURSE OUTCOMES:

Upon the completion of this course, the students will be able to

CO1: Determine the resultant of system of forces acting on bodies in two-dimensional plane.

CO2: Solve, statically-determinate problems in the field of engineering.

CO3: Solve problems involving rigid bodies under the influence of frictional forces

CO4: Compute the centroid of regular geometrical sections and apply transfer theorem to determine moment of inertia of various sections.

CO5: Analyze the plane trusses by calculating axial forces in the members using method of joints and method of sections.

UNIT - I

Systems of forces: Introduction – parallelogram law – Forces and components - Resultant of coplanar concurrent forces - vector notation – moment of force – principle of moments – couples - Resultant of planar force systems.

UNIT - II

Equilibrium of force systems: Equilibrium – free body diagrams – Equations of equilibrium – equilibrium of planar systems – graphical methods and analytical methods for equilibrium of planar systems – Moment of a Force and its applications, Varignon's theorem

UNIT - III

Friction: Introduction, limiting friction – types of friction and friction laws – application of friction – Horizontal plane, Inclined plane, ladder friction, wedge friction, Numerical examples

UNIT - IV

Centroids of plane areas: Introduction, locating the centroid of rectangle, triangle, circle, semi-circle, quadrant and sector of a circle using method of integration, centroid of composite areas and simple built-up sections, Numerical examples.

Moment of Inertia of plane areas: Introduction, Parallel axis theorem, polar moment of Inertia,

Radius of gyration, moment of inertia of rectangular, triangular and circular areas from the method of integration, moment of inertia of composite areas and simple built-up sections, Numerical examples.

UNIT - V

Trusses: Analysis of plane trusses using method of joints and method of sections, Numerical examples.

Text Books

3. Engineering Mechanics, S.S. Bhavikatti, J.G. Rajasekharappa, New Age Publications
4. A.K. Tayal: Engineering Mechanics, Umesh Publishers, 13th Edition, 2008
5. Ferdinand L. Singer: Engineering Mechanics, Harper Collins Publishers India, 3rd Edition, 2008.

Reference Books

1. Irving. H. Shames: Engineering Mechanics, PHI Publishers, 4th Edition, 2008
2. Timoshenko & Young: Engineering Mechanics, MGH Publishers, 4th Edition, 2010
3. K.L. Kumar, Engineering Mechanics, TMH Publishers, 3rd Edition, 2009
4. Engineering Mechanics by S. Timoshenko and D.H.Young, McGraw-Hill
5. Engg. Mechanics / S.S. Bhavikati & J.G. Rajasekharappa.

ELECTRONIC DEVICES AND CIRCUITS
(Common for ECE & EEE)

Subject Code: 25ECT101	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES
- To understand the working, characteristics of PN Junction diode, Zener diode, Tunnel diode,Varactor diode and LED.
- To describe the working, parameters of rectifiers and filters.
- To explain the working, characteristics of transistor (BJT) in different configurations, JFET,MOSFET and UJT.
- To explore the transistor biasing methods and to determine the stability factors.
- To describe h-parameter models of BJT and compare transistor amplifier configurations.

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

CO 1. Describe the working principle of PN Junction diode, Zener diode, Tunnel diode, Varactor diode , LED, photodiode.

CO 2. Explain the operation and analyze the parameters of rectifiers and filters.

CO 3. Describe the working and behaviour of transistor (BJT) in different configurations, JFET, MOSFET and UJT.

CO 4. Explain the transistor biasing methods and determine the stability factors.

CO 5. Analyze h-parameter models of BJT and compare transistor amplifier configurations.

Unit- I
Diode Characteristics: Introduction to Electronic Devices, semiconductor physics, V-I characteristics of PN Junction diode.

Special Semiconductor Diodes: Zener Diode, Break down mechanisms, Zener Diode Characteristics, Zener Diode as a Voltage Regulator, Tunnel diode, Varactor Diode, LED, Photo diode.

Unit- II
Rectifiers and Filters: Half wave rectifier, Full wave rectifier, Bridge rectifier, Derivation of ripple factor of rectifiers, Introduction to C- Filter,L-filter,LC-Filter,π-filter, Regulated Power Supply.

Unit- III
Transistor Characteristics: Bipolar junction transistors (BJTs)- input & output characteristics of transistor in CB, CE, CC configurations, Early effect and punch through, relation between current gain parameters (alpha, beta and gamma),JFET characteristics and parameters, MOSFET(enhancement and depletion),characteristics of UJT.

Unit- IV

Biasing and Stability: Need for biasing, criteria for fixing the operating point, Biasing methods-fixed bias, collector to base bias, self bias, stabilization against variations in V_{BE}, I_{co} and β, stability factors (S,S^1,S^{11}), Biasing of FET in common source, thermal runaway, thermal stability

Unit- V

Small Signal Low Frequency Transistor Amplifier Models: Two port networks, Transistor hybrid model, h-parameter representation of a transistor, Analysis of CB, CE and CC amplifiers using exact and approximate h-parameter models, comparison of transistor configurations in terms of Av , Ai , Ri , Ro , Avs , Ais.

Text Books:

1. Integrated Electronics – Jacob Millman, Chritos C. Halkies, Tata Mc-Graw Hill, 2nd edition
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9thEdition

Reference books:

1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill.
2. Electronic Devices and Circuits | by S Salivahanan, N Suresh Kumar, McGraw Hill 5th Edition

Website References:

1. http://www.vidyarthiplus.in/2011/11/electronic-device-and-circuits-edc.html

ELECTRONIC DEVICES AND CIRCUITS LAB
(Common for ECE & EEE)

Subject Code: 25ECL101	L	T	P	C
	0	0	3	1.5

Course Objectives:

- To understand the working, characteristics of PN Junction diode, Zener diode, Tunnel diode, Varactor diode and LED.
- To describe the working, parameters of rectifiers and filters.
- To explain the working, characteristics of transistor (BJT) in different configurations, JFET and UJT.
- To explore the transistor biasing methods.
- To describe h-parameter models of BJT and compare transistor amplifier configurations.

Course Outcomes:

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

CO 1. Draw the characteristics of PN Diode and Zener Diode
CO 2. Find the ripple factor of half and full wave rectifiers with and without filter
CO 3. Explain the characteristics of transistor in CE and CB configurations
CO 4. Compute the characteristics of JFET and self-bias circuit using BJT and FET
CO5. Determine h-parameters of a given BJT using hybrid model

LIST OF EXPERIMENTS

1. PN Junction diode forward and reverse bias characteristics (cut-in voltage, static and dynamic resistance)
2. Zener diode characteristics and Zener as voltage Regulator (breakdown voltage).
3. Half wave Rectifier without and with filter.
4. Full wave Rectifier without and with filter.
5. Transistor CE configuration input and output characteristics
6. Transistor CB configuration input and output characteristics
7. Drain and Transfer Characteristics of JFET (gm, μ and rd).
8. Analysis of voltage- divider bias/self-bias circuit using BJT.
9. Analysis of self-bias circuit using FET/MOSFET.
10. Determination of h-parameters of a given BJT using hybrid model.

COMMUNICATIVE ENGLISH LAB
(Common for all branches)

Subject Code: 25BHL101	L	T	P	C
	0	0	3	1.5

Course Objectives

The course is designed to:

1. Develop a strong foundation in **phonetics** and **pronunciation** for effective verbal communication.
2. Enhance students' **listening comprehension skills** through exposure to varied audio materials.
3. Improve **speaking skills** in formal and informal contexts through interactive exercises.
4. Train students in **presentation techniques** to express ideas clearly and confidently.
5. Equip students with **interview skills**; resume writing, and workplace communication essentials.

Course Outcomes (COs)

By the end of this course, students will be able to:

1. **Recognize** and **produce** English speech sounds accurately using the phonetic alphabet, and **demonstrate** correct stress, intonation, and rhythm in spoken communication. *(Remembering, Applying)*
2. **Develop** critical listening skills by **interpreting** gist, specific details, and speaker attitudes from a variety of authentic audio materials. *(Understanding, Analyzing)*
3. **Engage** in everyday conversations and **demonstrate** effective spoken interaction through structured activities such as role plays, JAM sessions, and telephone etiquette. *(Applying, Creating)*
4. **Plan**, **design**, and **deliver** effective oral presentations using visual aids, PowerPoint slides, and public speaking strategies. *(Applying, Creating)*
5. **Prepare** for professional interviews by **writing** resumes and cover letters, and **demonstrating** appropriate verbal and non-verbal communication skills in mock interviews. *(Creating, Evaluating)*

List of Topics:

Unit – 1: Introduction to Phonetics

- Introduction to the Phonetic Alphabet
- The Sounds of English: Speech Sounds – **Vowels and Consonants**
- Word Stress and Sentence Stress
- **Intonation Patterns** and their role in communication
- Accent and Rhythm in Connected Speech

Focus: Familiarizing students with correct pronunciation, phonetic transcription, and stress-timing features of spoken English.

Unit – 2: Listening Skills

- Listening for **Gist and Specific Information**
- Listening for **Note-Taking and Summarizing**
- Interpreting **Opinions and Attitudes** through listening

- Exposure to **Speeches and Talks** by Eminent Personalities (TED Talks, etc.)

Focus: Enhancing critical listening, comprehension, and note-making abilities through diverse audio inputs.

Unit – 3: Speaking Skills

- **Self-Introduction** and Peer Introduction
- Everyday **Conversation Skills** (greetings, taking/ending leave, casual dialogue)
- **Asking and Giving Information**
- **Role Plays** based on real-life situations
- **Just A Minute (JAM)** Sessions for spontaneity and fluency
- **Telephone Etiquette** and formal phone conversations

Focus: Developing interactive spoken English skills, fluency, and verbal etiquette through guided practice.

Unit – 4: Presentation Skills

- Basics of **Public Speaking and Presentation Techniques**
- Planning and Delivering **Poster Presentations**
- Designing and Presenting using **PowerPoint Slides**
- Using **Visual Aids** effectively during presentations

Focus: Equipping students with the skills to design, organize, and deliver structured oral presentations with confidence.

Unit – 5: Interview & Career Skills

- Writing a **Professional Resume** and Cover Letter
- Preparation for **Job Interviews**: Frequently Asked Questions
- Participating in **Mock Interviews** with Feedback
- Body Language, Tone, and Confidence Building

Focus: Preparing students for placement activities and professional communication contexts.

Suggested Software: Walden Info tech,Young India Films

Reference Books:

1. MeenakshiRaman,Sangeeta-Sharma.TechnicalCommunication.OxfordPress.2018.(This can be for theory and not for lab)
2. Samson T:Innovate with English, Foundations
3. Grant Taylor: English Conversation Practice, Tata McGraw-Hill Education India, 2016
4. Jayashree, M Let's Hear them Speak: Developing Listening –Speaking skills in English. Sage Publications
5. Hewing's, Martin. Cambridge Academic English (B2).CUP, 2012.(That is for reading and writing and can be used in theory classes but not in Lab)
6. T. Balasubramanyam, A Text book of English Phonetics for Indian Students,

(3rdEd) Trinity Press. (This is all theory and can be for MA English students but not for B. Tech students)

Web Resources:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw
12. https://www.linguahouse.com/en-GB
13. https://www.ted.com/watch/ted-ed

Voice &Accent:

1. .https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IAquestionsthattestcomprehension

CHEMISTRY LAB
(Common to CSE, CSM, CSD, IT, CSC, ECE and EEE)

Subject Code: 25BHL104	L	T	P	C
	0	0	3	1.5

Course Objectives:

- Verify the fundamental concepts with experiments.

Course Outcomes:

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

CO1: Determine the cell constant and conductance of solutions.

CO2: Measure molecular/system properties such as surface tension and viscosity and prepare advanced polymer Bakelite material.

CO3: Measure the strength of an acid present in secondary batteries by pH metry and strength of solutions by potentiometry.

CO4: Analyse the sample using spectroscopic techniques and Measure molecular/system property such as chloride content of water.

CO5: Measure molecular/system properties such as hardness of water and dissolved oxygen.

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method.
2. Conductometric titration of strong acid vs. strong base.
3. Conductometric titration of weak acid vs. strong base.
4. Determination of cell constant and conductance of solutions.
5. Potentiometry - determination of redox potentials and emfs.
6. Determination of Strength of an acid in Pb-Acid battery. (pHmetry)
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law.(Colurimetric estimation of iron)
9. Wavelength measurement of sample through UV-Visible Spectroscopy.
10. Identification of simple organic compounds by IR.
11. Preparation of nanomaterials by precipitation method.
12. Estimation of Ferrous Iron by Dichrometry.
13. Determination of surface tension and viscosity.
14. Determination of Hardness of water sample by EDTA Method
15. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method.
16. Determination of Chloride content present in given water sample

Reference:

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

HEALTH AND WELLNESS, YOGA AND SPORTS
(Common for all branches)

Subject Code: 25MCS103	L	T	P	C
	0	0	1	0.5

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

Course Outcomes: After completion of the course the student will be able to
Understand the importance of yoga and sports for Physical fitness and sound health.
Demonstrate an understanding of health-related fitness components.
Compare and contrast various activities that help enhance their health.
Assess current personal fitness levels.
Develop Positive Personality

UNIT I
Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.
Activities:
(i) Organizing health awareness programmes in community
(ii) Preparation of health profile
(iii)Preparation of chart for balance diet for all age groups.

UNIT II
Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.
Activities:
Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar.

UNIT III
Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.
Activities:
(i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
(ii) Practicing general and specific warm up, aerobics
(iii)Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping andrunning.

Reference Books:
1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning,2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014

5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014.

General Guidelines:

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

Evaluation Guidelines:

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

DESIGN THINKING AND SUSTAINABLE DEVELOPMENT
(Common for all branches)

Subject Code: 25BHS104	L	T	P	C
	1	0	2	2

COURSE OBJECTIVES:

- Understand the principles of creativity, innovation, and entrepreneurship in an engineering context.
- Apply the process of design thinking to real-life problems
- Recognize and evaluate the importance of sustainable development and responsible engineering.
- Explore user pain points and identify real-world problems through empathy and market analysis.
- Apply ideation techniques to validate feasible and viable solutions for the identified problems.

COURSE OUTCOMES:

Upon the completion of this course, the students will be able to

CO1: Describe innovation ecosystems, and entrepreneurial processes
CO2: Analyze the global sustainable development goals (SDGs) and connect them to engineering practices
CO3: Understand and explore design thinking methodology to identify and solve real-world problems
CO4: Develop understanding to identify and validate user problem statement
CO5: Develop approach towards generation and feasibility assessment of ideas

UNIT - I

Introduction to Innovation and Entrepreneurship: Innovation and its types – Incremental, Disruptive, Frugal, Social, Real-world examples of innovation – Indian and global, Introduction to entrepreneurial mindset, Journey of a startup – Idea to Market, Role of engineers in entrepreneurship

Activity: Conducting case studies on selected startups (e.g., Airbnb, Uber, etc.) and performing an in-depth sectoral analysis

UNIT - II

Sustainable Development Goals: Introduction to UN Sustainable Development Goals (SDGs), Link between engineering, sustainability, and society, Circular economy, Green technologies, Lifecycle thinking, Frugal innovation, Resource optimization

Activity: Conduct an analysis of a minimum of five Sustainable Development Goals (SDGs), including a comprehensive review of their objectives, targets, and key performance indicators

UNIT - III

Design Thinking – A Human-Centred Approach: Introduction to Design Thinking, Practical case studies of Design Thinking, The 5 stages of Design Thinking – Empathize, Define, Ideate, Prototype, Test

UNIT – IV

Problem Statement Identification and Validation: Empathize towards understanding user pain points, Tools and approaches for empathizing with users, Define – Confirm the problem the user is facing, Market analysis – Market size, Competitor analysis

Activity:

- For the identified problem, build empathy maps and create detailed user personas based on insights gathered from surveys and interviews.
- Determine the total market size, perform an in-depth market analysis, and analyze competitors to identify opportunities and gaps.
- Define the Problem statement and write HMW Statements.

UNIT - V

Ideation to solve user problems: Tools and approaches to identify ideas for solving identified problems, Feasibility and viability of ideas for prototype development

Activity: Apply brainstorming techniques to generate solutions for the identified problem and organize them visually through mind mapping.

Text Books

1. Eric Ries. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business.
2. Anuja Agarwal. (2023). Design Thinking: A Framework for Applying Design Thinking in Problem Solving. Cengage Learning India
3. Akhilesh A. Waoo. (2024). Sustainable Development Goals. Forever Shinings Publication

References

1. Rob Fitzpatrick. (2013)**.** The Mom Test: How to Talk to Customers and Learn If Your Business is a Good Idea When Everyone is Lying to You.
2. Tim Brown. (2009)**.** Change by Design: How Design Thinking Creates New Alternatives for Business and Society
3. Bill Aulet. (2013). Disciplined Entrepreneurship: 24 Steps to a Successful Startup. Wiley
4. Peter Thiel with Blake Masters. (2014). Zero to One: Notes on Startups, or How to Build the Future. Crown Business.
5. Don Norman. (2013). The Design of Everyday Things: Revised and Expanded Edition. Basic Books.
6. Lewrick, Michael, Patrick Link & Larry Leifer. (2018). The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems. Wiley