Engineering and Management Institute of India

Diploma in Engineering

1st year Common subjects

Engineering Physics (1.1)

UNIT-I

Crystal Structures:- Lattice points, Space lattice, Basis, Bravais lattice, unit cell and lattice parameters, Seven Crystal Systems with 14 Bravais lattices , Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Miller Indices, Inter planer spacing of Cubic crystal system.

Defects in Crystals:- Classification of defects, Point Defects: Vacancies, Substitution, Interstitial, Concentration of Vacancies, Frenkel and Schottky Defects, Edge and Screw Dislocations .

Principles of Quantum Mechanics:- Waves and Particles, de Broglie Hypothesis, Matter Waves, Davisson and Germer's Experiment, Heisenberg's Uncertainty Principle.

UNIT –II

Electron Theory of Metals:- Classical free electron theory, Derivation of Ohm's law, Mean free path, Relaxation time and Drift velocity, Failures of Classical free electron theory, Quantum free electron theory, Fermi-Dirac distribution, Fermi energy, Failures of Quantum free electron theory.

Band Theory of Solids:- Electron in a periodic potential, Bloch Theorem, Kronig-Penny Model(Qualitative Treatment), origin of Energy Band Formation in Solids, Classification of Materials into Conductors, Semi Conductors & Insulators, Effective mass of an Electron.

Semiconductor Physics:- Intrinsic Semiconductors and Carrier Concentration, Extrinsic Semiconductors and Carrier Concentration, Hall Effect and Applications.

UNIT – III

Dielectric Properties & Magnetic Properties:- Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Types of polarization: Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities (Electronic & Ionic) -Internal Fields in Solids. Magnetic Permeability, Magnetic Field Intensity, Magnetic Field Induction, Intensity of Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magnetron, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Hysteresis Curve on the basis of Domain Theory of Ferro Magnetism, Soft and Hard Magnetic Materials, Ferrites and their Applications.

UNIT – IV

Lasers:- Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

Fibers optics:- Structure and Principle of Optical Fiber, Acceptance Angle, Numerical Aperture, Types of Optical Fibers (SMSI, MMSI, MMGI), Attenuation in Optical Fibers.

UNIT –V

Nanotechnology:- Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Bottom-up Fabrication: Sol-gel Process; Top-down Fabrication: Chemical Vapor Deposition, Physical, Chemical and Optical properties of Nano materials, Characterization (SEM, EDAX), Applications.

Reference Book :-

1. Applied physics By Dr. Manjeet singh & Anita Sangwan.

2. Basic physics By Karl F. Khan.

Engineering Mathematics (1.2)

UNIT-I

Algebra:-Determinants:- Definition and expansion of determinants of order 2 and 3. Properties of determinants (not for examination). Solution of simultaneous equations using Cramer's rule(in 2 and 3 unknowns) - Simple Problems,

Matrices:- Definition –Singular Matrix Non-singular Matrix, Adjoint of a matrix and Inverse of a matrix up to 3 x 3 only. Simple Problems. Definition – Rank of a matrix. Finding rank of a matrix by determinant method (matrix of order 3 x 4) Simple Problems.

Binomial Theorem:- Definition of Factorial notation - Definition of Permutation and Combinations – values of n Pr. N Cr Binomial theorem for positive integral, binomial theorem.

UNIT –II

Complex Numbers:- Algebra of Complex Numbers:- Definition – Real and Imaginary parts, Conjugates, Modulus and amplitude form, Polar form of a complex number, multiplication and division of complex numbers (geometrical proof not needed)– Simple Problems .Argand Diagram – Collinear points, four points forming square, rectangle, rhombus and parallelogram only . Simple Problems.

UNIT – III

Trigonometry:- Properties of Trigonometric functions – Ratios of Compound angles, multiple angles, sub multiple angles – Transformations of Products into sum or difference and vice versa – Simple trigonometric equations – Properties of triangles Inverse Trigonometric functions.

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UNIT – IV

Integration and Its Applications:- Indefinite Integral – Standard forms – Integration by decomposition of the integrand of trigonometric, algebraic, exponential, logarithmic and Hyperbolic functions – Integration by substitution – Integration of reducible and irreducible quadratic factors – Integration by parts – Definite Integrals and properties, Definite Integral as the limit of a sum – Application of Integration to find areas under plane curves and volumes of Solids of revolution – Mean and RMS value.

UNIT –V

Differential Equations:- Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of the type first order, first degree, variable-separable, homogeneous equations, exact, linear differential equation of the form dy/dx + Py = Q, Bernoulli's equation, nth order linear differential equation with constant coefficients both homogeneous and non homogeneous and finding the Particular Integrals for the functions , , ,Sin ax, Cos ax.

Reference Book :-

1. Engineering mathematics- By A.B. Mathur.

2. Engineering mathematics- By J.P. Sharma.

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Engineering Chemistry (1.3)

UNIT-I

ELECTROCHEMISTRY AND BATTERIES:- Basic concepts of electrochemistry, Conductance, Specific, equivalent and molar conductance and effect of dilution on conductance, Electrochemical cells, Galvanic cell (daniel cell), Electrode potential, Electrochemical series and its applications, Nernst equation, Types of electrodes, Calomel electrode, quinhydrone electrode.

Batteries:- Classification of batteries primary cells (dry cells) and secondary cells (lead-acid battery, Ni-Cd cell) applications of batteries, numerical problems.

UNIT –II

Corrosion and its Control:- Introduction, causes and effects of corrosion; Theories of corrosion: Chemical and electrochemical corrosion with mechanism; Factors affecting the rate of corrosion: Nature of the metal and nature of the environment; Types of corrosion: Waterline and crevice corrosion; Corrosion control methods.

Cathodic protection:- Sacrificial anodic protection and impressed current cathodic protection; Surface coatings: Metallic coatings, methods of application of metallic coatings- hot dipping(galvanizing, tinning), electroplating(copper plating); Organic coatings: Paints.

UNIT – III

Materials chemistry: Polymers-classification with examples, polymerization-addition, condensation and co-polymerization; Plastics: Thermoplastics and thermosetting plastics; Compounding of plastics; Preparation, properties and applications of Polyvinylchloride, Teflon, Bakelite and Nylon-6, 6;

Redox Reactions: Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number, applications of redox reactions.

UNIT – IV

Nanotechnology: - Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Bottom-up Fabrication: Sol-gel Process; Top-down Fabrication: Chemical Vapor Deposition, Physical, Chemical and Optical properties of Nano materials, Characterization (SEM, EDAX), Applications.

Structure of Atom:- Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle,

Orbitals Theory:- concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule.

UNIT –V

Water: Sources and impurities of water, hardness of water, expression of hardness-units; Types of hardness: Temporary hardness, permanent hardness and numerical problems; Estimation of temporary and permanent hardness of water by EDTA method; Determination of dissolved oxygen by Winkler's method; Boiler troubles: Priming, foaming, scales, sludges and caustic embrittlement.

Treatment of water: Internal treatment of boiler feed water- carbonate, calgon and phosphate conditioning, softening of water by Zeolite process and Ion exchange process; Potable water-its specifications, steps involved in the treatment of potable water, Sterilization of potable water by chlorination and ozonization, purification of water by reverse osmosis process.

Reference Book :-

1. Applied chemistry-I. By Prof. Durga Nath Dhar.

2. Applied chemistry. By Dr. B. S. Chauhan

Communication skill (1.4)

UNIT-I

Communication Skills:- Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context

Barriers to communication:- Physiological Barriers, Physical Barriers Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers.

Perspectives in Communication:- Introduction, Visual Perception, Language Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.

UNIT –II

Elements of Communication:- Introduction, Face to Face Communication – Toneof voice, Body Language (Non-Verbal Communication), Verbal Communication Physical Communication.

Communication Styles:- Introduction, The Communication styles Matrix with example for each Direct Communication style, Spirited Communication style, Systematic Communication style, Considerate Communication style.

UNIT – III

Basic Listening Skills:- Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations.

Effective Written Communication:- Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion‘ Required, Shades of Meaning, Formal Communication.

Writing Effectively:- Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message.

UNIT – IV

Interview Skills:- Purpose of an interview, Do‘s and Dont‘s of an interview.

Giving Presentations:- Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering, Your Presentation, Techniques of Delivery.

UNIT –V

Group Discussion:- Introduction, Communication skills in group discussion, Do‘s and Don‘s of group discussion.

Reference Book :-

1. Communication skills for Engineer By Suneeta Mishra.

2. Advanced Communication skills By MTD Training.

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Personality Development (1.5)

UNIT-I

MANAGERIAL PERSONALITY:- DEFINITION OF PERSONALITY – BASICS OF PERSONALITY – DETERMINANTS OF PERSONALITY – DEVELOPMENT OF PERSONALITY – THEORIES OF PERSONALITY.

UNIT –II

PERSONALITY TRAITS:- DEFINITION – NATURE AND IMPORTANCE OF PERCEPTION. FACTORS INFLUENCING THE PERCEPTION.

DECISION MAKING:- IMPORTANCE AND NECCESSITY OF DECISION MAKING, PROCESS AND PRACTICAL WAY OF DECISION MAKING. WEIGHING POSITIVES & NEGATIVES.

INTERPERSONAL SKILLS:- UNDESTANDING THE RELATIONSHIP BETWEEN LEADERSHIP NETWORKING & TEAM WORK.ASSESSING INTERPERSONAL SKILL SITUATIONDESCRIPTION OF INTERPERSONAL SKILL.

UNIT – III

SELF DEVELOPMENT:- SELF AWARENESS – SELF-CONFIDENCE – MNEMONICS – GOAL SETTING TIME MANAGEMENT AND EFFECTIVE PLANNING. HUMAN GROWTH AND BEHAVIOUR.

UNIT – IV

SELF MANAGEMENT:- STRESS MANAGEMENT – MEDITATION AND CONCENTRATION TECHNIQUES – SELF HYPNOTISM – SELF ACCEPTANCE AND GROWTH.

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UNIT –V

TRANSACTIONAL ANALYSIS: - IDEGO – SUPER EGO – TRANSACTIONS – LIFE POSITION – WINNERS AND LOSERS – INTERPERSONAL RELATION.

SELF MANAGEMENT: - STRESS MANAGEMENT – MEDITATION AND CONCENTRATION TECHNIQUES – SELF HYPNOTISM – SELF ACCEPTANCE AND GROWTH

Reference Book: -

1. Social and personality development By David R. Shaffer.

2. Personality development course By Arun Sagar Anand.

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Engineering Drawing(1.6)

UNIT-I

Fundamental of Engineering Drawing, Scales and Curves :- Introduction to engineering drawing: Drawing instruments and accessories, types of line, lettering practice and rules of dimensioning , geometrical constructions, basic geometrical shapes; Scales: Types of scales, units of length and their conversion, construction of scales, plain scale, diagonal scale, vernier scale; Curves used in engineering practice and their constructions; Conic sections, construction of ellipse parabola and hyperbola, special curves, construction of cycloid, epicycloids, hypocycloid and involutes.

UNIT –II

Orthographic Projection, Projection of Planes:- Orthographic projection: Principles of orthographic projections, conventions, first and third angle projections, projection of points, projection of lines, lines inclined to single plane, lines inclined to both the planes, true lengths and traces; Projection of planes: Projection of regular planes, planes inclined to one plane, planes inclined to both planes, projection of planes by auxiliary plane projection meth.

UNIT – III

Projection of SolidDC Machines:- Projection of solids: Projections of regular solid, prisms, cylinders, pyramids, cones. Solids inclined to one plane, solids inclined to both planes projection of solid by auxiliary plane projection method.

UNIT – IV

Development of Surfaces, ISOMetric Projections:- Development of surfaces: Development of lateral surface of right regular solids, prisms, cylinders, pyramids and cones; Isometric projections: Principle of isometric projection, isometric scale, isometric projections and isometric views isometric projections of planes prisms, cylinders, pyramids, and cones.

UNIT –V

Transformation of Projections:- Transformation of projections: Conversion of isometric views to orthographic views and conversion of orthographic views to isometric vie**.**

Reference Book :-

1. Engineering Drawing By Dhananjay. A. Johle.
2. Engineering Drawing By K. C. John.

Basic Management (1.7)

UNIT-I

Principle of Management:- Introduction, definition and importance of management. Functions of Management, Planning, Organizing, Staffing, Coordinating, Directing, Motivating and Controlling. Concept and Structure of an organization, Types of industrial organization (a) Line organization,(b) Functional organization, (c) Line and Functional organization, Departmentalization, Introduction and its advantages. Hierarchical Management Structure Top, middle and lower level management.

UNIT –II

Work Culture:- Introduction and importance of Healthy Work Culture in organization; Components of Culture Importance of attitude, values and behaviour Behavioural Science – Individual and group behaviour Professional ethics – Concept and need of Professional Ethics. Intellectual Property Rights (IPR) Introduction, definition and its importance, Infringements related to patents, copyright, trade mark.

UNIT – III

Management Scope in Different Areas:- Human Resource Development, Introduction and objective, Manpower Planning, recruitment and selection, Performance appraisal methods, Material and Store Management, Introduction, functions and objectives of material management, Purchasing: definition and procedure, Just in time (JIT), Marketing and Sales, Introduction, importance and its functions, Difference between marketing and selling, Advertisement- print media and electronic media, Market-Survey and Sales promotion. Financial Management – Introduction, Concept of NPV, IRR, Cost-benefit analysis, Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty, Provident Fund, Maintenance Management, Concept and Preventive Maintenance.

UNIT – IV

Leadership and Motivation:- Leadership: Definition and Need of Leadership, Qualities of a good leader, Manager vs. leader, Motivation: Definition and characteristics of motivation, . Factors affecting motivation, Maslow's Need Hierarchy Theory of Motivation, Job Satisfaction.

UNIT –V

Legal Aspects of Business: Introduction and need Origin:- Labour Welfare Schemes, Wage payment : Definition and types Incentives: Definition, need and types, Factory Act 1948, Minimum Wages Act 1948, Customer Relationship Management (CRM), Definition and Need, Types of CRM, Customer satisfaction, Total Quality Management (TQM), Inspection and Quality Control, Concept of Quality Assurance, TQM.

Reference Book :-

1. Principles of management By Philip Kotler TEE Publication.

2. Principles of management By A. K. Sarathe.

Engineering Applied mechanics (1.8)

UNIT-I

Fundamentals:- Definitions of mechanics, statics, dynamics, Engineering Mechanics, body, rigid body, mass, weight, length, time, scalar and vector, fundamental units derived units, S.I. units.

Force:- Definition of a force, Newton, S.I. unit of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility.

Resolution of a force:- Definition, Method of a resolution, Types of component force, Perpendicular components and Non- perpendicular components.

Force system:- Definition, classification of force system according to plane and line of action Moments of a force.

UNIT –II

Equilibrium:- Definition, conditions of equilibrium, analytical and graphical condition of equilibrium for concurrent, non- concurrent and parallel force system.

Lami's theorem:- Statement and explanation, Application of Lami's theorem for solving various engineering problems.

Equilibrant:- Definition, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system.

Beams:- Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, fixed, hinged , roller), classification of loads, point load, uniformly distributed load. Reaction's for a simply supported beamonly .

UNIT – III

Centre of Gravity and Friction:-

Centroid:- Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure.

Center of gravity:- Definition, centre of gravity of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids.

Friction:- Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction, angle of repose and coefficient of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction.

Equilibrium of bodies on level plane:- external force applied horizontal and inclined up and down, Equilibrium of bodies on inclined plane, external forces is applied parallel to the plane, horizontal and incline to inclined plane.

UNIT – IV

Simple Liftind Machine:-

Definitions of simple machine, compound machine , load , effort , mechanical advantage , velocity ratio , input on a machine ,output of a machine ,efficiency of a machine , expression for mechanical advantage , velocity ratio and efficiency of a machine. Ideal machine, ideal effort and ideal load, friction in machines, effort lost in friction and frictional load

Law of machine:- maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self locking machine.

Study of simple machines:-

Simple axle and wheel, differential axle and wheel, single purchase crab, double purchase crab, simple screw jack, pulleys : First, second and third system of pulleys

UNIT –V

Effect of Force System, Work Power:-

Motion of particle:- Definition of speed, velocity, acceleration, uniform velocity, uniform acceleration and variable acceleration .

Definition of speed, velocity, acceleration, uniform velocity, uniform acceleration and variable acceleration.

Simple axle and wheel, differential axle and wheel, single purchase crab, double purchase crab, simple screw jack, pulleys : First, second and third system of pulleys.

Reference Book :-

1. Applied mechanics By I.B. Prasad, Khanna.

2. Applied mechanics By R.S. Jog, Anand Publishers, Gwalior.

Information Technology (1.9)

UNIT-I

T Software Concepts:-

Software:- Types of Software - its Nature and Qualities.

Operating Systems:- Features of Microsoft Windows and Linux - IT importance in CurrentScenario.

UNIT –II

MS Office- Applications:-

MS Word in Business Correspondence:- Letters - Tables - Mail Merge - Labels

Applications of MS Excel:- Graphs and Charts - Basic Calculations of various functions inExcel.

UNIT – III

MS Power Point:-

Introduction to MS Power Point:- Toolbar - Icons and Commands - Navigating in Power Point- Creation of Slides - Animation - Templates - Designing Presentations - Slide Show Controls - Making Notes on Pages and Handouts - Printing Presentations - Customizing Presentations - Types of Templates.

UNIT – IV

Computer Networks:-

Overview of Network:- Communication Processors - Communication Media - Types of Network - Network Topologies - Network Protocols - Network Architecture - Recent Developments -Basic Cloud Computing Service Models.

UNIT –V

Smart Tools & Apps:-

Tools & Apps:- Smart Cards - Paytm - On-line payment Apps - Knowledge and Information Sharing Apps - Digitisation - IOT - Hot Spot - Features of Artificial Intelligence.

Reference Book :-

1. Introduction to information technology By Rajaraman V.

2. Information technology By Stuart Gray.