Mathematics-I

[1st Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Mathematics	4-0-0, (4)	EPR	MA101I001MA

[Pre-requisites: Intermediate Mathematics]

Course Objectives

To expose student to understand the basic importance of Differential calculus, Partial derivatives, Integral calculus and Infinite series in science and engineering.

Course Content

Unit-1 Differential Calculus:

Functions of single variable: Review of limit, continuity and differentiability. Mean value theorems: Rolle's Theorem, Lagrange's theorem, Cauchy's theorem, Taylor's theorem with Lagrange's form of remainder, Expansions of functions in Taylor's and McLaurin's series, Asymptotes, Tracing of Simple curves.

Unit-2 Partial Derivatives

Functions of two variables: Limit, continuity and partial derivatives, derivatives of higher order and their commutativity, Euler's theorem on homogeneous functions, Total derivative, Change of variables, Jacobians, Maxima, minima and saddle points of functions of two variables.

Unit-3 Integral Calculus

Fundamental theorem of Integral calculus, Mean value theorems, Evaluation of definite integrals - reduction formulae, Application of integration to area, length, volume of revolution, Differentiation under integral sign.

Unit-4 Sequences and Series

Sequences and their limits, convergence of series, comparison test, ratio test, root test, Absolute and conditional convergence, Alternating series, Power Series, Radius of Convergence.

Course Materials

Required Text: Text books

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons.
3. Higher Engineering Mathematics by Ravish R Singh and Mukul Bhatt, TMH.

Optional Materials: Reference Books

1. Advanced Engg. Mathematics by R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
2. Higher Engineering Mathematics by B. V. Ramana, TMH.
3. Mathematical Analysis by T. M. Apostol, Addison-Wesley, 1974.
4. Basic course in real analysis by Ajit Kumar and S. Kumaresan, CRC Press

Mathematics-II

[2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Mathematics	4-0-0, (4)	EPR	MA101I002MA

[Pre-requisites: Intermediate Mathematics and Mathematics I]

Course Objectives

To expose student to understand the basic importance of matrices, Ordinary Differential Equations, Multiple Integrals and vector calculus in science and engineering.

Course Content

Unit-1 Matrices

Real vector space, Subspace, Linear span, Linear dependence and linear independence of vectors, Basis, Dimension, Linear transformation, Matrix associated with a linear transformation, Rank and inverse by elementary transformation (Gauss Jordan method), System of linear equations, Eigenvalues and eigenvectors, Cayley-Hamilton theorem, Diagonalization of matrices.

Unit-2 Ordinary Differential Equations

Exact differential equations; reducible to exact form; first order differential equations (linear and non -linear); Existence and Uniqueness of solutions. Picard's theorem (Statement only), Linear differential equations of higher order with constant coefficients, Method of variation of parameters, Cauchy's and Euler's equations

Unit-3 Multiple Integrals

Convergence of improper integrals, tests of convergence, Beta and Gamma functions – elementary properties, Double and triple integrals, change of order of integration, Application to area and volume.

Unit-4 Vector Calculus

Scalar and vector fields, Vector operator, Directional derivative, Gradient, Divergence and curl, Line, Surface and Volume integrals, Green's, Gauss's & Stoke's theorem (without proof) and applications.

Course Materials

Required Text: Text books

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons.
3. Higher Engineering Mathematics by B. V. Ramana, TMH.

Optional Materials: Reference Books

1. Advanced Engg. Mathematics by R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
2. Linear Algebra by M. Thamban Nair and Arindama Singh, Springer.
3. Differential Equations with Applications and Historical Notes by George Simmons, TMH.
4. Higher Engineering Mathematics by Ravish R Singh and Mukul Bhatt, TMH.

Physics-I

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Physics	3-0-0, (3)	EPR	PH10I005PH

[Pre-requisites: Basic Physics]

Course Objectives

To provide quality Scientific and Technical education, training, innovation and creativity in the areas of Pure and Applied Physics.

Course Content

Unit –I: Theory of Relativity

Frame of reference, Galilean principle of relativity, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, time dilation, addition of relativistic velocities, Variation of mass with velocity, Mass energy equivalence, energy-momentum relationship.

Unit –II: Wave Optics

Interference by division of amplitude: Newton's rings experiment, interference by division of wave front: Fresnel's biprism experiment, Diffraction at single slit, diffraction grating, Resolving Power of grating.

Unit –III: Quantum Physics

Inadequacy of classical mechanics, Compton effect, De-Broglie's hypothesis, Davison – Germer experiment, Uncertainty principle and its applications, wave packet, phase and group velocities, Wave function and Probability interpretation, normalization of wave function, commutation relation (position and momentum), Schrödinger equations: Time dependent and time independent, Applications of Schrödinger equation: particle in a box.

Unit –IV: Advanced Materials

Dielectric materials: Dielectric constant, Dielectric polarization and its types, polar and non-polar dielectric materials, E, P and D vectors, Concept of internal fields: Clausius - Mossotti equation.
Magnetic materials: Classification of Dia, Para and Ferro magnetic materials on the basis of magnetic moment, hard and soft magnetic materials.
Super Conductivity: Superconductivity, Meissner effect, Type-I and Type-II Super conductors, BCS theory, applications of superconductors.

Course Materials

Required Text: Text books

1. Concepts of Modern Physics: A.Beiser, TMH.
2. Optics: A Ghatak McGraw-Hill
3. Solid State Physics: S.O.Pillai, New Age Publications.
4. Gour and Gupta, Engineering Physics.
5. Avadhanulu and Kshirsagar, Engineering Physics.
6. Jenkins and White, Optics, McGraw Hill Company.
7. Mathur D.S: mechanics
8. Saha and Srivastava: Atreatise on heat.
9. Singh R.B.: Physics of Oscillations and Waves.

Optional Materials: Reference Books

1. Fundamentals of Optics:Jinkis and White,McGraw-Hill.
2. Solid State Physics: C.Kittel,Wiley Eastern
3. Solis State Physics: Azroff.

Physics-II

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Physics	3-0-0, (3)	EPR	PH10I006PH

[Pre-requisites: Basic Physics]

Course Objectives

To provide quality Scientific and Technical education, training, innovation and creativity in the areas of Pure and Applied Physics.

Course Content

Unit –I Theory of Semiconductors:

Crystalline solids, characteristics of unit cell, Miller indices, inter planar spacing. Classification of Solids, Kronig-Penney model, effective mass, density of states, carrier concentration, Fermi level in intrinsic and extrinsic semiconductors, mobility and Hall Effect

Unit –II Solid State Devices:

Transistor: Input and Output characteristics in CE mode, Transistor as an amplifier, Hartley Oscillator. FET: Input and output characteristics of J-FETs & MOSFETs, Operational amplifiers (Op-Amp).

Unit –III Electro-Magnetic Theory

Basic idea of gradient, divergence and curl, line, surface and volume integrals, Gauss's divergence and Stoke's curl theorems, continuity equation for charge and current, Ampere's law and its modification, concept of displacement current density, Maxwell's equations.

Unit –IV Laser & Fiber Optics

Laser: Principle of laser, Laser characteristics, Basic Components of Laser, Principle and working of Ruby, He-Ne & semiconductor lasers, applications of lasers: Holography.
Fiber Optics: Optical fibers: introduction, advantages, structure & classification, Principle of propagation in fibers, acceptance angle and cone, numerical aperture, attenuation & distortion, basic concepts of optical communication.

Course Materials

Required Text: Text books

1. Solid State Physics: Puri,Babber, S.Chand Publication
2. Electronics: Chattopadhay, Rakshit, New Age Publication.
3. Electrodynamics: David Griffiths, PHI learning Pvt. Ltd.
4. Laser: Ghatak
5. Gour and Gupta: Engineering Physics
6. Avadhanulu and Kshirsagar, Engineering Physics.
7. Rangwala and Mahajan: Electricity and Magnetism, TMH.
8. Verma H.C.: Concepts of Physics, Part-1 & Part-2, Bharati Bhawan (P&D)
9. A.Beiser, Concepts of Modern Physics, TMH.
10. Mani and Mehta,G.K. "Modern Physics" Affiliated East-West Press Pvt. Ltd.

Optional Materials: Reference Books

1. Solid State Physics: A.J. Dekker
2. Integrated Fleetsonics: Millman Halkias, McGraw-Hill
3. Laser: Silfvast, Cambridge Publication.

Communication Skills

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Humanities and Social Sciences	3-0-0, (3)	EPR	HS10I009HS

[Pre Requisite-NIL]

Course Objectives (CO)

1. To develop listening and writing skills
2. To formulate English sentences and avoid common errors
3. To enhance descriptive and explanatory skills
4. To use English in professional communication

Course Content

Unit 1.Syntax and Morphology

1.1 The concept of word formation, parts of speech; 1.2 Foreign words and phrases used in correspondence in English; 1.3 Common prefixes and suffixes in English, synonyms, antonyms and standard abbreviations; 1.4 Subject-verb agreement, punctuation.

Unit2. Reading and Comprehension

2.1 Comprehension passage; 2.2 Précis writing; 2.3 Short story (Home Coming: Rabindranath Tagore; The Lost Child: Mulk Raj Anand; Araby: James Joyce); 2.4 Writing business letter, short report.

Unit-3. Concept of Communication Model

3.1 Process need and principles of business communication; 3.2 Media and types of communication; 3.3 Barriers to communication; 3.4 Non-verbal communication.

Unit-4 Interpersonal Communication and Listening

4.1 Listening: types and levels, developing listening skills; 4.2 Interview: types, preparation, code of conduct for attending interview; 4.3 Meeting: Meaning, minutes, purpose, procedures of convening meeting, the role of chairperson and convener.

Course Materials

Required Text: Text books

1. Remedial English Grammar. F.T. Wood. Macmillan.2007
2. Communication Skills. Sanjay Kumar and Pushp-Lata. Oxford University Press. 2011.
3. Oxford Guide to Effective Writing and Speaking. John Seely. Oxford University Press, 2013.
4. English for Engineers. NP Sudharshana, C. Savitha.CUP.2018
5. Dubliners (Modern Classics), James Joyce, Penguin, 2000.
6. The Home-Coming, Rabindranath Tagore, CI Publisher, 2014.
7. The Lost Child and Other Stories, Mulk Raj Anand, Orient, 2004.

Optional Materials: Reference Books

1. English Vocabulary in Use (Intermediate) Michael McCarthy & Felicity O'Dell, 2002.
2. A Comprehensive Grammar of the English Language.R.Quirk, Pearson Education India, 2010.
3. The Hand book of Communication Skills. Owen Hargie, Routledge, 2003.
4. The Art and Science of Business Communication-P.D.Chaturvedi and Chaturvedi Mukesh, OUP.

Basic Electrical Engineering

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Electrical Engineering	3-0-0, (3)	EPR	EL10I022EL

[Pre Requisite-NIL]

Course Objectives

1. To impart the basic knowledge of the Electric and Magnetic circuits.
2. To understand the basic concepts of single phase and three phase AC circuits.
3. To impart basic knowledge of various electrical machines and measuring instruments.

Course Content

Unit –I

Elementary idea about power generation, transmission and distribution. Node voltage and mesh current method. Superposition, Thevenin's and Norton's theorems. Star- delta and Delta- star conversions.

Unit –II

Single phase EMF generation, Effective & Average values of sinusoids and determination of form-factor, Analysis of simple series & parallel R-L, R-C and RLC circuits, power and power factor, series & parallel resonances.

Unit –III

Three phase EMF generation, Delta and star connection, line and phase quantities and relations in star and delta connection, phasor diagram. Solutions of 3 phase circuits – balanced and unbalanced load, Measurement of single phase and three phase power.

Unit –IV

Analogy between electrical and magnetic circuits, solutions of magnetic circuits. Constructional details, principle of transformer operation , EMF equation, Phasor diagram on no load and full load, Equivalent circuits, Open circuits and short circuit tests, regulation and efficiency, All day efficiency. Hysteresis and eddy current losses.

Unit –V

Basic concepts and elementary idea of AC and DC machines. Classification of measuring instruments, indicating, recording and integrating type instruments. Deflecting torque, controlling torque, damping torque, Construction and working principle of single phase wattmeter and energy meter.

Course Materials

Required Text: Text books

1. Basic Electrical Engineering by Fitzerald and Higginbotham, TMH.
2. Basic Electrical Engineering by I.J Nagrath, TMH.

Optional Materials: Reference Books

1. Electrical Engineering Fundamentals by Vincent Del Toro.
2. Fundamentals of Electrical Engineering by Ashfaq Husain.
3. Basic Electrical Engineering by Hahdev and Chaturvedi.
4. ABC of Electrical Engineering by Jain and Jain.
5. Basic Electrical Engineering, A.Y Singhare.

Basic Biosciences

[1st Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Biotechnology	3-0-0, (3)	EPR	BT10I026BT

[Pre Requisite-NIL]

Course Objectives

1. To understand the structure and function of the cell, molecular mechanisms of cell cycle.
2. Acquainted with origin of life, evolution and classification of life.
3. To understand the human systems and application of biotechnology.

Course Content

Unit –I The Cell & Cell Cycle

Introduction to prokaryotic & eukaryotic cells, structure & function of cell organelles, models of plasma membrane, cell wall, mechanics of cell division, cell-cycle control, cell differentiation, apoptosis, introduction to biotechnology and its applications.

Unit –II Fundamental Processes

DNA structure, replication & proof-reading, RNA: types, structure & function, process of transcription, genetic code, protein synthesis & translational proof-reading, inhibitors of replication, transcription & translation.

Unit –III Basic Bioinformatics

Introduction & application of Bioinformatics, Sequences and nomenclature, Databases and Search tool, Microbial and cellular Databanks, Genome annotation, Sequence homology, Sequence Alignment, BLAST, FASTA, PDB.

Unit –IV Evolution and Human Physiology

Oparin-Haldane theory of chemical evolution; Organic Evolution- Darwin's theory of origin of species, Classification of plant & animal kingdom, Tissue system, overview of circulatory, digestive, endocrine, skeletal, respiratory and nervous system.

Course Materials

Required Text: Text books

1. Cell Biology by CB Powar.
2. Introduction to Bioinformatics by Arther M. Lesk.
3. Human physiology by Singh and Subhramanyam.

Optional Materials: Reference Books

1. Cell and Molecular Biology: Concepts and Experiments by G. Karp.
2. Human physiology by Guyton.

Computer Programming

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	EPR	CS101010CS

[Pre Requisite- Programming in C]

Course Objectives

1. To develop logic building and problem-solving using C++.
2. To understand the design and implementation issues involved with object-oriented programming languages.
3. To understand the procedural programming, error handling and debugging process on C++
4. To understand in depth the template, and file handling programming.

Course Content

Unit 1 Introduction to C++ and Object-Oriented Concepts

Introduction to Objects and Classes, Encapsulation, Access Modifiers, Polymorphism, Overloading, Inheritance, Overriding Methods, C++ Environment.

Unit 2: Classes and Data Abstraction

Structure Definitions, Accessing Members of Structures, Class Scope and Accessing Class Members, Controlling Access Function and Utility Functions, Constructors, Member Functions, Friend Function, Friend Classes, Function Overloading.

Unit 3: Operator Overloading and Inheritance

Fundamentals of Operator Overloading, operators, Introduction to Inheritance, Base Classes and Derived Classes, Multiple Inheritance.

Unit 4: Virtual Functions, Polymorphism, Files, and I/O Stream

Introduction to Virtual Functions, Abstract Base Classes, Concrete Classes, Virtual Base Class, Polymorphism, File Handling, Random Access, Object Serialization, Namespaces. Templates and Exception Handling: Function Templates, Overloading Template Functions, Class Template, Exception Handling, Constructors, Destructors and Exception Handling.

Course Materials

Required Text: Text books

1. Rumbaugh, J., Blaha, M., Premerlani, W., Eddy, F., & Lorensen. Object-oriented modeling and design. Englewood Cliffs, NJ: Prentice-hall.
2. Balagurusamy. Object Oriented Programming with C++, 6e. TMH.
3. Lafore, R. Object-oriented programming in Turbo C++. Galgotia publications.

Optional Materials: Reference Books

1. Let Us C++, Yashwant Kanetkar.
2. OOP, P Sengupta & B.B. Choudhari (PHI)
3. OOP With C++, Poonamchanda Sarang (PHI)

Data Structures

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	EPR	IT101025IT

[Pre Requisite- Programming in C]

Course Objectives

1. To introduce first level topics covering basics in Data Structures
2. To provide examples for various design paradigms
3. To identify the basic properties of graphs and trees and model simple applications

Course Content

Unit –I Introduction:

Introduction about Data Structure, Array Definition, Representation and Analysis, Single and Multidimensional Array, address calculation, application of array, Array as Parameters, Sparse Matrices Representation and its Transpose Algorithm Recursion: Recursive definition and processes, recursion in C, example of recursion, Sequential search, binary search, Sorting.

Unit –II Linked List

Representation and Implementation of Singly Linked Lists and Doubly Linked List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and Deletion to/from Linked Lists, Circular Linked List.

Unit –III Stacks and Queues

Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix Expression using Stack, Tower of Hanoi Problem. Queues: Array representation and implementation of queue, Operations on Queue: Create, Add, Delete, Full and Empty, Circular Queues, D-queues and Priority Queues, Linked Representation of Stack & Queues.

Unit –IV Trees and Graphs

Trees: Basic terminology, Binary Trees, Binary tree Representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary Trees. Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential representations of Graphs, Adjacency Matrices, Path Matrix, Hashing.

Course Materials

Required Text: Text books

1. Data Structure using C/C++. Langsam, Augenstein & Tananbaum, PHI.
2. Data Structure.Seymour Lipschutz & G. A. Vijyalaksmi Pai, Schaum's outlines, TMH.
3. Data Structure & Program Design. Robert L Kruse, PHI.

Optional Materials: Reference Books

1. Fundamentals of Data Structures. Horowitz and Sahani, Galgotia Publication Pvt. Ltd.
2. An Introduction to Data Structures with Application.Tremblay & Sorenson, TMH.
3. Classic Data Structure. D Samanata, PHI.

Basic Biomedical Engineering

[1st Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Biomedical Engineering	3-0-0, (3)	EPR	BM10I028BM

[Pre Requisite- Nil]

Course Objectives

1. To Make Students Aware of Biomedical Engineering With Relevance to Other Engineering Disciplines.
2. To Introduce Human Cell as Basic Functioning Unit.
3. To Make Students Understand the Origin and Recording of Various Biomedical Signals.
4. To Create Problem Solving Ability Among students With Application to Circuit Analysis.

Course Content

Unit-I Introduction to Biomedical as an Interdisciplinary Engineering Course:

Evolution of Modern Health Care System; What Is Biomedical Engineering; Component and Scope of Biomedical Engineering; Roles Played by Biomedical Engineers; Recent Advancement in Biomedical Engineering; Fundamentals of Interdisciplinary Engineering Domains.

Unit-II General Physiology:

Cell and Its Organelles; Structure and Function of Nucleus; Gene Expression - Transcription & Translation; Cell-Division; Cell Adaptation; Cell Death; Cell Degeneration and Aging; Cell Junctions and Its Types; Transport across Cell Membrane; Maintenance of Homeostasis.

Unit-III Biopotential and Electrodes:

Cell and Its Resting Potential; Action Potential and Its Ionic Origin; Types of Bio-Potentials and Their Characteristics - ECG, EMG, EEG, ERG; Electrode-Electrolyte Interface; Polarized & Non-Polarized Electrodes; Electrode Behavior and Circuit Model; Electrode Skin Interface; Types of Electrodes; Motion Artifacts.

Unit-IV Electrical Circuits & Networks and Essential Electrical Machines:

Introductory Concepts of Electrical Network; Kirchhoff's Laws; Node and Mesh Analysis; Methods for Analyzing DC and AC Networks; Principle of Duality; Network Transformation - Using Star to Delta and Delta to Star Network; Dot Convention for Coupled Circuits; Introduction to DC, Single Phase and Three Phase Electrical Systems; Supply, Distribution & Protective Mechanisms; Construction, Types and Basic Operating Principles of Transformers, Motors (DC, Stepper, Synchronous and Induction - Torque & Speed Control); Inverters, Control Relays and Electrical Drives.

Course Materials

Required Text: Text books

1. Enderle, J. and Bronzino, J., 2012. Introduction to biomedical engineering. Academic press.
2. Tortora, G.J. and Derrickson, B.H., 2008. Principles of anatomy and physiology. John Wiley & Sons.

Optional Materials: Reference Books

1. Khandpur, R.S., 1994. Handbook of biomedical instrumentation. Tata McGraw-Hill Education.
2. Van Valkenburg, M.E., 1964. Network analysis (Vol. 3). Englewood Cliffs, NJ: Prentice-Hall.

Basic Mechanical Engineering

[2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Mechanical Engineering	3-0-0, (3)	EPR	ME101027ME

[Pre Requisite- Nil]

Course Objectives

1. Understand the basics concept of thermodynamics.
2. Apply the laws of thermodynamics in engineering systems.
3. Identify various manufacturing processes and techniques for different applications.
4. Associate and implement the applications of various manufacturing processes for producing different engineering parts.
5. Understand the basic concept of material properties and apply the basic concepts of stress and strain in dealing with engineering problems.

Course Content

Unit-I First Law of Thermodynamics:

General – System open and closed system, thermodynamic properties, process, change of state, cycle. Zeroth law. First law of thermodynamics – conservation of energy, different forms of energies – internal energy, heat, work, kinematic energy, potential energy, application of first law to closed system and open system. Thermodynamic processes – constant volume, constant pressure, isothermal adiabatic and polytropic processes of ideal gases energy equation.

Unit-II Second Law of Thermodynamics:

Second law of thermodynamics – Kelvin Planck statement, reversibility and irreversibility. Heat engine, Heat pump, Carnot heat engine – Carnot cycle. Entropy, temperature - entropy diagram, change of entropy, work, heat transfer & internal energy change of gases during constant volume & constant pressure, isothermal and adiabatic processes, Properties of pure substance. Otto, diesel and dual combustion cycle. Standard efficiency mean effective pressure.

Unit-III Primary Manufacturing Processes:

Mechanical properties, stress – strain curve for ductile and brittle material etc. Normal and shear stress, Stresses in varying cross sectional area, Composite bars on axial loading.
Manufacturing Processes: Importance of manufacturing processes and classification. Casting: Types of mould, pattern, moulding materials, allowances, sand casting and die casting, casting defects. Metal forming processes: plastic deformation, hot forming and cold forming, basic working principles of rolling and forging processes.

Unit-IV Secondary Manufacturing Processes:

Metal cutting: Introduction, generating and forming, working principle, function & specification of simple lathe machine, shaper machine and introduction to CNC machine.
Welding: Principles of welding, types of welding – Gas welding, Arc welding, resistance welding, equipment & tools, types of welded joints, brazing & soldering and welding defects.

Course Materials

Required Text: Text books

1. Engineering Thermodynamics – P.K. Nag.
2. Engineering Thermodynamics – R. K. Rajput.
3. Strength of Materials – R. K. Rajput.
4. Manufacturing Technology (Vol. – I & II) – P.N. Rao.

Optional Materials: Reference Books

1. Thermodynamics an engineering approach- Yunus A Cengel and Michael A Boles.
2. Manufacturing Engineering and Technology- Serope Kalpakjian and Steven R. Schmidt.

Engineering Graphics

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Mechanical Engineering	1-2-2, (3)	EPR	ME10I024ME

[Pre Requisite- Nil]

Course Objectives

1. To have an Understanding of Engineering Curves, Scales and geometrical construction.
2. Understand orthographic Projection (I and III angle) Projection I.S. code.
3. Understand Isometric projection.
4. Understand development of surfaces.

Course Content

Unit-I Scales and Curves:

Introduction to Engineering Drawing: Scales: Representative Fraction, Type of Scale, Plain and Diagonal Scale, Scale of chords.
Engineering Curves: Conic section, Ellipse, Parabola, Hyperbola, Cycloidal Curves: Cycloid, Epicycloids, Hypocycloid, Involutes, and Helix.

Unit-II Projection of Points & Lines:

Projection: Introduction, Principle of Projection, Method of projection, Planes of projection, four quadrant, first and third angle projection, Reference line, symbols for methods of projection, Orthographic projection.
Projection of Point: Introduction, Point situated in first, second, third & fourth quadrant.
Projection of lines: Introduction, Line parallel to One or both the planes, Line contained by one or both the planes, Line perpendicular to one of the planes, Line inclined to one plane and parallel to other. Line inclined to both the planes, Traces.

Unit-III Projection of Planes & Solids:

Projection of planes: Introduction, Types of planes, Projection of planes, Projection of planes perpendicular to both the reference planes, Perpendicular to one plane and parallel to other plane, Perpendicular to one plane and inclined to the other plane, Inclined to both planes.
Projection of solids: Introduction, Type of solid, Projections of solids in simple position, Projection of solids with axes inclined to one of the reference planes and parallel to the other, Projections of solids with axes inclined to both H.P. and the V.P.

Unit-IV Section of Solids, Development of Surfaces and Isometric Projection:

Section of Solids: Sectional Planes, Section of solids, True Shape of Section.
Development of Surfaces: Introduction, Method of development, Development of lateral surfaces of right solids, Cube, Prisms, Cylinders, Pyramids & Cone.
Isometric Projection: Introduction, Isometric axes, Lines & planes, Isometric scale, Isometric projection and Isometric view, Conversion of Isometric to Orthographic Projections.

Course Materials

Required Text: Text books

1. Elementary Engineering Drawing -Bhatt, N. D., Charotar publishing Co.
2. Engineering Drawing Second Edition- Basant Agrawal and C M Agrawal, TMH.
3. Engineering Graphics, K. L. Narayana and P. Kannaiah, Scitech Publications (INDIA) Pvt. Ltd.

Optional Materials: Reference Books

Engineering Mechanics

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Mechanical Engineering	3-0-0, (3)	EPR	ME10I023ME

[Pre Requisite- Nil]

Course Objectives

1. Apply the laws of forces, moments and static equilibrium conditions to analyze the different force system, appearing in engineering application.
2. Understand and analyze the application of friction in various practical situations.
3. Understand the importance, and calculation of centroid and Moment of Inertia.
4. Solve the problem pertaining to the structures like frames, trusses and beam by using the principle of statics.
5. Apply the principles of dynamics to solve the various engineering problems of particle, elastic body and rigid body motion using classical and energy approach.

Course Content

Unit-I: Forces and Force System; Equilibrium:

Force and Force Systems: Introduction, Force and Force Systems , Moment & Couple, Varignon's Theorem, Resultant and Resolution Forces, Parallel Forces, Free Body Diagram, Equilibrium Conditions, Support and Support Reaction, Application to Various Engineering Problems.

Unit – II Centroid & Centre of Gravity; Moment of Inertia; Friction:

Introduction, Centre of, Gravity, Mass, Volume and Area.
Moment of Inertia: Introduction, Moment of Inertia, Polar Moment of Inertia, Product of Inertia, Mass Moment of Inertia.
Friction: Introduction, Laws of Friction, Types of Friction, Wedges Friction, Ladder Friction, Application of Friction In Simple Lifting Machine, Belt and Pulley Arrangement and Screw Jack.

Unit – III Beams; Trusses and Frames:

Beams: Introduction, Types of Beams, Support Reactions, Shear Force and Bending Moment Diagram for Simply Supported, Overhanging and Cantilever Beam, Point of Contra-flexure.
Trusses and Frames: Introduction, Types of Trusses and Frames, Analysis of Forces in Trusses and Frames by different Methods.

Unit – IV Kinetics and Kinematics of the Particle and Elastic bodies:

Introduction, Curvilinear Motion, Work and Energy Principle, Principle of Impulse and Momentum
Collision of Elastic Body, Conservation of Momentum, Loss of Kinetic Energy during Impact.

Unit –V Kinetics and Kinematics of the Rigid Body; Virtual work:

D'Alembert's Principle, Plane & Rotary Motion, Work & Energy Principle, Principle of Conservation of Energy.
Virtual Work: Introduction, Principle of Virtual Work.

Course Materials

Required Text: Text books

1. A.K. Tayal: Engineering Mechanics (Statics and Dynamics)
2. N. H. Dubey: Engineering Mechanics (Statics and Dynamics)
3. D. S. Kumar: Engineering Mechanics (Statics and Dynamics)

Optional Materials: Reference Books

1. Irving Shames: Engineering Mechanics.
2. F. P. Beer and E. R. Johnston: Vector Mechanics for Engineers
3. S. Timoshenko and D. H. Young: Engineering Mechanics
4. S. S. Bhavikatti and K. G. Rajashekarappa: Engineering Mechanics
5. I. B. Prasad: A Text Book of Applied Mechanics.

Applied Chemistry

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Chemistry	3-0-0, (3)	EPR	CY101007CY

[Pre Requisite- Nil]

Course Objectives

1. Aware of Applied Chemistry knowledge of different industrial materials
2. Utilize the Applied Chemistry knowledge to develop innovative technology in their respective field.
3. Explore new areas of research in allied fields of science and technology.
4. Function as a member of an interdisciplinary problem solving team.

Course Content

Unit-I: Technology of Water:

Standards for drinking water, Methods of Treatment of water for domestic and industrial purposes: sedimentation, coagulation, filtration, sterilization, break point chlorination, Determination of alkalinity and hardness of water. Demineralization of water, softening of water: lime-soda process, ion-exchange process, zeolite process. Boiler Troubles: Carry Over, Priming, Foaming, Scale, Sludge, Corrosion, Caustic Embrittlement. Internal treatment of water: Carbonate conditioning, Phosphate conditioning, Colloidal conditioning, Calgon conditioning. Calculations on water softening by Lime-soda process, Zeolite process.

Unit – II Fuels, Combustion & Cement:

Classification, Calorific value, Types, Determination by Bomb calorimeter, Dulong's Formula, Analysis of Coal, Proximate and Ultimate analysis, Flue gas analysis, Significance, Numericals, Carbonization of Coal, Manufacture of metallurgical coke by Otto Hoffman's byproduct oven, Combustion calculations.
Cement: Characteristics of the constitutional compounds of cement, setting and hardening of cement, Additives of the cement, Properties and general composition.

Unit – III Corrosion and Phase Rule:

Corrosion and its control: Electrochemical series, Galvanic series, Types of corrosion: dry and wet corrosion, galvanic, concentration cell, pitting, stress, inter-granular, waterline.
Factors affecting corrosion: Nature of metal and nature of environment, Protective measure against corrosion.
Phase Rule: Phase Rule, Explanation of terms, Advantages & Limitations of Phase rule, application of Phase rule to one component system; Water system.

Unit – IV Lubricants & Polymers:

Lubricants: Functions of' lubricant, Mechanism of lubrication, Fluid or Hydrodynamic Lubrication, Thin film or Boundary lubrication & Extreme pressure lubrication, Tests of lubricants and their significance.
Polymers: Types of Polymerization, thermoplastics & thermosetting polymers, preparation, properties and applications of Teflon, PVC, Nylon, Bakelite & Urea-Formaldehyde. Elastomers: Natural rubber, Vulcanization of rubber & Synthetic rubber.

Course Materials

Required Text: Text books

1. A text book of Engineering Chemistry, S. S. Dara, S. Chand & Co. New Delhi.
2. Engineering Chemistry, M. M. Uppal & S.C. Bhatia, Khanna Publishers. New Delhi.
3. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publishing Company.

Optional Materials: Reference Books

1. Chemistry of Engineering Materials, C.P. Murthy, C. V. Agarwal and A. Naidu, B. S. Publication, Hyderabad.
2. Engineering Chemistry, J. C. Kuriacose and J. Rajaram, TMH.

Environment and Ecology

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Chemistry	3-0-0, (3)	EPR	CY10I008CY

[Pre Requisite- Nil]

Course Objectives

1. Aware of knowledge about Environment, Ecology, natural resources, environmental pollution and control measures, and Instrumental techniques for monitoring of pollutants for the service of mankind.
2. Learn about environmental impacts of all scientific and technology based activities.
3. Develop environment benign technology for the welfare of the Society and Nation.
4. Apply the knowledge of environmental science to improve the existing technology in daily life and research.

Course Content

Unit-I: Fundamentals of Environment & Ecology:

Definition, Components of Environment, Environmental Degradation, Fundamentals of Ecology and Ecosystem, Components and Classification of Ecosystem, Energy flow in Ecosystem: Tropic level, Food Chain, Food Web, Ecological Pyramid, Environment Impact Assessment & Sustainable Development.

Unit – II Natural Resources:

Material cycles- Carbon, Nitrogen, Sulphur, Phosphorus and Water Cycles. Mineral Resources, Energy Resources, Conventional and Non-Conventional: Coal, Petroleum, Natural Gas, Nuclear Fuel, Hydro- Electric, Solar, Biomass, Wind, Tidal, Geothermal, and Hydrogen as alternative future source of Energy.

Unit – III Environmental Pollution and its Control:

Air Pollution and control measures, Water Pollution, Land Pollution, Noise Pollution.
Global warming, Acid Rain, Ozone-Layer Depletion, Photochemical Smog, Waste water treatment, Solid waste management.

Unit – IV Environment Quality Standards and Instrumental Techniques for monitoring of Pollutants:

Ambient air quality standards, Water quality parameter and standards: pH, Turbidity, Hardness, Sulphate, Phosphates, Iron, Dissolved Oxygen, Biochemical Oxygen Demand, Chemical Oxygen Demand.
Instrumental Techniques: UV-Visible Spectroscopy, Atomic Absorption Spectroscopy, Nephelometry and Turbidimetry, Calibration and Traceability.

Course Materials

Required Text: Text books

1. Environmental Chemistry, B.K. Sharma & H. Kaur, Goel Publishing House.
2. Environmental Chemistry, A. K De, New Age International Publishers.
3. Environmental Chemistry and Pollution, S. S. Dara & D. D. Mishra, S. Chand Publishing.

Optional Materials: Reference Books

1. Instrumental method of Analysis, B.K. Sharma, Goel Publishing House.
2. Environmental Chemistry, Samir K. Banerjee, PHI. New Delhi.