SYLLABUS FOR 1ST YEAR B. TECH STUDENTS

Subject Code: EE1L002	Name: Basic Electrical and Electronics Engineering	L-T-P-C: 3-1-0-4
Prerequisite: None		

Electrical

Module 1: (Introduction)
Sources of Energy; Generation, Transmission and Distribution of Electric Power an Overview

Module 2: (DC Circuits)
Basic Elements of Circuits, Dependent and Independent Sources, Source Transformation, Current and Voltage Division, Star-Delta Transformation, Nodal Analysis, Mesh Analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Transient in RL Circuit, Transient in RC Circuit.

Module 3: (AC Circuits)
Single phase AC circuits: Generation of Sinusoidal Voltage Waveform (AC) and Fundamental Concepts, Representation of Sinusoidal Signal by a Phasor, Instantaneous, Average and RMS Quantities, Power, Energy and Power Factor, Impedance and Admittance, Phasor Diagrams, Power in Complex Notation, Series and Parallel Circuits, Introduction to Resonant Circuit.
Three phase AC circuits: Star and Delta Connected System, Line and Phase Quantities, Three Phase Circuits with Balanced and Unbalanced Load.

Module 4: (Introduction to Electric Machines)
Transformer: Principle of Operation, Overview of Ideal and Practical Transformer
DC Machines: Principle of Operation of DC Generator and DC Motor, Classification, Concept of EMF and Torque Equation.

Electronics

Module 5: (Op-amp: Features and Basic Circuits)
Opamp: Schematic and operation, virtual ground, inverting and non-inverting configurations, adder, subtractor circuits

Module 6: (Semiconductor Fundamentals and Diode)
Basics of semiconductors: doping, drift & diffusion
Diode: p-n junction structure, operation, IV characteristics, zener and avalanche breakdown, rectifier, clipper & clamper circuits

Module 7: (Transistor Circuits)
Introduction to BJT (NPN/PNP) and basic operation, biasing, CE amplifier, introduction to MOSFET and basic working principle

Module 8: (Introduction to Digital Electronics)
Number systems and arithmetic; Basic logic gates and truth table.

Text Books:

1. William H. Hayt, "Engineering Circuit Analysis", McGraw Hill, 2012
2. Ben G Streetman, S K Banarjee, "Solid State Electronic Devices," 6th edition, PHI India, New Delhi, 2007.
3. S. Sedra and K. C. Smith, "Microelectronic Circuits," Oxford University Press, India, 2005
4. M. M. Mano and M. D. Ciletti, "Digital Design," 4th ed., Pearson Education, NJ, USA, 2007.

Reference Books:

1. E. Hughes, "Electrical Technology," Pearson Education, 2010.
2. Charles K. Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, 2022
3. S M Sze, K K Ng, Physics of Semiconductor Devices, 3rd edition, John Wiley, New Jersey, 2007.
4. R. A. Gayakwad, "Op-Amps and Linear Integrated Circuits," PHI Learning, 2009.
5. Samuel C. Lee, "Digital Circuits and Logic Design," PHI Learning, 2009.

Subject Code: EE1P002	Basic Electrical and Electronics Engineering Laboratory	L-T-P-C: 0-0-3-2

Learning Outcomes:

- Obtain and analyse V-I characteristics of electrical loads such as lamp.
- Apply and verify fundamental circuit theorems, Analyse the behaviour of R-L-C circuits, measure electrical power using different methods for 1-ph and 3-ph circuits.
- Identify and operate basic lab equipment: CRO, Function Generator, Universal trainer kit, Multi-meter.
- Design, implement, and test Op-amp based circuits, basic logic gates using ICs, rectifiers.
- Obtain and analyse V-I characteristics of basic electronic components, e.g., diode etc.

Syllabus

Study of V-I characteristics of Electrical Loads.
Verification of Network Theorems
Study of RLC circuit(s).
Measurement of Electric Power in 1-ph circuit.
Measurement of Electric Power in 3-ph circuit.
Operation of basic lab equipment: CRO, Function Generator, Universal trainer kit, Multi-meter.
Study of V-I characteristics of electronics component such as Diode, BJT etc..
Study of half wave and full wave rectifier.
Study of Opamp based circuits
Study of different logic gates and their implementation using ICs

Text Books:

1. William H. Hayt, "Engineering Circuit Analysis", McGraw Hill, 2012.
2. S. Sedra and K. C. Smith, "Microelectronic Circuits," Oxford University Press, India, 2005.
3. M. M. Mano and M. D. Ciletti, "Digital Design," 4th ed., Pearson Education, NJ, USA, 2007.

Reference Books:

1. E. Hughes, "Electrical Technology," Pearson Education, 2010.
2. Charles K. Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, 2022
3. R. A. Gayakwad, "Op-Amps and Linear Integrated Circuits," PHI Learning, 2009.
4. Samuel C. Lee, "Digital Circuits and Logic Design," PHI Learning, 2009.
5. Robert L. Boylestad & Louis Nash, "Electronic Devices and Circuit Theory", PRENTICE HALL

Subject Code: MA1L003	Name: Calculus and Ordinary Differential Equations	L-T-P-C: 3-1-0-4

Prerequisite: None

Module 1: (Differentiation) (6 Hours) Limit, continuity and differentiability of functions of several variables, Partial derivatives and their geometrical interpretation, Differentials, Derivatives of composite and implicit functions, Derivatives of higher order and their commutativity

Module 2: (Maxima and Minima) (6 Hours) Euler's theorem on homogeneous functions, Harmonic functions, Taylor's expansion of functions of single and several variables, Maxima and minima of functions of several variables, Lagrange's method of multipliers.

Module 3: (Basics of Vector Calculus) (6 Hours) Double and triple integrals, Scalar and vector fields, Level surfaces, Directional derivative, Gradient, Curl, Divergence

Module 4: (Theorems of Green, Gauss and Stoke) (6 Hours) Line and surface integrals, Theorems of Green, Gauss and Stoke.

Module 5: (First Order Differential Equations) (4 Hours) First order differential equations, Exact, Linear and Bernoulli's form

Module 6: (Higher Order Differential Equations) (8 Hours) Second order differential equations with constant coefficients, Euler's equations, Particular integrals by: Variation of parameters, Undetermined coefficients, Operator method, System of differential equations, Introduction to power series and power series

Text Books:

1. G. B. Thomas and R. L. Finney, Calculus and Analytic Geometry, Narosa Publishing House, 1984.
2. Kreyszig E. Advanced Engineering Mathematics, John Wiley & Sons
3. Simmons G. F. and Robertson J. S. Differential Equations with applications and Historical notes, Tata McGraw-Hill Publishing Company Limited, New Delhi, India

Reference Books:

1. Bartle R. G. and Sherbert D. R. Introduction to Real Analysis, Wiley India
2. Jain R. K. and Iyengar S. R. K. Advanced Engineering Mathematics, Narosa
3. Apostol T. M. Calculus - Vol.2, Wiley India
4. Ross S. L. Differential Equations, Wiley India
5. Coddington E. A. An Introduction to Ordinary Differential Equations, Prentice Hall

Subject Code: MA1L004	Name: Linear Algebra and Complex Analysis	L-T-P-C: 3-1-0-4

Prerequisite: None

Linear Algebra:

Module 1: (Systems of Linear Equations and Vector Spaces) (7 Hours) System of linear equations, Consistency conditions, Elementary row operations, Matrix inversion by row operations; Vector spaces, Subspaces, span, Linear dependence, independence of vectors, Basis, dimension

Module 2: (Linear Transformations and Associated Matrices) (6 Hours) Linear transformations, Range, Kernel, Rank, Nullity of linear transformation, Space of all linear transformations, Cayley Hamilton Theorem, Matrix associated with a linear map, Linear map associated with a matrix

Module 3: (Eigenvalues and Eigenvectors) (5 Hours) Eigenvalues and eigenvectors, Hermitian and skew Hermitian matrices, Orthogonal and unitary matrices.

Complex Analysis:

Module 4: (Analytic Functions) (6 Hours) Limit, continuity, differentiability and analyticity of functions Cauchy-Riemann equations (Cartesian and polar), Harmonic functions, Elementary complex functions

Module 5: (Integration Over Closed Curves) (6 Hours) Line integrals, Upper bounds for moduli of contour integrals, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions

Module 6: (Series Expansion and Residue Theorem) (6 Hours) Power series, Taylor's series, Laurent's series, Zeros and singularities, Residue theorem, Evaluation of improper integrals by residue theorem

Text Books:

1. Strang G. Linear Algebra and its applications, Cengage Learning
2. Hoffman K. and Kunze R. Linear Algebra, Pearson Pub
3. Churchill R.V. and Brown J.W. Complex Variables and Applications, Mc-Graw Hill

Reference Books:

1. Kreyszig E. Advanced Engineering Mathematics, John Wiley & Sons
2. Jain R. K. and Iyengar S. R. K. Advanced Engineering Mathematics, Narosa
3. Axler S. Linear Algebra Done Right, UTM, Springer

Subject Code: ID2L002	Name: Introduction to Bio-Technology (IBT)	L-T-P-C: 2-0-0-2

Prerequisite: None

An Introduction to Bioscience & Technology

Cell: The Unit of Life (1-2)

The concept of cell in the perspective of a whole living body; Concept of cell, tissue system, organ and whole organism. Brief overview of plant and animal cell.

Genes are DNA & Bioinformatics: (2-4)

DNA is the genetic material; Structural aspects–components of DNA and RNA, Nucleosides & Nucleotides (introduction, structure & bonding), Double helical structure of DNA (Watson and Crick model). Mutations change the sequence of DNA, a gene codes for a single polypeptide, recombination occurs by physical exchange DNA, genetic code is triplet. NCBI, protein primary sequence analysis, DNA sequence analysis, sequence alignment, BLAST, multiple sequence alignment; *CLUSTALW.*

Expression of genetic information: Central dogma (8-10)

The Relationship between genes and protein, Visualization of protein structure using PyMol, The Central dogma; The basic processes of DNA replication, RNA Transcription and Protein translation; Protein function: Enzymes as a case study.

Mutation and Disease (2-3)

Occurrence, kinds of Mutation, spontaneous & induced Mutation, Mutagens, detection of Mutation, Lethal Mutations, Biochemical Mutations, Phenotypic effects of Mutation, Molecular basis of Mutation, Significance & Practical applications of Mutation.

Immune system (2-3)

An overview of immune system

Genetic Engineering (2-3)

Recombinant DNA technology and basic genetic engineering techniques; some case studies: Cholera Toxin, *Bt* toxins, GM food, transgenic plants.

Book

Sl No.	Name of the Book	Year of Publication/ Reprint
1	Molecular Biology of Cell by Alberts *et al*	6th Edition, 2014
2	Molecular Cell Biology by Lodish *et al*	8^{th} Edition, 2016

Subject Code: CS1L002	Name: Programming in C	L-T-P-C: 2-0-2-3

Prerequisite: None

Theory:

Module 1: Introduction (4 hours): Data types, constants, variables, scope, expressions and operators, input and output statements.
Module 2: Control Flow (5 hours): Conditional and branch statements (if-else, switch), Iteration statements (for, while, do-while, goto).
Module 3: Core Concepts (14 hours): Single and Multidimensional arrays, functions and recursion, strings, structures, pointers and dynamic memory allocation.
Module 4: Searching and Sorting (3 hours) Linear and binary search, selection sort, bubble sort, insertion sort.
Module 5: File Handling (2 hours) File open, close, read, and write.

Laboratory Experiments:

1. Familiarization with C Programming Environment
2. Data types, constants, scope of variables, operators and input-output
3. Conditional and branch statements, Loops and iteration statements
4. Single and Multidimensional arrays, Pointers and dynamic memory allocation
5. Strings
6. Function and recursion
7. Structures
9. File handling

Text Books:

1. Yashavant Kanetkar, "Let us C", 20th Edition, BPB.
2. E. Balagurusamy, "Programming in ANSI C", 9th Edition, McGraw Hill.
3. Byron S. Gottfried, "Programming with C (Schaum's Outlines)", 4th Edition, McGraw Hill.
4. Paul Deitel and Harvey Deitel. C: How to Program, 9th Edition, Pearson.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.
2. Herbert Schildt, "C: The Complete Reference", 4th Edition, McGraw Hill.
3. R. G. Dromey, "How to Solve it by Computer", Pearson.
4. Al Kelley and Ira Pohl, "A Book on C", 4 th Edition, Addison-Wesley.
5. Stephen G. Kochan, "Programming in C", 4th Edition, Addison-Wesley.
6. K. N. King, "C Programming: a modern approach" 2nd Edition, W. W. Norton & Company

Subject Code: ID1L002	Name: Introduction to Bharatiya Knowledge Tradition	L-T-P-C: 2-0-0-2

Prerequisite: None

Module 1: General Survey of BKT: Key achievements, Definition, scope and sources of BKT, Misconceptions about BKT and its contemporary relevance, General features of Science and Technology in India, Methods of knowledge generation in BKT;

Module 2: Linguistics: Key contributions, Panini's Aṣṭādhyāyī and its relevance;

Module 3: Mathematics and Astronomy: Key contributions in Astronomy and Mathematics, General features of Indian Mathematics;

Module 4: Metallurgy and Material Science: Survey of Ceramic and Metallurgical practices in India, Survey of Rasaśāstra and its key contributions;

Module 5: Civil Engineering: Key achievements, Vāstuśāstra, town planning, traditional water management structures and practices;

Module 6: Health Sciences: Survey of traditional health sciences, General features of Āyurveda, Āyurvedic practices for preventive healthcare, Yoga and its importance in maintaining healthy life

Module 7: Indian Approach to Entrepreneurship: Meaning of 'artha,' Importance of Dharma, Key lessons from Kauṭliya's Arthaśāstra and Cāṇakyanīti sutra

Text Books:

1. Mahadevan, B., Vinayak Rajat Bhat and Nagendra Pavana R. N. Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning, 2022

2. Subbarayappa, B. V. Science in India: A Historical Perspective. Rupa, 2013

3. Kumar, Alok. Ancient Hindu Science: Its Transmission and Impact on World Cultures. Springer Nature Switzerland, 2022

Reference Books:

1. Ray, Priyadaranjan and S. N. Sen. The Cultural Heritage of India: Volume VI (Science and Technology). The Ramakrishna Mission Institute of Culture, 2018

Subject Code: ME1L002	Name: Engineering Mechanics	L-T-P-C: 3-1-0-4

Prerequisite: None

Force systems: Moment of a force about a point and about an axis, Couple moment, Reduction of a force system to a force and a couple.

Equilibrium: Free body diagram, Equations of equilibrium, Problems in two and three dimensions, Plane frames and trusses.

Friction: Laws of Coulomb friction, Problems involving large and small contact surfaces, Belt friction.

Kinematics and Kinetics of particles: Particle dynamics in rectangular coordinates, Cylindrical coordinates and path coordinates.

Properties of Areas: Moments of inertia and product of inertia of areas, polar moment of inertia.

Concept of Stress and Strain: Normal and Shear stresses, State of stress at a point, Ultimate strength, Allowable stress, Factor of safety, Normal and shear strains, Generalized Hooke's law, Poisson's ratio, Analysis of axially loaded members.

Transformation of Stress and Strain: Transformation of stress and strain, Principal stresses/strains and Mohr's circle.

Torsion: Torsion of cylindrical bars, Torsional stress, Modulus of rigidity and deformation.

Flexural Loading: Shear force and bending moment diagrams, Flexure formula, Shear stress in beams.

Text/Reference Books:

- Ferdinand P. Beer, E. Russell Johnston, Jr. (TMH) - *Vector Mechanics for Engineers: Statics and Dynamics*
- L. G. Kraige., and J. L. Meriam. (Wiley) - *Engineering Mechanics - Statics*
- L. G. Kraige., and J. L. Meriam. (Wiley) - *Engineering Mechanics – Dynamics*
- I.H. Shames (Pearson) - *Engineering Mechanics: Statics and Dynamics*
- S. Timoshenko, D. H. Young (TMH) - *Engineering Mechanics*
- Ferdinand Beer , E. Russell Johnston, Jr., J. DeWolf (TMH) - *Mechanics of Materials*
- S. Timoshenko, D. H. Young (East West Press) - *Elements of Strength of Materials*
- James M. Gere, Barry J. Goodno (CL Engg) - *Mechanics of Materials*

Subject Code: HS1L007	Name: English for learning and Communications	L-T-P-C: 2-0-2-3

Prerequisite: None

Theory

Vocabulary (Synonyms, Antonyms, Homonyms, Homophones); Grammar (Articles, Preposition, Conjunctions, Verb, Adverbs, Adjectives, Nouns and Pronouns, Tenses, Singular/Plural); Punctuation; Common Errors; Paragraph and Essay writing, Email writing, Phonetics, Just a Minute, Notice, Agenda and Minutes of Meeting Basics of Communication (Definition, Models, Types); Nonverbal Communication; Barriers of Communication Select Prose and Poetry texts: 3 Poems, 2 short stories and 1 essay

Text Books:

1. Oxford Practical English Usage by Michael Swan , 2016
2. Effective Technical Communication by M. Ashraf Rizvi, 2018
3. Developing Communication Skills by Krishna Mohan and Meera Banerji , 2019

Reference Books:

1. Author Name, “Title”, Publisher Name, Edition, Year

Subject Code: PH1L002	Name: Physics	L-T-P-C: 3-0-0-3
Prerequisite: None		

Module 1: (Classical Physics) (12 hours)

Lagrangian mechanics, constraints, Action principle, Lagrange's equations, Hamiltonian equations, central forces, Kepler's problem, waves and oscillations, damped and forced oscillations, normal modes, superposition, and resonance, Introduction to relativity.

Module 2: (Electromagnetic waves) (10 hours)

Maxwell's equations, wave equation, plane electromagnetic waves, longitudinal and transverse waves, superposition, wave packets, two- and three-dimensional waves, energy-momentum, Poynting's theorem, electromagnetic boundary conditions.

Module 3: (Optics) (9 hours)

Coherence, Laser, Young's experiment, interferometers, diffraction, Fraunhofer diffraction (single slit), dispersion, Single photon and applications

Module 4: (Basics of Quantum Physics) (11 hours)

Failure of classical physics, qualitative review of relevant experiments, de Broglie waves, uncertainty principle, wave function, probability interpretation, Schrodinger equation, Particle in a box, potential barrier, quantum tunneling, potential well, and harmonic oscillator.

Text Books:

1. Herbert Goldstein, Charles P. Poole, and John L. Safko, "Classical Mechanics", Pearson Education Inc., third edition, 2011.
2. H. J. Pain, "The Physics of Vibrations and Waves", John Wiley & Sons, Ltd, Sixth edition, 2015.
3. D. J. Griffiths, "Introduction to Electrodynamics," Cambridge University Press & Assessment, Fifth Edition, 2025.
4. Ajoy Ghatak, "OPTICS", McGraw-Hill Publication, Eighth edition, 2024
5. J. J. Sakurai and Jim Napolitano, "Modern Quantum Mechanics", Cambridge University Press, Third edition, 2020.

Reference Books:

1. Frank S Crawford, "Waves – Berkeley Series", McGraw-Hill Publication, 1st edition, 2017.
2. Robert Resnick, "Introduction to Special Relativity", Wiley and Sons, 1st edition, 2007.
3. Feynman, Leighton, and Sands, "Lectures on Physics, Vol I, II, & III," Pearson Education, Millennium edition, 2012.

Subject Code: PH1P001	Name: Physics Laboratory	L-T-P-C: 0-0-3-2
Prerequisite: None		

Syllabus:

To determine the damping constant of the pendulum for different eddy damping current. To verify Malus's Law of polarization of light. To determine the wave length of the prominent lines of mercury source by a plane transmission diffraction grating and to calculate the resolving power and dispersive power of the grating. To study the intensity distribution of Fraunhofer diffraction pattern by a single slit and measure the width of the slit for a given wavelength of laser light. To determine the wavelength of the given source using the Michelson interferometer. To determine the wave length of the given source using Fresnel's biprism. To find out the resonance and beat time period of the coupled pendulum and find out the spring constant. To study the interference pattern and determine the radius of curvature of the plano convex lens using Newton's rings apparatus. To determine Young's Modulus of different materials through uniform and non-uniform bending methods.

Text/Reference Books:

1. Ghatak A. Optics, McGraw-Hill.
2. Pain H. J. The Physics of Vibrations and Waves, Wiley.

Subject Code: CY1L002	Name: Chemistry	L-T-P-C: 3-0-0-3
Prerequisite: None		

Suggested Chemistry (CY1L001) syllabus in line with NEP 2020

Chemical Thermodynamics and application: Reaction feasibility and spontaneity; phase, chemical, and electrochemical equilibrium.
Electrochemistry and energy storage: Batteries, concentration cells, fuel cells.
Chemical Kinetics: Rate laws, catalysis, surface and chain reactions, polymerization.
Solid State & Nanomaterials: Crystal structures, defects, semiconductors, and energy materials.

Bonding Models & Properties: (a) In Molecules, Supramolecules, Metals and Metal Complexes; (b) Implications on electrical, magnetic, and optical properties. (c) Absorption & Emission Spectroscopy.
Basic Industrial Chemistry: Functional polymers, Energy storage, Memory storage. Chemistry in Daily Life, Surfactants, Foam, Gels, Colloids, Plasticizer, Dyes, Paints, Fire retardants, Fertilizers, Cement, Organic pollutants, Pesticides, Fungicides, Agrochemicals.

Text/Reference Books:

1. Brown L. and Holme, T. Chemistry for Engineering Students, Thomson Brooks.
2. Atkins P. and Paula J. D. Atkins' Physical Chemistry, Oxford.
3. Shriver, D. F. and Atkins, P. W. Atkins' Inorganic Chemistry, Oxford.
4. Wiseman P. An Introduction to Industrial Organic Chemistry, Applied Science.
5. Principles of Polymerization by George Odian (4th Edition, Wiley – 2004).

Subject Code: CY1P001	Name: Chemistry Laboratory	L-T-P-C: 0-0-3-2

Prerequisite: None

1.	**Semester No:**	I
2.	**Core/Elective/Breadth:**	Elective
3.	**Contact Hours:**	42
4.	**Theory:**	None
5.	**(Autumn/ Spring):**	Autumn
6.	**Level:**	10+2 (Higher Secondary)
7.	**Lab:**	Yes

1. Objective of Course:

The objective of this course is to familiarize students about introductory to physical chemistry, organic chemistry, inorganic chemistry experiments and analysis.

2. Lecture -wise Break up

Sl. No.	Course Contents	Contact Hours	No. of Practical
1	Introduction of some basic Chemistry Techniques	3	1
2	Determination of the Surface Tension and Parachor of a homologous series	3	1
3	Measurement of the Coefficient of Viscosity of ethanol & ethanol – water system	3	1
4	Studies on acid-base Conductometric Titration	3	1
5	Studies on pH Metric Titration of strong base with strong acid	3	1
6	Estimation of sulphate ion in tap water by Nepheloturbidimetric analysis	3	1
7	Spectrophotometric determination of acid dissociation constant (pK_a) of methyl red (MR), an acid base indicator	3	1
8	Determination of Solubility and Solubility Product of a sparingly soluble salt at room temperature by Conductometric method	3	1
9	Potentiometric Titration of a given sodium carbonate solution with aqueous hydrochloric acid solution	3	1
10	Kinetics of Ester Hydrolysis.	3	1
11	Detection of Functional Groups in an organic compound for Solid sample.	3	1
12	Detection of Functional Groups in an organic compound for Liquid sample.	3	1
13	Mid semester and End semester Examination	6	1
Total		42	1

3. Suggested Books:

Sl. No.		Year of Publication/ Reprint
1	A text book of Practical Organic Chemistry by A. I. Vogel	1989
2	Practical Chemistry by O. P. Pandey, D. N. Bajpai, S. Giri	2000
3	An advanced course in practical chemistry by A. K. Nad, B. Mahapatra and A. Ghoshal	2011

Subject Code: ME1P001	Name: Introduction to Manufacturing Processes	L-T-P-C: 0-0-3-2

Prerequisite: None

Experiments:

Machining:

- Introducing to various machine tools and demonstration on machining
- Making a steel pin as per drawing by machining in centre lathe
- External screw thread on lathe
- Making a regular polygon prism (MS)/ hexagon by milling machine
- Slot fitting by milling machine
- Making a cast iron Vee block by shaping
- Study of machining in machining centre (CNC)
- Study of Electro discharge machining (EDM)

Foundry Practice:

- Orientation, demonstration and practice on metal casting
- Practicing sand moulding using split and uneven parting line pattern
- Practice on CO_2 moulding and machine moulding
- Mechanised sand preparation and melting practice

Welding Practice:

- Practice on electric arc welding
- Practice on oxy-acetylene gas welding
- Introduction and demonstration on submerged arc welding

Metal Forming:

Demonstration of forging/ deep drawing and other forming process

3D Printing/ Rapid prototyping

Design and 3D printing of polymer component using FDM/ SLA

Fitting operation: Assembly of machined parts

Text/Reference Books:

- Chapman W.A.J., *Workshop Technology - Part I*, CBS Publishers.
- Chapman W.A.J., *Workshop Technology - Part II*, CBS Publishers.
- Hajra Choudhury S.K., *Elements of workshop Technology Vol. I*, Media Promoters.
- Hajra Choudhury S.K., *Elements of workshop Technology Vol. II*, Media Promoters.
- Rao P.N., Manufacturing Technology, Tata McGraw – Hill.
- Jain R.K., Production Technology, Khanna Publishers.

Subject Code: CE1P001	Name: Engineering Drawing and Graphics	L-T-P-C: 1-0-3-3

Prerequisite: None

Experiments:

- BIS conventions, Dimensioning rules, Free hand sketching
- Scales, Engineering curves
- Orthographic projections of points and lines
- Projection of planes
- Introduction to CAD tools, basic shapes and styles
- Orthographic projections of solids
- Soilds - Isometric projections and views
- Sections of solids and intersection
- Development of the surfaces of solids
- Circuit drawing/Building drawing/Machine drawing/Drawing using 3D view.

Text Books:

1. Bhatt N.D. "Elementary Engineering Drawing", Charotar Publishing House, 2023
2. 2. D. M. Kulkarni, A. P. Rastogi, and A. K. Sarkar, "Engineering Graphics with AutoCAD", PHILearning Private Limited, New Delhi, 2009

Reference Books:

1. Gill P.S. "Engineering Drawing & Engg. Graphics", S. K. Kataria & Sons, 2013
2. Parthasarathy N. S., Vela Murali, "Engineering Drawing", Oxford University Press, 2015

Subject Code: CE1P001	Name: Engineering Drawing and Graphics	L-T-P-C: 1-0-3-3

Prerequisite: None

Experiments:

- BIS conventions, Dimensioning rules, Free hand sketching
- Scales, Engineering curves
- Orthographic projections of points and lines
- Projection of planes
- Introduction to CAD tools, basic shapes and styles
- Orthographic projections of solids
- Soilds - Isometric projections and views
- Sections of solids and intersection
- Development of the surfaces of solids
- Circuit drawing/Building drawing/Machine drawing/Drawing using 3D view.

Text Books:

3. Bhatt N.D. "Elementary Engineering Drawing", Charotar Publishing House, 2023
4. 2. D. M. Kulkarni, A. P. Rastogi, and A. K. Sarkar, "Engineering Graphics with AutoCAD", PHILearning Private Limited, New Delhi, 2009

Reference Books:

1. Gill P.S. "Engineering Drawing & Engg. Graphics", S. K. Kataria & Sons, 2013
2. Parthasarathy N. S., Vela Murali, "Engineering Drawing", Oxford University Press, 2015

Subject Code: EP1L001	Name: Classical Mechanics and Special Relativity	L-T-P-C: 3-0-0-3
Prerequisite: None		

Syllabus: Review of Newton's laws of motion, Frames of reference, Rotating frames, Centrifugal and Coriolis forces, Free and constrained motion, D'Alemberts principle and Lagrange's equation of first kind, Lagrangian formulation, Hamilton's equation of motion, Variational principles, Canonical transformation and Poisson Bracket, Hamilton Jacobi theory and action angle variables, Eulerian angles, Euler's equation, Motion in a non-inertial frame of reference, Periodic motion, Small oscillations, normal coordinates, Rigid body motion, The inertia tensor, Central force, Kepler's Laws and Rutherford scattering, Galilean and Lorentz transformation, Length contraction, Time dilation, Proper time, Doppler effect, Mass-energy relation.

Books/references:

1. Classical Mechanics: J. R. Taylor
2. Classical Mechanics: David Morin
3. Introduction to Special relativity: R. Resnick
4. H. Goldstein, Classical Mechanics, Addison Wesley 1980

Subject Code: EE1L003	Subject Name: Analog and Digital Electronic Circuits	L-T-P-C: 3-1-0-4

Learning Outcome

- Explain the structure and principle of operation of diodes, BJTs, and MOSFETs. Analyze their characteristics and apply them in rectification, amplification, and switching applications.
- Integrate analog and digital electronics concepts to analyze and design mixed-signal circuits. Evaluate amplifier parameters such as voltage/current gain, input/output resistance, linearity, bandwidth, and power efficiency.
- Design and analyze RC and LC low-pass, high-pass, band-pass, and band-stop filters of single and higher order.
- Apply binary arithmetic, signed numbers, complements, and weighted codes in digital computations. Develop truth tables and realize switching functions using logic gates.
- Design combinational circuits such as encoders, decoders, multiplexers, comparators, adders, and ALUs. Construct state diagrams, transition tables, and excitation tables for sequential circuits.
- Demonstrate proficiency in using theoretical analysis and practical IC implementation for real-world circuit design.
- Apply ADE knowledge in higher-level courses such as VLSI, Communication Systems, Embedded Systems, and Power Electronics.

Syllabus

Semiconductor devices: Diode, BJT, MOSFET, their structures and principle of operations

Operational Amplifiers: Functionality, specifications (voltage gain, current gain, input resistance, output resistance, dynamic range, bandwidth, linearity, power efficiency etc.), effect of cascading, various applications and typical circuits;

Filters: Low pass, high pass, band pass and band stop filters, single and higher order passive filter topologies (RC and LC);

Feedback: Basic concept of negative and positive feedback, application of negative feedback in amplifiers, effect on gain, bandwidth, input resistance, output resistance and desensitivity to parameter variations;

Oscillators: Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, applications and typical circuits;

Operational amplifier: Differential mode of operation, common mode rejection, typical op-amp specifications, inverting amplifier, non-inverting amplifier, integrator, differentiator, summing amplifier etc.

Number Systems: Decimal, binary, octal, hexadecimal number system and conversion , binary weighted codes, signed numbers, 1s and 2s complement codes, Binary arithmetic

Boolean Algebra: Binary logic functions , Boolean laws, truth tables, associative and distributive properties, DeMorgans theorems, realization of switching functions using logic gates

Combinational Logic: Switching equations, canonical logic forms, sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, Quine-McCluskey minimization technique, mixed logic combinational circuits, multiple output functions.

Analysis & design of Combinational Logic: Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers as function generators, binary adder, substractor, BCD adder, Binary comparator, arithmetic logic unit

Sequential Logic: Sequential circuits, flip-flops, clocked and edge triggered flipflops, timing specifications, asynchronous and synchronous counters, counter design with state equations, Registers ,

serial in serial out shift registers, tristate registor, timing considerations.

Sequential Circuits: State diagrams and tables, transition table, excitation table and equations. Examples using flip-flops. Analysis of simple synchronous sequential circuits, construction of state diagram, counter design.

Practical analog and Digital ICs, LM741, LM555, LM311 etc., Data sheet ,

Text books:

1. "Integrated Electronics: Analog and Digital Circuits and Systems" – Jacob Millman & Christos Halkias
2. A. Malvino and D. J Bates "Electronic Principles," Tata McGrawHill Education, 2006
3. M. Morris Mano, "Digital Logic and Computer Design," 1st Ed., Prentice Hall, 1979, 15th Reprint 2013.
4. S. Lee, "Digital Circuits and Logic Design," 1st Ed., Prentice Hall India, 2008.

Reference Books

1. Malvino and Brown, "Digital Computer Electronics," Tata McGraw - Hill Education, 2001
2. Samuel C. Lee, "Digital Circuits and Logic Design," PHI Learning, 2009.