



**JAIDEV EDUCATION SOCIETY'S  
J D COLLEGE OF ENGINEERING AND MANAGEMENT  
KATOL ROAD, NAGPUR  
DEPARTMENT OF BASIC SCIENCE AND HUMANITIES**

**SYLLABUS**

**Subject: Engineering Chemistry  
Branch: Mechanical Engineering**

**Unit-1**

**[8 Hr]**

**Energy Source:** Introduction, classification of fuel, essential properties of fuel, characteristics of good fuel, solid fuel-Coal, Various types of Coal, Analysis of coal-Proximate and Ultimate analysis, liquid fuel and Gaseous fuel. Flue Gas Analysis, Batteries, capacitor battery.

**Unit-2**

**[9 Hr]**

**Lubricants:** Introduction, function of lubricants, types of lubrication – Thick film, Thin film and Extreme pressure lubrication, classification of lubricants - Solid, Semi – solid and Liquid Lubricants, properties of lubricants, Physical properties – Viscosity, Viscosity index, surface tension, Oiliness, Flash point and Fire point, Pour point and Cloud point, Chemical properties – Acidity, Emulsification, Saponification.

**Unit-3**

**[9 Hr]**

**Metallurgy:** Introduction, Occurrence of metals, types of ores, concentration of ores by physical methods- Crushing and Sizing, Froth- Flotation, Magnetic Separation, Gravity separation method. Chemical methods- Calcination, Roasting, Reduction of Ore- by Pyrolysis, Chemical reductions, Refining of Metals.

**Unit-4**

**[9 Hr]**

**Nanomaterials:** General introduction to nanotechnology, timeline and milestone, overview of different nanomaterials available, potential use of nanomaterials in electronics, sensors, catalysis, environment and cosmetics. Physical chemistry related to nanoparticles such as colloids and clusters: conductivity and enhanced catalytic activity compared to the same materials in the macroscopic state. Synthesis of nanomaterials: 'Top-Down'- photolithography and 'Bottom-Up'- sol-gel method. Carbon nanotubes: single-walled and multi-walled carbon nanotubes, their structures, properties and applications. Potential risks of nanomaterials- environmental impact.

**Unit-5**

**[9 Hr]**

**Polymers:** Classification of Polymers - PVC, Bakelite - preparation, properties and applications - Effect of Polymer Structure on Properties - Compounding of Plastics- Polymer Blends and Polymer Alloys Definition, Examples, Concepts of polymer processing, injection molding, rheology, polymer properties, polymer analysis.



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**Subject: Engineering Chemistry  
Branch: Civil Engineering**

**Unit-1**

**[8 Hr]**

**Cement:** Portland cement: Manufacture, role of microscopic constituents. Properties-setting and hardening, heat of hydration and soundness Types of cement-Rapid hardening, High alumina, Portland Pozzolana cement; Introduction to Grading of cement.

**Unit-2**

**[9 Hr]**

**Water Conditioning:** Specifications of water for industries (paper, textile, beverages and power generation), types of hardness; softening of water by lime-soda process, Zeolite process, De-mineralization process (principle, advantages and limitations). Numerical based on lime-soda and Zeolite process. Boiler troubles, sequestration (carbonate, phosphate and calgon), Treatment of waste water.

**Unit-3**

**[9 Hr]**

**Environmental Chemistry:** Introduction- Air pollution; Noise pollution, optimum decibel levels; Water pollution; Greenhouse effect and Global warming; e-Waste and Radioactive pollution; Role of electromagnetic radiation in global warming, Carbon Credit, Chemicals affecting- factors for depletion of ozone layer.

**Unit-4**

**[9 Hr]**

**A] Nanomaterials:** Definition of nanomaterials, nano scale. Carbon nano tubes: Different types of CNT; applications of nanomaterials in construction, environment and electronics. Threats of Nanomaterials.

**B] Corrosion:** Dry and Wet corrosion and Preventive Methods: Different types of corrosion (Pitting, Stress, Intergranular and Galvanic), protection against corrosion, design and selection of engineering materials, cathodic and anodic protection, Brief discussion about Protective Coatings.

**Unit-5**

**[9 Hr]**

**Polymers and Plasticizer:** Introduction to reactions involving substitution, addition, elimination, cyclization and ring opening. Liquid crystals and liquid crystal polymers (thermotropic and lyotropic), phases of thermotropic polymers: nematic, smectic, cholesteric; advantages, disadvantages and applications. Polymers used in cement, its Properties and Limitation.



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**Subject: Engineering Chemistry  
Branch: Electrical Engg.**

**Unit-1**

**6 hrs**

**Water Treatment:** Introduction, hard and soft water, softening of water – Zeolite process, Ion exchange process, Hot Lime –Soda process, water characteristics- Hardness, Domestic water treatment

**Unit-2**

**6 hrs**

**Fuels:** Introduction, classification of fuel, essential properties of fuel, characteristics of good fuel, solid fuel- Coal, Various types of Coal, Analysis of coal-Proximate and Ultimate analysis, liquid fuel- Refining of Petroleum.

**Unit-3**

**8 hrs**

**Electrochemistry:** Introduction-basic concepts, Transport number and its determination by Moving Boundary method, Debye-Hückel theory, Conductometric titrations, Ostwald's theory of acid-base indicator, Quinonoid theory, Electrodes – Glass electrode, Quinhydrone electrode.

**Unit-4**

**8 hrs**

**Advanced Polymeric Materials:** Introduction to reactions involving substitution, addition, elimination, cyclization and ring opening. Liquid crystals and liquid crystal polymers (thermotropic and lyotropic), phases of thermotropic polymers: nematic, smectic, cholesteric; advantages, disadvantages and applications

**Unit-5**

**Battery Technology:**

**6 hrs**

Classification of batteries: Primary, Secondary- Electricity storage density, power density, energy efficiency, cycle life, shelf life. Rechargeable alkaline storage batteries, Ni-metal hydride, Lithium ion batteries and H<sub>2</sub>-O<sub>2</sub> Fuel cell.



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**Subject: Engineering Chemistry  
Branch: Electronics and Telecommunication Engineering**

**Unit-1**

**6 hrs**

**Nanomaterials:** Definition of nanomaterials, nano scale. Carbon nano tubes: Different types of CNT; applications of nanomaterials in medicine, environment and electronics. Threats of Nanomaterials.

**Shape memory alloys:** Definition, Properties, and general applications.

**Unit-2**

**Advanced Polymeric materials:**

**6 hrs**

Introduction to reactions involving substitution, addition, elimination, cyclization and ring opening. Liquid crystals and liquid crystal polymers (thermotropic and lyotropic), phases of thermotropic polymers: nematic, smectic, cholesteric; advantages, disadvantages and applications.

**Unit-3**

**Atomic and molecular structure**

**8 hrs**

Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structure.

**Unit-4**

**Periodic properties**

**6 hrs**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

**Unit-5**

**6 hrs**

**Magnetic Materials:** Introduction, Magnetic fields or quantities, types of magnetism, classification of magnetic materials, soft magnetic materials, H magnetic materials, Ferrites, Ferro, and Para Magnetic materials



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**Subject: Engineering Chemistry  
Branch: Computer Sci. Engg.**

**Unit-1**

**6 hrs**

**Water Treatment:** Introduction, hard and soft water, softening of water – Zeolite process, Ion exchange process, Hot Lime –Soda process, water characteristics- Hardness, Domestic treatment of water

**Unit-2**

**6 hrs**

**Nanomaterials:** Definition of nanomaterials, nano scale. Carbon nano tubes: Different types of CNT; applications of nanomaterials in medicine, environment and electronics. Threats of Nanomaterials.

**Unit-3**

**8 hrs**

**Atomic and molecular structure:** Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbital. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structure.

**Unit-4**

**8 hrs**

**Periodic properties:** Effective nuclear charge, penetration of orbital's, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

**Unit-5**

**6 hrs**

**Spectroscopic techniques and applications (UV and NMR):**

**Part A) Ultraviolet Spectroscopy:** Principles of spectroscopy and selection rules. Ultraviolet spectroscopy and its application. Fluorescence and its applications in medicine.

**Part B) NMR Spectroscopy:** Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques.



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**Course Content**

**ENGINEERING CHEMISTRY ( Practical)**

**List of Experiments: (Perform any 8– 10 Experiments)**

1. Determination of Hardness of water sample by EDTA method.
2. Determination of flash point by Pensky Martin Apparatus
3. Determination of Dissolve Oxygen by Iodometric method.
4. Determination of percent purity of Bleaching Powder.
5. pH – metric Titration (any one type of Acid Base titration)
6. Conductometric Titration (any one type of Acid Base titration)
7. Surface tension: Determination of relative surface tension of liquid with respect to water using drop number method.
8. Viscosity: Determination of relative viscosity of liquid with respect to water using Ostwald's viscometer method.
9. To determine the normality in Normal term and Strength in gms/lit of HCl solution by titrating with  $\text{Na}_2\text{CO}_3$  solution.
10. To find out Morality, Normality and Strength of the given  $\text{KMnO}_4$  solution by titrating against N/10 Mohr's solution.
11. Determination of Acid value of an oil sample.
12. Determination of Saponification value of an oil sample.

**Reference Books:**

1. Systematic experiments in Chemistry, A. Sethi, New Age International Publication, New Delhi.
2. Practical Inorganic Chemistry, A. I. Vogel, ELBS Pub.
3. Practical in Engineering Chemistry, S. S. Dara.



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**Engineering Mathematics I**

**Common for all branches**

**Unit 1: Linear Algebra- Matrices**

**[09 Hours]**

Determinants & Matrix, Inverse of Matrix by adjoint method, Inverse by partitioning method, solution of system of linear equations, Rank of Matrix, Consistency of linear system of equation

**Unit 2: Ordinary Differential Equations of First Order and First Degree and Their Applications**

**[09 Hours]**

Linear equations; Reducible to linear equations (Bernoulli's equation); Exact differential equations; Equations reducible to exact equations ; Applications to orthogonal trajectories , mechanical systems and electrical systems.

**Unit 3: Linear Differential Equations with Constant Coefficients**

**[09 Hours]**

Introductory remarks - complementary function, particular integral; Rules for finding complementary functions and particular integrals; Method of variation of parameters; Cauchy's homogeneous and Legendre's linear equations.

**Unit 4: Partial Differentiation**

**[09 Hours]**

Partial derivatives of first and higher orders; Homogeneous functions – Euler's Theorem for functions containing two and three variables (with proofs); Total derivatives; Change of variables.

**Unit 5: Applications of Partial differentiation**

**[09 Hours]**

Jacobians - properties; Taylor's and Maclaurin's theorems (without proofs) for functions of two variables; Maxima and minima of functions of two variables; Lagrange's method of undetermined multipliers.



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**Engineering Mathematics II**

**Common for all branches**

**Unit 1: Complex Numbers**

**[09 Hours]**

Definition and geometrical representation ; De-Moivre's theorem(without proof) ; Roots of complex numbers by using De-Moivre's theorem ; Circular functions of complex variable – definition ; Hyperbolic functions ; Relations between circular and hyperbolic functions ; Real and imaginary parts of circular and hyperbolic functions ; Logarithm of Complex quantities.

**Unit 2: Integral calculus & Multiple Integrals**

**[09 Hours]**

Beta, Gamma functions; Tracing of the curves given in Cartesian, parametric & polar forms. Double integration in Cartesian and polar co-ordinates; Evaluation of double integrals by changing the order of integration and changing to polar form; Triple integral

**Unit 3: Fourier Series & Transform**

**[09 Hours]**

Fourier Series , Definition and Properties (excluding FFT), Fourier Integral Theorem, Relation with Laplace Transform, Applications of Fourier Transform to Solve Integral Equations.

**Unit 4: Vector Differential Calculus**

**[09 Hours]**

General rules of vector Differentiation; Scalar and vector fields: Gradient , divergence and curl ; Solenoidal and irrotational vector fields; Vector identities .

**Unit 5: Vector Integral Calculus**

**[09 Hours]**

Vector Integration : line integral , surface integral and volume integral ; Green's lemma , Gauss' divergence theorem and Stokes' theorem (without proofs) .





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**Engineering Physics  
Branch-Civil**

**Unit I**

**Architectural Acoustics and Ultrasonics (08 Hrs)**

Sound, Reflection of Sound Waves, Absorption of Sound Waves, Sabine's Formula, Reverberation Theory, Acoustic designing of a Hall, Common Acoustic Defects, Acoustical Materials, Ultrasonic Waves, Production of Ultrasonics (Piezoelectric effect, Magnetostriction effect) and its Applications,

**Unit II**

**Forces, Newton's Laws (10 Hrs)**

Coordinate frames, change of frames as linear transformation, rotation matrix, Scalars and vectors - Definition based on their transformation under change of frames; Examples and problems; Newton's Laws of Motion, First law (law of inertia), inertial frame; Second law, concept of force; Third law; Forces in Nature, derived forces; friction, pressure in a fluid; Examples and problems including friction and constraints.

**Unit III**

**Elements of Thermodynamics (09 Hrs)**

Heat and Work in Thermodynamics, Internal Energy, First Law of Thermodynamics, Application of First Law, Heat Engine, The Carnot Cycle, Second Law of Thermodynamics, Entropy, Third Law of Thermodynamics.

**Unit IV**

**Oscillation (08 Hrs)**

Harmonic oscillator, Free oscillation, Damped oscillation- over-damped, critically damped and Under damped oscillators, Forced oscillation and Resonance, differential wave equation.

**Unit V**

**Solids, Crystal Structure and X-rays (10 Hrs)**

Structure of Solids, characteristic properties crystalline and amorphous of solids, Classification of solids ( ionic, molecular, covalent (network), or metallic, factor affecting on increasing strength of material, Bonding in Solids, correlation between bonding and the properties of solids. Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices, Interplanar spacing for cubic system, Bragg's law, X-ray diffraction, Line and Continuous Spectrum of X-ray.

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**Engineering Physics  
Branch-CSE/IT**

**Unit I**

**Semiconducting materials: (10 Hrs)**

Energy bands in solids, Intrinsic and extrinsic semiconductors, P-type and N-type semiconductor, P-N junction diode, I-V characteristics in forward and reverse bias, Rectifiers, Zener diode as a voltage regulator, Transistor action and its characteristics, Transistor as an amplifier (CE mode), Transistor as a switch and Logic gates (OR, AND, NOT, NAND, NOR, X-OR, X-NOR)

**Unit II**

**Optics, Fibre Optics and Laser: (09 Hrs)**

Interference of light in thin film, wedge shaped film, Newton's rings, Antireflection coatings. Principle and structure of optical fibre, acceptance angle, acceptance cone, numerical aperture, applications. Interaction of radiation with matter, population Inversion and Optical resonance cavity, Three and four level laser, Types of LASER – Ruby and He-Ne laser, Application of LASER.

**Unit III**

**Ultrasonic and Dielectric Materials: (08 Hrs)**

Ultrasonic waves, Properties of ultra sonic waves, production of ultrasonics (Piezoelectric effect, Magnetostriction effect) and its applications. Dielectric parameters (Dielectric constant, Electric displacement, Polarization & Polarizability), Types of polarization, temperature and frequency dependences of dielectric materials.

**Unit IV**

**Electron Ballistics and Quantum Mechanics: (09 Hrs)**

Motion of a charged particle in uniform electric and magnetic field, Cross field configuration, Measurement of 'e/m' by Thomson's method, Bainbridge mass spectrograph. Wave-particle duality, Wave packet, Heisenberg's uncertainty principle, Schrödinger's time dependent and independent wave equations, physical significance of wave function.

**Unit V**

**Crystal Structure and Nanoscience (09 Hrs)**

Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices, Interplaner spacing for cubic system, Bragg's law of X-ray diffraction. Introduction to nanoscience and nanotechnology, Classification of nano materials, Application of nanomaterials in engineering



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**Engineering Physics B.Tech.  
Branch-( ETC/EE)**

**Unit-I**

**Laser & Optical Fibre** **(09 Hrs)**

Interaction of radiation with matter, Population Inversion and Optical resonance cavity , Three and four level laser, Ruby laser, He-Ne laser, Semiconductor laser , Properties and engineering applications of laser.

Optical fibers: Propagation by total internal reflection, structure and classification (based on material, refractive index and number of modes), Modes of propagation in fiber, Acceptance angle, Numerical aperture, Attenuation and dispersion.. Applications: I) As a Sensors - i) Temperature Sensor ii) Pollution / Smoke detector iii) Liquid level sensor. II) As a Detectors- i) PIN detector ii) Avalanche Detector.

**Unit-II**

**Semiconductor Physics** **(10 Hrs)**

Band-theory based classification of solids into insulators, semiconductors and conductors, Fermi-Dirac distribution Function, Intrinsic semiconductors: Germanium and silicon; Fermi-energy, Typical energy band diagram of an intrinsic semi-conductor, Extrinsic semiconductors, Current conduction in semiconductors.

PN- junction diode; Unbiased, Forward biased & Reverse biased mode with Energy band diagram , Diode rectifier equation, Bipolar Transistor action, Hall effect, Hall coefficient & Hall Angle, V-I characteristics of i) Tunnel diode, ii) Zener diode iii) LED.

**Unit-III**

**Electron Ballistics** **(09 Hrs)**

Lorentz force, Motion of charged particles in uniform electric and magnetic fields (parallel, perpendicular and at an acute angle), Effect of electric and magnetic fields on kinetic energy of charged particle, Crossed electric and magnetic field configurations, Velocity filter, Electrostatic and magnetostatic deflection.

Bethe's law, Electric and Magnetic focusing, Construction & working of Electrostatic lens, Devices: CRT, CRO, Block Diagram, Function & working of each block.

**Unit-IV**

**Wave Optics** **(09 Hrs)**

Interference in thin films, Interference in Wedge shape thin film, Newton's rings, Anti-reflection coating, advanced applications of interference in thin film.

Polarization by reflection, Brewster's law, polarization by double refraction, Nicol prism, elliptically and circularly polarized light, Quarter wave plate and half wave plate.

**Unit-V**

**Electromagnetic waves** **(08 Hrs)**

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples.



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**Engineering Physics  
Branch-(Mechanical Engg.)**

**Unit I**

**Ultrasonics and Dielectric Materials: (08 Hrs)**

Ultrasonic waves, production of ultrasonics (Piezoelectric effect, Magnetostriction effect) and its applications.

Dielectric parameters (Dielectric constant, Electric displacement, Polarization & Polarizability), Types of polarization, temperature and frequency dependences of dielectric materials.

**Unit II**

**Laser and Fibre Optics : (09Hrs)**

Interaction of radiation with matter, Population Inversion and Optical resonance cavity , Three and four level laser, Ruby laser, He-Ne laser, Semiconductor laser , Properties and engineering applications of laser.

Optical fibers: Propagation by total internal reflection, structure and classification (based on material, refractive index and number of modes), Modes of propagation in fiber, Acceptance angle, Numerical aperture, Attenuation and dispersion.. Applications: I) As a Sensors - i) Temperature Sensor ii) Pollution / Smoke detector iii) Liquid level sensor. II) As a Detectors- i) PIN detector ii) Avalanche Detector.

**Unit III**

**Electron Optics and Quantum Mechanics: (10Hrs)**

Measurement of 'e/m' by Thomson's method, Determination of electronic charge by Millikan's oil drop method, Bainbridge mass spectrograph.

Heisenberg's uncertainty principle, Schrödinger's time dependent and time independent wave equations, physical significance of wave function.

**Unit IV**

**Crystal Structure, X-rays and Electrodynamics: (09 Hrs)**

Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices, Interplaner spacing for cubic system, Bragg's law, X-ray diffraction, Line and Continuous Spectrum of X-ray.

Introduction of Maxwell equations(no derivation), Electromagnetic wave in free space.

**Unit V**

**Magnetic and Semiconducting materials: (09 Hrs)**

Types of magnetic materials( Ferrimagnetic & Antiferromagnetic), B-H curve.

Classical free electron theory-electrical conductivity, resistivity and its temperature dependence, microscopic Ohm's law, Band theory of solids, conductivity of semiconductors, Hall effect.



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**Engineering Physics**

**Branch : Computer Science and Engineering / Information Technology / Electrical  
Engineering-Electronics and Telecommunication**

**List of Practicals :**

<b>Exp. No.</b>	<b>Name of experiment</b>	<b>Based on Unit</b>
1	Hall Effect - Determination of Hall Coefficient.	IV
2	Measurement of Band gap energy.	IV
3	Study of I-V characteristics of P-N junction diode.	I
4	Experiment on Fibre Optics.	I
5	Newton's rings - Determination of radius of curvature of Plano convex lens.	III
6	Edge Shaped film - Determination of thickness of thin wire.	III
7	Interferometer - Determination of wavelength of He-Ne laser light.	II
8	Cathode ray Tube - Determination of 'e/m' of electron.	V
9	Crystal Plane – Study of planes with the help of models related Miller Indices	III
10	Four Probe Method - Determination of resistivity of semiconductor	II



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**Basic Electrical and Electronics Engineering**

**Unit 1**

**(6 Lectures)**

**Elementary Electrical Concepts and CIRCUIT COMPONENTS**

**Fundamental of Electrical system:** Potential difference, Ohm's law, Effect of temperature on resistor, resistance temperature coefficient, **Electrical wiring system:** Study of different wire gauges and their applications in domestic and industry. **Resistors:** color code, type of resistors, material used for resistors, resistance wires, resistance standards, frequency errors in resistors. **Capacitors:** Capacitance standards, variable capacitors, frequency errors in capacitors. Loss angle and power factor of capacitors. **Inductors:** standards of inductance, mutual inductance, self-inductance, variable inductance, inductors for high and low frequency work, frequency errors in inductors.

**Unit 2**

**(6 Lectures)**

**Measurement Of Electrical Quantities, Measuring Instruments & Energy Resources**

Measurement of Voltage, Current, and Power (1ph and 3ph), Introduction to PMMC instrument, Ohmmeter, galvanometer, potentiometers, power factor meter and frequency meters. Study of circuit breakers & Actuators (MCB & Fuse, Power Contactors & Aux contactors, Electro-Mechanical & Solid state Relays). **Energy Resources and Utilization:** Conventional and nonconventional energy resources; Introduction to electrical energy generation from different resources, transmission, distribution and utilization, Concept of Supply Demand, Power Factor, Need of unity factor.

**Unit3**

**(6 Lectures)**

**Introduction to diodes, diode circuit and Transducers**

The P-N Junction Diode, V-I characteristics, Diode as Rectifier, specifications of Rectifier Diodes, Half Wave, Full wave, Bridge rectifiers, Equations for IDC VDC VRMS, IRMS, Efficiency and Ripple Factor for each configuration. Zener Diode, Characteristics, Specifications, Zener Voltage Regulator, Types of Diodes: LED, Photodiode. Introduction to transducer, Classification of transducers, characteristics and choice of transducers.

**Unit 4**

**(6 Lectures)**

**Semiconductor Devices and Applications:**

**Transistors:** Introduction, Classification, CE, CB, and CC configurations,  $\alpha$ ,  $\beta$ , concept of gain and bandwidth. Operation of **BJT** in cut-off, saturation and active regions (DC analysis). BJT as an amplifier, biasing techniques of BJT, BJT as a switch.

**Introduction to Digital Electronics:** Number System, Basic logic Gates, Universal Gates, Boolean Postulates, De-Morgan Theorems



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## **Workshop Syllabus**

### **For CSE, IT, ETC & EE Branch**

**Instructions to the student:**

Each student is required to maintain a „workshop journal“ consisting of drawing / sketches of the jobs and a brief description of tools, equipment, and procedure used for doing the job.

**Contents:**

- a) **Carpentry:** Technical Terms related to wood working, Types of wood, Joining materials, Types of joints - Mortise and Tenon, Dovetail, Half Lap, etc., Methods of preparation and applications, Wood working lathe, safety precautions.
- b) **Welding:** Arc welding - welding joints, edge preparation, welding tools and equipment, Gas welding - types of flames, tools and equipment, Resistance welding - Spot welding, joint preparation, tools and equipment, safety precautions.
- c) **Fitting:** Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc., Fitting hand tools like vices, cold chisel, etc. Drilling machine and its operation.
- e) **Machine shop:** Lathe machine, types of lathes, major parts, cutting tool, turning operations (Demo), safety precautions

**List of Practical:**

1. Wood sizing exercises in planning, marking, sawing, chiseling and grooving to make half lap joint and cross lap joint.
2. A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding, drilling and tapping on M. S. plates.
3. Exercise in Arc welding (MMAW) to make a square butt joint.
4. A demo job on turning of a Mild Steel cylindrical job using center lathe.



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**For Mechanical & Civil Branch**

**Instructions to the student:**

Each student is required to maintain a „workshop journal“ consisting of drawing / sketches of the jobs and a brief description of tools, equipment, and procedure used for doing the job.

**Contents:**

- a) **Carpentry:** Technical Terms related to wood working, Types of wood, Joining materials, Types of joints - Mortise and Tenon, Dovetail, Half Lap, etc., Methods of preparation and applications, Wood working lathe, safety precautions.
- b) **Welding:** Arc welding - welding joints, edge preparation, welding tools and equipment, Gas welding - types of flames, tools and equipment, Resistance welding - Spot welding, joint preparation, tools and equipment, safety precautions.
- c) **Fitting and Plumbing:** Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc., Fitting hand tools like vices, cold chisel, etc. Drilling machine and its operation, Different types of pipes, joints, taps, fixtures and accessories used in plumbing, safety precautions.
- d) **Sheet Metal Work:** Simple development and cutting, bending, Beading, Flanging, Lancing and shearing of sheet metal, Sheet metal machines - Bending Machine, Guillotine shear, Sheet metal joints, Fluxes and their use.
- e) **Machine shop:** Lathe machine, types of lathes, major parts, cutting tool, turning operations (demo), safety precautions.

**List of Practical:**

1. Wood sizing exercises in planning, marking, sawing, chiseling and grooving to make half lap joint and cross lap joint.
2. A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding, drilling and tapping on M. S. plates.
3. A job on use of plumbing tools and preparation of plumbing line involving fixing of water tap and use of elbow, tee, union and coupling, etc.
4. Making a small parts using GI sheet involving development, marking, cutting, bending, brazing and soldering operations- i) Tray ii) Funnel and similar articles.
5. Exercise in Arc welding (MMAW) to make a square butt joint.
6. Exercise in Resistance (Spot) welding to make a lap joint.
7. A job using power operated tools related to sheet metal work, Welding, Fitting, Plumbing, Carpentry and pattern making.
8. A demo job on turning of a Mild Steel cylindrical job using center lathe.





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**Electrical workshop:-**

- 1) To wire for a stair case arrangement using a two-way switch.
- 2) To measure electrical quantities-voltage current, power & power factor in RLC circuit.



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**Introduction to Computer programming**

**Unit I**

**Basic of Programming Language:** (6 Hrs)

HLL, LLL, Language translator, Error checking, Debugging, Programming processes, Flowcharts, Algorithms along with asymptotic notation.

**Unit II**

**Types, Operators and Expressions in C language :(6 Hrs)**

Variable names, Data types, sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

**Unit III**

**Control Flow:** (6 Hrs)

Statements and Blocks. If-else, else-if, switch, Loops: while and for, do-while break and continue go to and Labels. Initializing arrays, Initializing character arrays, multidimensional arrays, Introduction to pointers.

**Unit IV**

**Functions and Pointers in Python:** (6 Hrs)

Functions and Program Structure: Basic of functions, functions returning non-integers external variables scope rules.

**Pointers in Python:** Pointers to integers, characters, floats, arrays.

**Unit V**

**(6 Hrs)**

**Structures in Python:** Basics of structures, structures with functions, arrays of structures.

**File handling in Python:** Basics of file handling.



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**ICPC**

**Practical list**

<b>Sr.No.</b>	<b>NAME OF PRATICAL</b>
<b>1</b>	A simple program to display a message "Hello World" on screen.
<b>2</b>	Write a Program to print addition, subtraction Multiplication and Division of a entered number.
<b>3</b>	Write a Program to LCM of the entered number.
<b>4</b>	Write a program to find GCD of the entered number.
<b>5</b>	Write a program to find the greatest among three numbers.
<b>6</b>	Write a any menu driven program using if...else statement.
<b>7</b>	Write a any menu driven program using Switch case statement.
<b>8</b>	Write a program to find count of even no ,count of odd number , sum of even no and sum of odd number between 1 to 50.
<b>9</b>	Write a Program to generate prime number up to inputted number.
<b>10</b>	Write a program to check entered no is Armstrong no or not.
<b>11</b>	Write a program to find transpose of a matrix.
<b>12</b>	Write a Program to find multiplication of a two matrix elements.
<b>13</b>	Write a Program to find length of a string.(with and without using a library function)
<b>14</b>	Write a Program to find addition of two numbers using pointer.
<b>15</b>	Open ended Program. (How to execute C program on Linux operating system )
<b>16</b>	Write a Python program to print "Hello World".
<b>17</b>	Write a Python program to display the current date and time.
<b>18</b>	Write a Python program which accepts the radius of a circle from the user and compute the area.
<b>19</b>	Write a Python program to find reverse of the entered number.
<b>20</b>	Write a Python program to get the Python version you are using

**NOTE: - Perform any 8 from 1 to 15 and any 2 from 16 to 20.**



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**Mini Project List**

1	Library management
2	Snake Game
3	Quiz Game
4	Department store system
5	Tic-tac-toe game
6	Personal Dairy Management System
7	Telecom Billing Management System
8	Bank Management System
9	Contacts Management
10	Medical Store Management System
11	Hostel Accommodation System
12	Clothing Store Management
13	Gym Management System
14	A Car Rental System
15	Employee Record System



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**Basic Civil and Mechanical Engineering**

**Part I Basic Civil Engineering**

**Unit 1:** introduction to civil engineering

Various branches introduction to civil engineer in various construction activities basic engineer properties and various materials: earth bricks timber, stone, sand Aggregate cement moter steel bituminous glass FRP composite material

**Unit 2:** building component and planning material

Foundation and superstructure function of foundation type of shallw and deep foundation suitability in different situation plinth wall lintels beam column slab roof staircase floor door window and study of building plans ventilation and basic plumbing and sanitation

**Unit 3:** surveying

Principal of surveying element of distance angular measurement plotting of area base line and off set introduction of plane table survey introduction to leveling concept of bench mark reduce level and counting

**Part II Basic Mechanical Engineering**

**Unit 1:** Introduction to Mechanical Engineering, Introduction to Laws of Thermodynamics with simple examples pertaining to respective branches, IC Engines: Classification, Applications, Basic terminology, 2 and 4 stroke IC engine working principle, Power Plant: Types of Power plant; Gas power plant, Thermal power plant, Nuclear power plant, Automobiles: Basic definitions and objectives

**[6 hrs]**

**Unit 2:** Design Basics, Machine and Mechanisms, Factor of safety, Engineering Materials: types and applications, basics of fasteners, machining and machinability. Introduction to lathe machine, drilling machine, milling machine, basics of machining processes such as turning, drilling and milling. Introduction to casting

**[6 hrs]**



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## **Engineering Graphics**

**Unit I Introduction to Computer Aided Drawing [03 hrs]**

Theory of CAD software, Demonstration knowledge, layout of the software, standard tool bar/menus and description of most commonly used tools bars, Navigational tools. Creation of 2D/3D environment. Commands and creation of co-ordinate points, lines, axes, polyline, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, offset, mirror, rotate, trim, extend, break, chamfer, fillet, zoom, pan, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, lettering. Line properties, 3D modeling & topology of engineering component.

**Unit II Drawing standards & Orthographic Projections: [03 hrs]**

Drawing standard SP: 46, type of lines, lettering, dimensioning. Basic geometrical construction, drawing of regular polygon, Theory of projection, introduction to orthographic projection, drawing of orthographic views of objects from their isometric views by using first angle method of projection.

**Unit III Projections of Points & Projections of Straight Lines: [03 hrs]**

Projection of point lying in four quadrants. Projections of lines parallel and perpendicular to one or both planes, projections of lines inclined to one or both reference planes.

**Unit IV Projections of Planes & Projections of Solids: [03 hrs]**

Projections of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes.

Types of solids, Projection of solid when axis is perpendicular to one of the reference planes, when axis is inclined to one and parallel to other reference plane, when axis is inclined to both the reference planes

**Unit V Isometric Projections [03 hrs]**

Isometric projections: Isometric scale, drawing of isometric projections from given orthographic views.



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**Engineering Graphics Lab**

**List of Practical :**

1. Introduction of CAD software and to study and practice basic draw commands exists in the CAD software.
2. Lines, lettering and dimensioning. (Drafting work)  
Identify the different types of Lines in the given object, draw lettering and give the Required dimensions in the given object.
3. Geometric Construction. (Drafting work)
4. Orthographic projections first sheet. (Using CAD software)
5. Orthographic projections second sheet. (Using CAD software)
6. Projections of straight lines. (Drafting work)
7. Projections of planes & solids. (Drafting work)
8. Isometric Projections first sheet. (Using CAD software)
9. Isometric Projections second sheet. (Using CAD software)



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## **Communication Skills**

### **Unit 1: Communication and Communication Processes (06 hrs)**

Introduction to Communication, Types and functions of Communication, Barriers to Communication and overcoming them, Role of Communication Skills in Society

**Reading:** Introduction to Reading, Barriers to Reading, Types of Reading: Skimming, Scanning, Intensive and Extensive, Strategies for Reading Comprehension.

**Listening :** Importance of Listening, Types of Listening, Barriers to Listening.

### **Unit 2: Study of Sounds in English and Vocabulary Building (06 hrs)**

Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation of Different Sounds in English.

**Vocabulary Building:** The concept of Word Formation, Root words from foreign languages and their use in English, Use of prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations

### **Unit 3: English Grammar (06 hrs)**

Grammar: Forms of Tenses, Articles, Prepositions, Use of Auxiliaries and Modal Auxiliaries, Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Common Errors. Misplaced modifiers

### **Unit 4: Professional Verbal Communication (06 hrs)**

Components of an effective talk, Idea of space and time in public speaking, Tone of voice, Body language, Timing and duration of speech, Audio-Visual Aids in speech. Presentation Skills, Group Discussion and Job Interviews

### **Unit 5: Developing Business Writing Skills, Styles and Practice (06 hrs)**

Writing Emails, Report Writing: Format, Structure and Types, Letter Writing: Types, Parts, Layouts, Writing Job Application Letter and Resume.

**Nature and Style of sensible Writing and Practice:** Describing, Defining, Classifying, Providing examples or evidence, writing introduction and conclusion, Writing Practices: Comprehension, Précis Writing, Essay Writing





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**Communication Skills Lab**

List of Practical Sessions (Any 10 PR sessions can be conducted):

- 1) Pronunciation, Intonation, Stress and Rhythm(02 hrs)
- 2) Introduction to Phonemic symbols (02 hrs)
- 3) Articulation of sounds in English with proper manner (02 hrs)
- 4) Practice and exercises on articulation of sounds (02 hrs)
- 5) Read Pronunciations/transcriptions from the dictionary (02 hrs)
- 6) Practice and exercises on pronunciations of words (02 hrs)
- 7) Introduce yourself (02 hrs)
- 8) Importance of Business Communication with the help of a case study.(02hrs)
- 9) Listening Skills/ Comprehension(02 hrs)
- 10) Common Everyday Situations: Conversations and Dialogues(02 hrs)
- 11) Communication at Workplace(02 hrs)
- 12) Rapid reading sessions (02 hrs)
- 13) Draft Email(02 hrs)
- 14) Resume Writing(02hrs)
- 15) Drafting Business Letter(02 hrs)
- 16) Preparing technical paper using IEEE format(02 hrs)
- 17) Extempore (02 hrs)
- 18) Elocution (02 hrs)
- 19) Group discussion (02 hrs)
- 20) Participating in a debate (02 hrs)
- 21) Presentation techniques (02 hrs)
- 22) Interview techniques – Job Interviews, Telephonic Interviews(02hrs)
- 23) Mock interviews and practice sessions(02 hrs)



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## **Energy and Environment Engineering**

### **Unit 1**

**Air Pollution:** Environment and Human health - Air pollution, Particulate emission: sources- effects-control measures -, air quality standards, and measurement of air pollution. Disposal of solid wastes, Bio-medical wastes effects- control measures [4 hrs]

### **Unit 2**

**Water Pollution and Conservation:** Water pollution- types of pollutants, effects- control measures, Water conservation and its methods, rainwater harvesting, methods of rainwater harvesting Surface runoff harvesting, Rooftop rainwater harvesting, Noise pollution –effects and control measures, -Thermal pollution – Soil pollution –Nuclear hazard. [4 hrs]

### **Unit 3**

**Conventional Power Generation:** Steam power station, Nuclear power plant – Gas turbine power plant- Hydro power station: Schematic arrangement, advantages and disadvantages, Thermo electric and thermionic generators, Environmental aspects for selecting the sites and locations of power plants. [4 hrs]

### **Unit 4**

**Renewable Power Generation:** Solar, Wind, Biogas and Biomass, Ocean Thermal energy conversion (OTEC), Tidal, Geothermal energy, Magneto Hydro Dynamics (MHD): Schematic arrangement, advantages and disadvantages. [4 hrs]

### **Unit 5**

**Energy conservation:** Scope for energy conservation and its benefits Energy conservation Principle – Maximum energy efficiency, Maximum cost effectiveness, Methods and techniques of energy conservation in ventilation and air conditioners, refrigerator, compressors, pumps, fans and blowers, Energy conservation in electric furnaces, ovens and boilers, lighting techniques. Triffs and economic aspects in power generation. [4 hrs]

### **Reference/Text Books:**

1. A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, A Text book of Power System Engineering, Dhanpat Rai Publication.
2. Rai. G. D., Non Conventional Energy Sources, Khanna Publishers, Delhi, 2006.
3. Rao S., Parulekar B.B., Energy Technology-Non conventional, Renewable And Conventional, Khanna Publishers, Delhi, 2005.
4. Glynn Henry J., Gary W. Heinke, Environmental Science and Engineering, Pearson Education, Inc, 2004.
5. J. M. Fowler, Energy and the Environment, McGraw-Hill, 2 nd Edition, 1984.
6. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Prentice Hall, 2003.