



SHRIDEVI
EDUCATION

Sri Shridevi Charitable Trust (R.)

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

Sira Road, Tumkur - 572 106, Karnataka, India.

Phone: 0816 - 2212629 | Principal: 0816 - 2212627, 9686114899 | Telefax: 0816 - 2212628

Email: info@shrideviengineering.org, principal@shrideviengineering.org | Website: www.shrideviengineering.org

ESTD: 2002



(Approved by AICTE, New Delhi, Recognised by Govt. of Karnataka and Affiliated to Visvesvaraya Technological University, Belagavi)

COURSE CONTENTS AND OUTCOMES OF BASIC SCIENCE DEPARTMENTS (Effective from Academic year 2018-19)

CALCULUS AND LINEAR ALGEBRA

Semester	: I	CIE Marks	: 40
Course Code	: 18MAT11	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 3:2:0	Exam Hours	: 03
Credits : 04			

Course Learning Objectives: This course Calculus and Linear Algebra (18MAT11) will enable students:

- To familiarize the important tools of calculus and differential equations that are essential in all branches of engineering.
- To develop the knowledge of matrices and linear algebra in a comprehensive manner.

MODULE-I

Differential Calculus-1: Review of elementary differential calculus, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Curvature and radius of curvature- Cartesian and polar forms; Centre and circle of curvature (All without proof-formulae only) –applications to evolutes and involutes.

(RBT Levels: L1 & L2)

MODULE-II

Differential Calculus-2: Taylor's and Maclaurin's series expansions for one variable (statements only), indeterminate forms - L'Hospital's rule. Partial differentiation; Total derivatives-differentiation of composite functions. Maxima and minima for a function of two variables; Method of Lagrange multipliers with one subsidiary condition. Applications of maxima and minima with illustrative examples. Jacobians-simple problems.

(RBT Levels: L1 & L2)

MODULE-III

Integral Calculus: Review of elementary integral calculus. Multiple integrals: Evaluation of double and triple integrals. Evaluation of double integrals- change of order of integration and changing into polar coordinates. Applications to find area volume and centre of gravity. Beta and Gamma functions: Definitions, Relation between beta and gamma functions and simple problems.

(RBT Levels: L1 & L2)

MODULE-IV

Ordinary differential equations (ODE's) of first order:

Exact and reducible to exact differential equations. Bernoulli's equation.

Applications of ODE's-orthogonal trajectories, Newton's law of cooling and L-R circuits. Nonlinear differential equations: Introduction to general and singular solutions ; Solvable for p only; Clairaut's and reducible to Clairaut's equations only. **(RBT Levels : L1, L2 & L3)**

MODULE-V

Linear Algebra: Rank of a matrix-echelon form. Solution of system of linear equations – consistency. Gauss-elimination method, Gauss –Jordan method and Approximate solution by Gauss-Seidel method. Eigen values and eigenvectors-Rayleigh's power method. Diagonalization of a square matrix of order two. **(RBT Levels : L1, L2 & L3)**

Textbooks:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition, 2. McGraw-Hill Book Co., New York, 1995.
2. James Stewart : "Calculus –Early Transcendentals", Cengage Learning India Private Ltd., 2017.
3. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Srimanta Pal & Subobh C Bhunia: "Engineering Mathematics", Oxford University Press, 3rd Reprint, 2016.
5. Gupta C.B., Singh S.R. and Mukesh Kumar: "Engineering Mathematics for Semester I & II", Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Web links and Video Lectures:

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>
4. VTU EDUSAT PROGRAMME - 20

Course Outcomes: On completion of this course, students are able to:

CO1 : Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.

CO2 : Learn the notion of partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and Jacobians.

CO3 : Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.

CO4 : Solve first order linear/nonlinear differential equation analytically using standard methods

CO5 : Make use of matrix theory for solving system of linear equations and compute eigenvalues and eigenvectors required for matrix diagonalization process.

Question Paper Pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

ENGINEERING PHYSICS

Semester	: I/II	CIE Marks	: 40
Course Code	: 18PHY12/22	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 3:2:0	Exam Hours	: 03
Credits : 04			

Course Learning Objectives:

This course (18PHY12/22) will enable students to

- Learn the basic concepts in Physics which are very much essential in understanding and solving engineering related challenges.
- Gain the knowledge of newer concepts in modern physics for the better appreciation of modern technology

MODULE-I

Oscillations and Waves

Free Oscillations: Definition of SHM, derivation of equation for SHM, Mechanical simple harmonic oscillators (mass suspended to spring oscillator), complex notation and phasor representation of simple harmonic motion. Equation of motion for free oscillations, Natural frequency of oscillations.

Damped and forced oscillations: Theory of damped oscillations: over damping, critical & under damping, quality factor. Theory of forced oscillations and resonance, Sharpness of resonance. One example for mechanical resonance.

Shock waves: Mach number, Properties of Shock waves, control volume. Laws of conservation of mass, energy and momentum. Construction and working of Reddy shock tube, applications of shock waves.
Numerical problems

(RBT Levels : L1, L2 & L3)

MODULE-II

Elastic properties of materials:

Elasticity: Concept of elasticity, plasticity, stress, strain, tensile stress, shear stress, compressive stress, strain hardening and strain softening, failure (fracture/fatigue), Hooke's law, different elastic moduli: Poisson's ratio, Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (n) in terms of α and β . Relation between Y, n and K, Limits of Poisson's ratio.

Bending of beams: Neutral surface and neutral plane, Derivation of expression for bending moment. Bending moment of a beam with circular and rectangular cross section. Single cantilever, derivation of expression for Young's modulus.

Torsion of cylinder: Expression for couple per unit twist of a solid cylinder (Derivation), Torsional pendulum-Expression for period of oscillation. Numerical problems.

(RBT Levels : L1, L2 & L3)

MODULE- III

Maxwell's equations, EM waves and Optical fibers

Maxwell's equations: Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static), Gauss' divergence theorem and Stokes' theorem. Description of laws of electrostatics, magnetism and Faraday's laws of EMI. Current density & equation of Continuity; displacement current (with derivation) Maxwell's equations in vacuum.

EM Waves: The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations), Plane electromagnetic waves in vacuum, their transverse nature, polarization of EM waves (Qualitative).

Optical fibers: Propagation mechanism, angle of acceptance. Numerical aperture. Modes of propagation and Types of optical fibers. Attenuation: Causes of attenuation and Mention of expression for attenuation coefficient. Discussion of block diagram of point to point communication. Merits and demerits Numerical problems.

(RBT Levels : L1 & L2)

MODULE IV

Quantum Mechanics and Lasers

Quantum mechanics: Introduction to Quantum mechanics, Wave nature of particles, Heisenberg's uncertainty principle and applications (non confinement of electron in the nucleus), Schrodinger time independent wave equation, Significance of Wave function, Normalization, Particle in a box, Energy eigen values of a particle in a box and probability densities.

Lasers: Review of spontaneous and stimulated processes, Einstein's coefficients (derivation of expression for energy density). Requisites of a Laser system. Conditions for laser action. Principle, Construction and working of CO₂ and semiconductor Lasers.

Application of Lasers in Defense (Laser range finder) and Engineering (Data storage).

Numerical problems

(RBT Levels : L1, L2 & L3)

MODULE-V

Material science

Quantum Free electron theory of metals: Review of classical free electron theory, mention of failures. Assumptions of Quantum Free electron theory,

Mention of expression for density of states, Fermi-Dirac statistics (qualitative), Fermi factor, Fermi level, Derivation of the expression for Fermi energy, Success of QFET.

Physics of Semiconductor: Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band, Hole concentration in valance band (only mention the expression), Conductivity of semiconductors(derivation), Hall effect, Expression for Hall coefficient (derivation)

Dielectric materials: polar and non-polar dielectrics, internal fields in a solid, Clausius-Mossotti equation(Derivation), mention of solid, liquid and gaseous dielectrics with one example each. Application of dielectrics in transformers. Numerical problems.

(RBT Levels : L1, L2 & L3)

Textbooks:

1. A Text book of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand & Company Ltd, New Delhi.
2. Engineering Physics-Gaur and Gupta Dhanpat Rai Publications-2017.
3. Concepts of Modern Physics-Arthur Beiser: 6th Ed, Tata McGraw Hill Edu Pvt Ltd- New Delhi 2006.

Reference books:

1. Introduction to Mechanics, MK Verma: 2nd Ed, University Press(India) Pvt Ltd, Hyderabad 2009.
2. Lasers and Non Linear Optics, BB laud, 3rd Ed, New Age International Publishers 2011.
3. Solid State Physics-S O Pillai, 8th Ed New Age International Publishers-2018.
4. Shock waves made simple- Chintoo S Kumar, K Takayama and KPJ Reddy: Willey India Pvt. Ltd., New Delhi, 2014.
5. Introduction to Electrodynamics, David Griffiths, 4th Ed, Cambridge University Press 2017.

Course Outcomes:

Upon completion of this course, students will be able to

1. Understand various types of oscillations and their implications, the role of Shock waves in various fields and Recognize the elastic properties of materials for engineering applications.
2. Realize the interrelation between time varying electric field and magnetic field, the transverse nature of the EM waves and their role in optical fiber communication.
3. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent 1-D Schrodinger's wave equation.
4. Apprehend theoretical background of laser, construction and working of different types of laser and its applications in different fields

5. Understand various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models.

Question paper pattern:

Note:- The SEE question paper will be set for 100 marks and the marks will be proportionately reduced to 60.

- The question paper will have **ten** full questions carrying equal marks.
- Each full question consisting of **20** marks.
- There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer **five** full questions, selecting **one** full question from each module.

BASIC ELECTRICAL ENGINEERING

Semester	: I/II	CIE Marks	: 40
Course Code	: 18ELE13/23	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 2:2:0	Exam Hours	: 03
Credits : 03			

Lecture hours per module: Six hours and **Tutorials per module: one of 2 hours**

Course Objectives:

- To explain Ohm's law and Kirchhoff's laws used for the analysis of DC circuits.
- To explain fundamentals of AC circuits and the behaviour of R, L and C and their combinations in AC circuits.
- To discuss three phase balanced circuits.
- To explain principle of operation, construction and performance of electrical machines such as single phase transformer, DC machines, synchronous generator and three phase induction motor.
- To introduce concepts of electrical wiring, circuit protecting devices and earthing.

MODULE-1

D.C.Circuits: Ohm's Law and Kirchhoff's Laws, analysis of series, parallel and series- parallel circuits excited by independent voltage sources. Power and Energy.

A.C. Fundamentals: Generation of sinusoidal voltage, frequency of generated voltage, definition and numerical values of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities.

(RBT Levels : L1, L2, L3 & L4)

MODULE - 2

Single Phase Circuits: Analysis, with phasor diagram, of circuits with R, L, C, R-L, RC, R-L-C for series and parallel configurations. Real power, reactive power, apparent power and power factor.

Three Phase circuits: Advantages of 3-phase power, Generation of 3-phase power, Three-phase balanced circuits, voltage and current relations in star and delta connections. Measurement of three phase power using two wattmeter method.

(RBT Levels : L1, L2, L3 & L4)

MODULE - 3

Single Phase Transformers: Necessity of transformer, Principle of operation, Types and construction of transformers. emf equation, losses, variation of losses with respect to load, efficiency, Condition for maximum efficiency.

Domestic Wiring: Service mains, meter board and distribution board. Brief discussion on concealed conduit wiring. Two-way and three-way control. Elementary discussion on circuit protective devices: Fuse and Miniature Circuit Breaker (MCB's), electric shock, precautions against shock. Earthing: Pipe and Plate earthing.

(RBT Levels : L1, L2 & L3)

MODULE – 4

DC Generators: Principle of operation, Construction of D.C. Generators. Expression for induced emf, Types of D.C. Generators, Relation between induced emf and terminal voltage.

DC motors: Principle of operation, Back emf, Torque equation, Types of dc motors, Characteristics of dc motors (shunt and series motors only) and Applications.

(RBT Levels : L1, L2 & L3)

MODULE – 5

Three Phase Synchronous Generators: Principle of operation, Constructional details, Synchronous speed, Frequency of generated voltage, emf equation, Concept of winding factor (excluding the derivation and calculation of distribution and pitch factors).

Three Phase Induction Motors: Principle of operation, Generation of rotating magnetic field, Construction and working of three-phase induction motor, Slip and its significance. Necessity of starter, star-delta starter.

(RBT Levels : L1, L2 & L3)

Textbooks:

- 1 Basic Electrical Engineering, D C Kulshreshtha, Tata McGraw Hill, Revised First Edition.
- 2 Principles of Electrical Engineering & Electronics, V.K. Mehta, Rohit Mehta, S.Chand Publications.

Reference Books:

- 1 Fundamentals of Electrical Engineering and Electronics, B. L. Theraja, S. Chand & Company Ltd, Reprint Edition 2013.
- 2 Electrical Technology, E. Hughes, International Students 9th Edition, Pearson, 2005.
- 3 Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill, 2017.

Course Outcomes:

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

- Analyse D.C and A.C circuits.
- Explain the principle of operation and construction of single phase transformers.

- Explain the principle of operation and construction of DC machines and synchronous machines.
- Explain the principle of operation and construction of three phase induction motors.
- Discuss concepts of electrical wiring, circuit protecting devices and earthing.

Graduate Attributes (As per NBA): Engineering Knowledge, Problem Analysis.

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.

ELEMENTS OF CIVIL ENGINEERING AND MECHANICS

Semester	: I/II	CIE Marks	: 40
Course Code	: 18CIV14/24	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 2:2:0	Exam Hours	: 03
Credits : 03			

Course Objectives:

The objectives of this course are:

- To make students to learn Scope of various fields of Civil Engineering, basics of civil engineering concepts and importance of infrastructure development.
- To develop a student's ability to analyze the problems involving Forces and Moments with their applications, Centroid and Moment of inertia and Kinetics of bodies.

Module-1

Introduction to Civil Engineering: Scope of different fields of Civil Engineering; Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources & Irrigation Engineering, Transportation Engineering and Environmental Engineering. Role of Civil Engineers in the Infrastructural development, effect of infrastructural facilities on social-economic development of a country. **(RBT Level : L1)**

Introduction to Engineering Mechanics: Basic concepts of idealization- Particle, Continuum and Rigid Body; Force; Systems of Forces; Basic Principles – Physical Independence of forces, Superposition, Transmissibility, Newton's Laws of Motion, Resolution and Composition of forces, Law of parallelogram of forces, Polygonal law, Resultant of Concurrent coplanar force systems, Coplanar Non Concurrent Force System: Moment of a Forces, couple, Varignon's theorem, Resultant of Coplanar non-concurrent force system.

(RBT Level : L1, L2 & L3)

Module-2

Equilibrium of Forces: Free body diagrams, Lami's theorem, Equations of Equilibrium, equilibrium of concurrent and non concurrent coplanar force systems. **(RBT Level : L1, L2 & L3)**

Friction: Types of friction, Laws of dry Friction, Limiting friction, Concept of Static and Dynamic Friction; Numerical problems on motion of single and connected bodies on planes, wedge friction, ladder friction, rope and Pulley systems. **(RBT Level : L1, L2 & L3)**

Module-3

Support Reactions: Types of Loads and Supports, statically determinate and indeterminate beams, Support Reaction in beams, Numerical problems on support reactions for statically determinate beams (Point load, uniformly distributed & uniformly varying loads and Moments)

(RBT Level : L1, L2 & L3)

Analysis of Simple trusses: Types of trusses, Analysis of statically determinate trusses using method of joints and method of sections.

(RBT Level : L1, L2 & L3)

Module-4

Centroid: Centroid of simple figures from first principle, Centroid of composite/built-up sections; Moment of Inertia: Introduction, second moment of area of plane sections from first principles, Parallel axes and perpendicular axes Theorems, Radius of gyration, Moment of inertia of composite area and built-up sections.

Concept of Product of Inertia(No Problems)

(RBT Level : L1, L2 & L3)

Module-5

Kinematics: Definitions, Displacement, Average velocity, Instantaneous velocity, Speed, Acceleration, Average acceleration, Variable acceleration, Acceleration due to gravity, Newton's Laws of Motion. Rectilinear Motion–Numerical problems. Curvilinear Motion–Super elevation, Projectile Motion, Relative motion, Numerical problems. Motion under gravity, Numerical problems,

(RBT Level : L1, L2 & L3)

Kinetics: D'Alembert's principle and its applications in plane motion and connected bodies including pulleys

(RBT Level : L2 & L3)

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

1. Mention the applications of various fields of Civil Engineering.
2. Compute the resultant of given force system subjected to various loads.
3. Comprehend the action of Forces, Moments and other loads on systems of rigid bodies and compute the reactive forces that develop as a result of the external loads.
4. Locate the Centroid and compute the Moment of Inertia of regular and built-up sections.
5. Express the relationship between the motion of bodies and analyze the bodies in motion.

ADVANCED CALCULUS AND NUMERICAL METHODS

Semester	: II	CIE Marks	: 40
Course Code	: 18MAT21	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 3:2:0	Exam Hours	: 03
Credits : 04			

Course Learning Objectives: This course viz., Advanced Calculus and Numerical Methods (18MAT21) aims to prepare the students:

- To familiarize the important tools of vector calculus, ordinary/partial differential equations and power series required to analyze the engineering problems.
- To apply the knowledge of interpolation/extrapolation and numerical integration technique whenever analytical methods fail or very complicated, to offer solutions.

MODULE-I

Vector Calculus:-

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector fields- Illustrative problems.

Vector Integration: Line integrals, Theorems of Green, Gauss and Stokes (without proof). Applications to work done by a force and flux.

(RBT Levels : L1 & L2)

MODULE-II

Differential Equations of higher order:- Second order linear ODE's with constant coefficients-Inverse differential operators, method of variation of parameters; Cauchy's and Legendre homogeneous equations. Applications to oscillations of a spring and L-C-R circuits.

(RBT Levels : L1, L2 & L3)

MODULE-III

Partial Differential Equations(PDE's):- Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one dimensional heat and wave equations and solutions by the method of separation of variables.

(RBT Levels : L1, L2 & L3)

MODULE-IV

Infinite Series:- Series of positive terms- convergence and divergence. Cauchy's root test and D'Alembert's ratio test(without proof)- Illustrative examples.

Power Series solutions:- Series solution of Bessel's differential equation leading to $J_n(x)$ - Bessel's function of first kind-orthogonality. Series solution of Legendre's differential equation leading to $P_n(x)$ -Legendre polynomials. Rodrigue's formula (without proof), problems.

(RBT Levels : L1 & L2)

MODULE-V

Numerical Methods:

Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods(only formulae)- Illustrative examples.

Numerical integration: Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules, Weddle's rule (without proof)–Problems.

(RBT Levels : L1, L2 & L3)

Textbooks:

1. **B.S. Grewal:** Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. **E. Kreyszig:** Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. **C.Ray Wylie, Louis C.Barrett :** “Advanced Engineering Mathematics”, 6th Edition, 2. McGraw-Hill Book Co., New York, 1995.
2. **James Stewart :** “Calculus –Early Transcendentals”, Cengage Learning India Private Ltd., 2017.
3. **B.V.Ramana:** "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. **Srimanta Pal & Subobh C Bhunia:** “Engineering Mathematics”, Oxford University Press, 3rd Reprint, 2016.
5. **Gupta C.B., Singh S.R. and Mukesh Kumar:** “Engineering Mathematics for Semester I & II”, Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Web links and Video Lectures:

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>
4. VTU EDUSAT PROGRAMME - 20

Course Outcomes: On completion of this course, students are able to:

CO1 : Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.

CO2 : Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.

CO3 : Construct a variety of partial differential equations and solution by exact methods/method of separation of variables.

CO4 : Explain the applications of infinite series and obtain series solution of ordinary differential equations.

CO5 : Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.

Question Paper Pattern:

- **The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.**
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

ENGINEERING CHEMISTRY

Semester	: I/II	CIE Marks	: 40
Course Code	: 18CHE12/22	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 3:2:0	Exam Hours	: 03
Credits : 04			

Course Learning Objectives:

This course (18CHE12/22) will enable students to

- Master the basic knowledge of engineering chemistry for building technical competence in industries, research and development.
- To develop knowledge in the fields of use of free energy in chemical equilibrium, electrochemistry and energy storage systems, Corrosion and metal finishing.
- To understand the importance of energy systems, environmental pollution, waste management, water chemistry, Instrumental methods of analysis and Nanomaterials.

MODULE-I

Electrochemistry and Energy storage systems

Use of free energy in chemical equilibria: Thermodynamic functions: Definitions of free energy and entropy. Cell potential, derivation of Nernst equation for single electrode potential, numerical problems on E, E⁰, and E_{cell}

Electrochemical energy systems: Reference electrodes: Introduction, construction, working and applications of Calomel electrode. Ion-selective electrode – Definition, construction and principle of Glass electrode and determination of pH using glass electrode. Electrolyte concentration cells, numerical problems

Energy storage systems: Introduction, classification - primary, secondary and reserve batteries. Construction, working and applications of Ni-MH and Li-ion batteries

(RBT Levels: L3)

MODULE-II

Corrosion and Metal finishing

Corrosion: Introduction, Electrochemical theory of corrosion, Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product, nature of medium – pH, conductivity and temperature. Types of corrosion - Differential metal and differential aeration - pitting and water line). Corrosion control: Anodizing – Anodizing of aluminium, Cathodic protection - sacrificial anode and impressed current methods, Metal coatings – Galvanization

Metal finishing: Introduction, Technological importance. Electroplating: Introduction, principles governing electroplating-Polarization, decomposition potential and overvoltage. Electroplating of chromium (hard and decorative). Electroless plating: Introduction, electroless plating of nickel & copper, distinction between electroplating and electroless plating processes

(RBT Levels: L1 & L2)

MODULE-III

Energy Systems

Chemical Fuels: Introduction, classification, definitions of CV, LCV, and HCV, determination of calorific value of solid/liquid fuel using bomb calorimeter, numerical problems. Knocking of petrol engine – Definition, mechanism, ill effects and prevention. Power alcohol, unleaded petrol and biodiesel

Fuel Cells: Introduction, differences between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 electrolyte, and solid oxide fuel cell (SOFCs)

Solar Energy: Photovoltaic cells- introduction, construction and working of a typical PV cell, Preparation of solar grade silicon by Union Carbide Process/Method. Advantages & disadvantages of PV cells

MODULE - IV

Environmental Pollution and Water Chemistry

Environmental Pollution: Air pollutants: Sources, effects and control of primary air pollutants: Carbon monoxide, Oxides of nitrogen and sulphur, hydrocarbons, Particulate matter, Carbon monoxide, Mercury and Lead. Secondary air pollutant: Ozone, Ozone depletion

Waste Management: Solid waste, e-waste & biomedical waste: Sources, characteristics & disposal methods (Scientific land filling, composting, recycling and reuse)

Water Chemistry: Introduction, sources and impurities of water; boiler feed water, boiler troubles with disadvantages -scale and sludge formation, boiler corrosion (due to dissolved O_2 , CO_2 and $MgCl_2$). Sources of water pollution, Sewage, Definitions of Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), determination of COD, numerical problems on COD. Chemical analysis of water: Sulphates (gravimetry) and Fluorides (colorimetry). Sewage treatment: Primary, secondary (activated sludge) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis

(RBT Levels: L3)

Module V

Instrumental methods of analysis and Nanomaterials

Instrumental methods of analysis: Theory, Instrumentation and applications of Colorimetry, Flame Photometry, Atomic Absorption Spectroscopy, Potentiometry, Conductometry (Strong acid with a strong base, weak acid with a strong base, mixture of strong acid and a weak acid with a strong base)

Nanomaterials: Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties). Synthesis of nanomaterials: Top down and bottom up approaches, Synthesis by Sol-gel, precipitation and chemical vapour deposition, Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes – properties and applications

(RBT Levels: L1 & L2)

Course Outcomes: On completion of this course, students will have knowledge in:

CO1 : Use of free energy in equilibria, rationalize bulk properties and processes using thermodynamic considerations, electrochemical energy systems.

CO2 : Causes & effects of corrosion of metals and control of corrosion. Modification of surface properties of metals to develop resistance to corrosion, wear, tear, impact etc. by electroplating and electroless plating.

CO3 : Production & consumption of energy for industrialization of country and living standards of people. Electrochemical and concentration cells. Classical, modern batteries and fuel cells. Utilization of solar energy for different useful forms of energy.

CO4 : Environmental pollution, waste management and water chemistry.

CO5 : Different techniques of instrumental methods of analysis. Fundamental principles of nano materials.

Question Paper Pattern:

- **The SEE question paper will be set for 100 marks and the marks scored by the student will be proportionately reduced to 60.**
- The question paper will have **ten** full questions carrying equal marks.
- Each full question carries **20** marks.
- There will be **two** full questions (with a **maximum** of **three** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer **five** full questions, selecting **one** full question from each module.

C PROGRAMMING FOR PROBLEM SOLVING

Semester	: I/II	CIE Marks	: 40
Course Code	: 18CPS13/23	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 2:2:0	Exam Hours	: 03
Credits : 03			

Course Learning Objectives:

This course (18CPS13/23) will enable students to:

- Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
- Implement different programming constructs and decomposition of problems into functions.
- Use and implement data structures like arrays and structures to obtain solutions.
- Define and use of pointers with simple applications.

MODULE-I

Introduction to computer Hardware and software: Computer generations, computer types, bits, bytes and words, CPU, Primary memory, Secondary memory, ports and connections, input devices, output devices, Computers in a network, Network hardware, Software basics, software types.

Overview of C: Basic structure of C program, executing a C program. Constant, variable and data types, Operators and expressions,

(RBT Levels : L1 & L2)

MODULE 2

Managing Input and output operations. Conditional Branching and Loops. Example programs, Finding roots of a quadratic equation, computation of binomial coefficients, plotting of Pascals triangle.

(RBT Levels : L1 & L2)

MODULE 3

Arrays: Arrays (1-D, 2-D), Character arrays and Strings, Basic Algorithms: Searching and Sorting Algorithms (Linear search, Binary search, Bubble sort and Selection sort).

(RBT Levels : L1, L2 & L3)

MODULE 4

User Defined Functions and Recursion.

Example programs, Finding Factorial of a positive integers and Fibonacci series.

(RBT Levels : L1, L2 & L3)

MODULE 5

Structure and Pointers, Preprocessor Directives

(RBT Levels : L1, L2 & L3)

Course Outcomes:

The student will be able to :

- Illustrate simple algorithms from the different domains such as mathematics, physics, etc.
- Construct a programming solution to the given problem using C.
- Identify and correct the syntax and logical errors in C programs.
- Modularize the given problem using functions and structures.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill
2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.

Reference Books:

1. Sumitabha Das, Computer Fundamentals & C Programming, Mc Graw Hill Education.
2. Gary J Bronson, ANSIC Programming, 4th Edition, Cengage Learning.
3. Dey and Ghosh, Programming in C, 3rd Edition, Oxford University Press.
4. Vikas Gupta: Computer Concepts and C Programming, Dreamtech Press 2013.
5. R S Bichkar, Programming with C, University Press, 2012.
6. V Rajaraman: Computer Programming in C, PHI, 2013.
7. Basavaraj S. Anami, Shanmukhappa A Angadi, Sunilkumar S. Manvi, Computer Concepts and C Programming: A Holistic Approach to Learning C, Seond edition, PHI India, 2010.

BASIC ELECTRONICS

Semester	: I/II	CIE Marks	: 40
Course Code	: 18ELN14/24	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 2:2:0	Exam Hours	: 03
Credits : 03			

Course Objectives:

This course will enable students to:

- Understand characteristics, operation and applications of the diodes, bipolar junction transistors, field effect transistors, SCRs and operational amplifiers in electronic circuits.
- Understand different number systems and working of fundamental building blocks of digital circuits.
- Understand the principle of basic communication system and mobile phones.

MODULE-1

Semiconductor Diodes and Applications:

p-n junction diode, Equivalent circuit of diode, Zener Diode, Zener diode as a voltage regulator, Rectification-Half wave rectifier, Full wave rectifier, Bridge rectifier, Capacitor filter circuit (2.2, 2.3, 2.4 of Text 1).

Photo diode, LED, Photo coupler. (2.7.4, 2.7.5, 2.7.6 of Text 1).

78XX series and 7805 Fixed IC voltage regulator (8.4.4 and 8.4.5 of Text 1).

(RBT Levels : L1, L2 & L3)

MODULE-2

FET and SCR:

Introduction, JFET: Construction and operation, JFET Drain Characteristics and Parameters, JFET Transfer Characteristic, Square law expression for I_D , Input resistance, MOSFET: Depletion and Enhancement type MOSFET-Construction, Operation, Characteristics and Symbols, (refer 7.1, 7.2, 7.4, 7.5 of Text 2), CMOS (4.5 of Text 1).

Silicon Controlled Rectifier (SCR) – Two-transistor model, Switching action, Characteristics, Phase control application (refer 3.4 upto 3.4.5 of Text 1).

(RBT Levels : L1, L2 & L3)

MODULE-3

Operational Amplifiers and Applications:

Introduction to Op-Amp, Op-Amp Input Modes, Op-Amp Parameters-CMRR, Input Offset Voltage and Current, Input Bias Current, Input and Output Impedance, Slew Rate (12.1, 12.2 of Text 2).

Applications of Op-Amp - Inverting amplifier, Non-Inverting amplifier, Summer, Voltage follower, Integrator, Differentiator, Comparator (6.2 of Text 1).

(RBT Levels : L1, L2 & L3)

MODULE-4

BJT Applications, Feedback Amplifiers and Oscillators:

BJT as an amplifier, BJT as a switch, Transistor switch circuit to switch ON/OFF an LED and a lamp in a power circuit using a relay (refer 4.4 and 4.5 of Text 2).

Feedback Amplifiers – Principle, Properties and advantages of Negative Feedback, Types of feedback, Voltage series feedback, Gain stability with feedback (7.1-7.3 of Text 1).

Oscillators – Barkhausen's criteria for oscillation, RC Phase Shift oscillator, Wien Bridge oscillator (7.7-7.9 of Text 1).

IC 555 Timer and Astable Oscillator using IC 555 (17.2 and 17.3 of Text 1).

(RBT Levels : L1, L2 & L3)

MODULE-5

Digital Electronics Fundamentals:

Difference between analog and digital signals, Number System-Binary, Hexadecimal, Conversion- Decimal to binary, Hexadecimal to decimal and vice-versa, Boolean algebra, Basic and Universal Gates, Half and Full adder, Multiplexer, Decoder, SR and JK flip-flops, Shift register, 3 bit Ripple Counter (refer 10.1-10.7 of Text 1).

Basic Communication system, Principle of operations of Mobile phone (refer 18.2 and 18.18 of Text 1).

(RBT Levels : L1 & L2)

Course Outcomes:

After studying this course, students will be able to:

- Describe the operation of diodes, BJT, FET and Operational Amplifiers.
- Design and explain the construction of rectifiers, regulators, amplifiers and oscillators.
- Describe general operating principles of SCRs and its application.
- Explain the working and design of Fixed voltage IC regulator using 7805 and Astable oscillator using Timer IC 555.
- Explain the different number system and their conversions and construct simple combinational and sequential logic circuits using Flip-Flops.
- Describe the basic principle of operation of communication system and mobile phones.

ELEMENTS OF MECHANICAL ENGINEERING

Semester	: I/II	CIE Marks	: 40
Course Code	: 18ME15/25	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 2:2:0	Exam Hours	: 03
Credits : 03			

Course Objectives:

This course (18ME15/25) will enable students to

CLO1 Learn the fundamental concepts of energy, its sources and conversion.

CLO2 Comprehend the basic concepts of thermodynamics.

CLO3 Understand the concepts of boilers, turbines, pumps, internal combustion engines and refrigeration

CLO4 Distinguish different metal joining techniques.

CLO5 Enumerate the knowledge of working with conventional machine tools, their specifications.

MODULE-1

Sources of Energy : Introduction and application of energy sources like fossil fuels, hydel, solar, wind, nuclear fuels and bio-fuels; environmental issues like global warming and ozone depletion.

Basic concepts of Thermodynamics: Introduction, states, concept of work, heat, temperature; Zeroth, 1st, 2nd and 3rd laws of thermodynamics. Concept of internal energy, enthalpy and entropy (simple numericals).

Steam: Formation of steam and thermodynamic properties of steam (simple numericals).

(RBT : L1, L2 & L3)

MODULE-II

Boilers: Introduction to boilers, classification, Lancashire boiler, Babcock and Wilcox boiler. Introduction to boiler mountings and accessories (no sketches).

Turbines: Hydraulic Turbines – Classification and specification, Principles and operation of Pelton wheel turbine, Francis turbine and Kaplan turbine (elementary treatment only).

Hydraulic Pumps: Introduction, classification and specification of pumps, reciprocating pump and centrifugal pump, concept of cavitation and priming.

(RBT: L1, L2 & L3)

MODULE – III

Internal Combustion Engines

Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption.

Refrigeration and Air conditioning

Refrigeration - Definitions - Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration. Refrigerants, Properties of refrigerants, List of commonly used refrigerants. Principle and working of vapor compression refrigeration and vapor absorption refrigeration. Domestic refrigerator. Principles and applications of air conditioners, window and split air conditioners.

(RBT Levels : L1, L2 & L3)

MODULE IV

Properties, Composition and Industrial Applications of engineering materials

Metals – Ferrous: cast iron, tool steels and stainless steels and nonferrous: aluminum, brass, bronze. Polymers - Thermoplastics and thermosetting polymers. Ceramics - Glass, optical fiber glass, cermets. Composites - Fiber reinforced composites, Metal Matrix Composites Smart materials – Piezoelectric materials, shape memory alloys, semiconductors and insulators.

Joining Processes: Soldering, Brazing and Welding

Definitions. Classification and methods of soldering, brazing and welding. Brief description of arc welding, oxy-acetylene welding, TIG welding, and MIG welding.

Belt drives

Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive, ratio of tension in flat belt drives, advantages and disadvantages of V belts and timing belts, simple numerical problems.

Gear drives

Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, advantages and disadvantages over belt drives, simple numerical problems on velocity ratio.

(RBT Levels : L1, L2 & L3)

MODULE-V

Lathe - Principle of working of a center lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tailstock offset method and Compound slide swiveling method, Specification of Lathe.

Milling Machine - Principle of milling, types of milling machines. Working of horizontal and vertical milling machines. Milling processes - plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.

(Layout sketches of the above machines need not be dealt. Sketches need to be used only for explaining the operations performed on the machines)

Introduction to Advanced Manufacturing Systems

Computer Numerical Control (CNC): Introduction, components of CNC, open loop and closed loop systems, advantages of CNC, CNC Machining centers and Turning centers.

Robots: Robot anatomy, joints and links, common robot configurations.

Applications of Robots in material handling, processing and assembly and inspection.

(RBT Levels : L1, L2 & L3)

Course Outcomes:

Upon completion of this course, students will be able to

- CO1 Identify different sources of energy and their conversion process.
- CO2 Explain the working principle of hydraulic turbines, pumps, IC engines and refrigeration.
- CO3 Recognize various metal joining processes and power transmission elements.
- CO4 Understand the properties of common engineering materials and their applications in engineering industry.
- CO5 Discuss the working of conventional machine tools, machining processes, tools and accessories.
- CO6 Describe the advanced manufacturing systems.

Question paper pattern:

- **The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.**
- The question paper will have **ten** full questions carrying equal marks.
- Each full question consisting of **20** marks.
- There will be **two** full questions (with a **maximum** of **three** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer **five** full questions, selecting **one** full question from each module.

Note

- To illustrate the concepts of operations of turbines, pumps, conventional machines like lathe, drilling, milling, grinding etc., the instructions should be blended with video presentations and visit to the laboratories/ machine shop concerned.
- Demonstration of soldering, brazing and welding should be arranged in the workshop.
- To illustrate the fundamentals of CNC machining and turning centers and robots, video presentations should be adapted in addition to class room instructions.
- The boiler mountings and accessories should be shown in the engine lab.