

Rationale

Subject of Hydraulics is a basic engineering subject and helps in solving fluid flow problems in the field of Civil Engineering. The subject deals with basic concepts and principles in hydrostatics, hydrokinematics and hydrodynamics and their application in solving fluid - mechanics problems.

Detailed Contents**UNIT I**

Introduction: Fluids: Real and ideal fluids. Hydrostatics, Hydrodynamics, Hydraulics. Properties of Fluids (definition only) .Mass density, specific weight, specific gravity, viscosity, surface tension -cohesion, adhesion and, capillarity, vapour pressure and compressibility. Units of measurement and their conversion.

UNIT II

Hydrostatic Pressure: Pressure, intensity of pressure, pressure head, Pascal's law and its applications. Total pressure, resultant pressure, and centre of pressure. Total pressure and centre of pressure on horizontal, vertical and inclined plane surfaces of rectangular, triangular, trapezoidal shapes and circular.(No derivation) .Measurement of Pressure: Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure. Piezometer, simple manometer and differential manometer, Bourden gauge and dead weight pressure gauge.

UNIT III

Fundamentals of Fluid Flow: Types of Flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow, Discharge and continuity equation (flow equation) {No derivation}, Types of hydraulic energy: Potential energy, kinetic energy, pressure energy Bernoulli's theorem; statement and description (without proof of theorem) and simple numerical problems.

Flow Measurements (brief description with simple numerical problems), Venturimeter and mouthpiece, Pitot tube, Orifice and Orificemeter, Current meters, Notches and weirs (simple numerical problems)

UNIT IV

Flow through Pipes: Definition of pipe flow; Reynolds number, laminar and turbulent flow – explained through Reynold's experiment, Critical velocity and velocity distributions in a pipe for laminar flow. Head loss in pipe lines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction (No derivation of formula). Hydraulic gradient line and total energy line. Flow from one reservoir to another through a long pipe of uniform cross section (simple problems). Pipes in series and parallel. Water hammer phenomenon and its effects (only definition and description).

UNIT V

Flow through open channels: Definition of an open channel, uniform flow and non-uniform flow, Discharge through channels using Chezy's formula (no derivation), Manning's formula (no derivation), Simple Numerical Problems. Most economical channel sections (no derivation) Rectangular, Trapezoidal, Simple Numerical Problems. Head loss in open channel due to friction.

Hydraulic Pumps: Hydraulic pump, reciprocating pump, centrifugal pumps (No numericals and derivations) (may be demonstrated with the help of working models).

Note: Visit to Hydraulic research station is must to explain the various concepts.

Instructional Strategy

Hydraulics being a fundamental subject, teachers are expected to lay considerable stress on understanding the basic concepts, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room and provide tutorial exercises so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject be supplemented by demonstrations and practical work in the laboratory. Visit to hydraulic research stations must be carried out.

Recommended Books

1. Jagdish Lal, "Fluid Mechanics and Hydraulics" Delhi Metropolitan Book Co. Pvt Ltd.
2. Modi, PN, and Seth, SM; "Hydraulics and Fluid Mechanics", Standard Publishers Distributors, Delhi
3. Khurmi RS, "Hydraulics and Hydraulics Machines", S Chand and Co., Delhi
4. Likhni SK., Laboratory Manual in Hydraulics, Delhi Wiley Eastern.
5. Birinder Singh, "Fluid Mechanics", Kaptian Publishing, New Delhi.
6. Sarao A.S., "Fluid Mechanics", Tech. India Publication, New Delhi

1. To verify Bernoulli's Theorem
2. To find out venturimeter coefficient
3. To determine coefficient of velocity (C_v), Coefficient of discharge (C_d) Coefficient of contraction (C_c) of an orifice and verify the relation between them
4. To perform Reynold's experiment
5. To verify loss of head in pipe flow due to: a) Sudden enlargement b) Sudden contraction c) Sudden bend
6. Demonstration of use of current meter and pitot tube
7. To determine coefficient of discharge of a rectangular notch/triangular notch.

Rationale

The important functions of a diploma civil engineer includes the jobs of detailed surveying,plotting of survey data, preparation of survey maps and setting out works.While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like chain surveying, compass surveying leveling, that the Civil Engineering diploma holder will normally be called upon to perform and plane table surveying, Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

Detailed Contents**UNIT I**

Introduction:Basic principles of surveying.Concept and purpose of surveying, measurements-linear and angular, units of measurements.Instruments used for taking these measurements, classification based on surveying instruments etc.

UNIT II

Chain surveying: Purpose of chain surveying, principles of chain surveying and its advantages and disadvantages,Obstacles in chain surveying,Direct and indirect ranging offsets and recording of field notes.Errors in chain surveying and their corrections.

UNIT III

Compass surveying:Purpose of compass surveying. Use of prismatic compass: Setting and taking observations.Concept of following with simple numerical problems: Meridian - Magnetic and true,Bearing - Magnetic, True and Arbitrary,Whole circle bearing and reduced bearing,Fore and back bearing,Magnetic dip and declination.Local attraction - causes, detection, errors and corrections, problems on local attraction, magnetic declination and calculation of included angles in a compass traverse.

UNIT IV

Plane Table Surveying :Purpose of plane table surveying, equipment used in plane table survey:Setting of a plane table: Centering, Levelling, Orientation.Methods of plane table surveying:Radiation, Intersection, Traversing,Resection. Concept of Two point and Three point problems (Concept only).Errors in plane table survey and precautions to control them. Testing and adjustment of plane table and alidade.

UNIT V

Levelling: Purpose of levelling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and bench marks. Identification of various parts of Dumpy level and use of Dumpy level, Engineer's level, Auto level: advantages and disadvantages, use of auto level. Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis.Levelling staff: single piece, folding, invar precision staff, telescopic.Temporary adjustment and permanent adjustment of dumpy level by two peg method. Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels.Level book and reduction of levels by: Height of collimation method and Rise and fall method.Arithmetic checks, problem on reduction of levels, fly levelling, check leveling and profile levelling (L-section and X-section), errors in levelling, permissible limits, reciprocal leveling. Numerical problems. Computations of Areas of regular figures and irregular figures. Simpson's rule: prismatic formula and graphical method use of planimeter for computation of areas, numerical problems.

Instructional Strategy

This is highly practice-oriented course. While imparting theoretical instructions, teachers are expected to demonstrate the use of various instruments in surveying, stress should be laid on correct use of various instruments so as to avoid/minimize errors during surveying. It is further recommended that more emphasis should be laid in conducting practical work by individual students. Technical visit to Survey of India, Northern Region and Great Trigonometrical Survey(GTS), Dehradun.

Recommended Books

1. Hussain, SK and Nagraj, MS; "Text Book of Surveying"; New Delhi, S Chand and Co Ltd.
2. Deshpande, RS; "A Text Book Surveying and Levelling"; Poona, United Book Corporation
3. Kocher, CL; "A Text Book of Surveying"; Ludhiana, Katson Publishing House

4. Kanetkar, TP and Kulkarni, SV., "Surveying and Leveling", Poona, AVG Parkashan
5. Kanetkar, TP; and Kulkarni, SV; "Surveying and Leveling" Poona, AVG Prakashan
6. Mahajan, Sanjay "Surveying -I", Tech. Publication, Delhi
7. Punmia, BC; "Surveying and Leveling", Delhi Standard Publishers Distributors.
8. Shahai, PB; "A Text Book of Surveying", Oxford and IBH Publishing Co.

I. Chain surveying:

- i) a) Ranging a line
- b) Chaining a line and recording in the field book
- c) Taking offsets - perpendicular and oblique (with a tape only)
- d) Setting out right angle with a tape
- ii) Chaining of a line involving reciprocal ranging
- iii) Chaining a line involving obstacles to ranging
- iv) Chain Survey of a small area.

II. Compass Surveying:

- i) a) Study of prismatic compass
- b) Setting the compass and taking observations
- c) Measuring angles between the lines meeting at a point

III. Levelling:

- i) a) Study of dumpy level and levelling staff
- b) Temporary adjustments of various levels
- c) Taking staff readings on different stations from the single setting and finding differences of level between them
- ii) To find out difference of level between two distant points by shifting the instrument
- iii) Longitudinal and cross sectioning of a road/railway/canal
- iv) Setting a gradient by dumpy and auto-level

IV. Plane Table Surveying:

- i) a) Study of the plane table survey equipment
- b) Setting the plane table
- c) Marking the North direction
- d) Plotting a few points by radiation method
- ii) a) Orientation by
 - Trough compass
 - Back sighting
- b) Plotting few points by intersection, radiation and resection method

iii) Traversing an area with a plane table (at least five lines)

V. Layout of Buildings (from given drawing of two room residential building) by use of surveying instruments.

Rationale

Civil Engineering diploma holders have to supervise construction of various types of civil works involving use of various materials like stones, bricks and tiles, cement and cement based products, lime, timber and wood based products, paints and varnishes, metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills in conducting tests to determine suitability of materials for various construction purposes. In addition, specifications of various materials should also be known (PWD/BIS) for effective quality control.

Detailed Contents**UNIT I**

Bricks: Classification, Characteristics of good bricks, Ingredients of good brick earth, Different forms of bricks, testing of bricks as per BIS. Defects of bricks. Brick masonry: Bond – meaning and necessity; English, flemish bond and other types of Bonds. Construction of brick walls : methods of laying bricks in walls, precautions observed in the construction of walls, methods of bonding new brick work with old (toothing, raking, back and block bonding), Expansion and contraction joints. Timber: Seasoning of timber; Methods, Defects in Timber, Decay of Timber, Preservation of Timber, Testing of Timber, Veneers , Plywood.

UNIT II

Cement: OPC, Manufacture of OPC, Composition, Types of cement. Lime: Classification, Slaking and hydration, Hardening, Testing, Storage, Handling. Concrete: Ingredients of concrete, W/C ratio, Workability, Different grades in cement concrete, Concrete Blocks. Mortars: Classification, Uses, Characteristics of good mortar, Ingredients. Cement mortar, Lime mortar, Lime cement mortar, special mortars. Composite Materials, Fibre Reinforced concrete, Geo Materials.

UNIT III

Doors, Windows and Ventilators: Glossary of terms with neat sketches. Classification based on materials i.e. wood, metal and plastic and their suitability for different situations. Different type of doors- panel door, flush door, flazed door, rolling shutter, steel door, sliding door, plastic and aluminium doors. Window: Panel window, glazed windows (fixed and openable) ventilators, sky light window, plastic and

aluminium windows. Door and window frames – materials and sections, door closures, hold fasts. Arches and Lintels(Brief discussion)

UNIT IV

Floors: Essential requirements of a floor, factors affecting selection of flooring material, various types of floorings (brick, tiled cement concrete, terrazzo, marble, timber, flooring reinforced concrete floor, pre cast concrete floor.)Roofs and roof coverings: Requirements of good roof , classification, types of roof coverings for pitched roof. A.C. sheet roofs :fixing of A.C. sheets, laying of big six sheets, G.I. Sheets roofs, slates, flat roof.

UNIT V

Wall Finishes: Plastering, pointing and painting ,Special Treatments: Fire resistant, water resistant, thermal insulation, acoustical construction and anti-termite treatment. Scaffolding, construction details and suitability of mason’s brick layers and tubular scaffolding, shoring, underpinning

Books Recommended:

1. Building Construction by Sharma and Koul
2. Building materials and construction by Gurcharan Singh
3. Properties of concrete by A.M.Neville
4. Concrete Technology by M S Shetty

1. To identify the stones used in building works by visual examination.
2. To determine the crushing strength of bricks.
3. To determine the water absorption of bricks and efflorescence of bricks.
4. To identify various types of timbers such as: Teak, Sal, Chir, Sissoo, Deodar, Kail & Hollock by visual examination only.
5. The students should submit a report work on the construction materials, covering water proofing material, cements, steel, paints and timber products available in the local market. They will also show the competitive study based upon the cost, brand name, sizes available in the local market.
6. Demonstration of tools and plants used in building construction.
7. To prepare Layout of a building: two rooms building with front verandah
8. To construct brick bonds (English bond only) in one, one and half and two brick thick:
(a) Walls for L, T and cross junction (b) Columns

Rationale

Drawing is the language of engineers. Engineering is incomplete without a thorough knowledge of drawing. A Civil Engineering diploma holder must be capable of sketching detailed constructional drawing of various components of building for the purpose of communication with the craftsman. Planning of small buildings, developing a line plan, dimensioning, key plan, drainage plan should be a part of curriculum. The diploma engineer must be conversant with reading and interpretation of drawing for execution of work.

Detailed Contents

UNIT I

Drawing No. 1: (2 sheets)

Details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick plinth protection have to be shown in the drawing.

UNIT II

Drawing No. 2: (one sheet): Plans of „T“ and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond

Drawing No. 3: (one sheet): Drawing of flat roof, showing the heat/thermal insulation provisions.

Drawing No. 4: (2 sheets): Detailed drawing of basement, single wooden floor, double wooden floor.

UNIT III

Drawing No.5 (3 sheets): Elevation, sectional plan and sectional side elevation of flush door, glazed door, panelled door and window, Aluminium door and window with wire gauge shutter. Sketches of various joints of different members.

Drawing No.6(one sheet): Draw atleast one sheet using CAD software

UNIT IV

Drawing No. 7: (2 sheet): Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation.

Drawing No.8 (4 sheets): Drawing detailed plan, elevation and section of a two room residential building from a given line plan, showing details of foundations, roof and parapet

Drawing No. 9 (one sheet): Drawing details of damp proofing arrangement of roofs and walls as per BIS Code. Show the rain water drainage arrangement also.

UNIT V

Drawing No. 10: Draw detailed plan, elevation and section of:

- (i) Single flight R.C.C. stair case
- (ii) Dog legged wooden stair case

Drawing No. 11 (one sheet): Drawings of following floors

Cement concrete floors on ground and at first floor

- i) Conglomerate (Concrete Flooring)
- ii) Bonded cement concrete flooring
- iii) Terrazo flooring
- iv) Ceramic/vitrified tile flooring

Drawing No.12: Draw atleast one sheet using CAD software

NOTE:

- a) All drawings should be as per BIS code and specifications in SI Units
- b) Intensive practice of reading and interpreting building drawings should be given
- c) Some practice should be done to prepare drawings on AutoCAD

Recommended Books

1. Civil Engineering Drawing by RS Malik, Asia Publishing House
2. Civil Engineering Drawing by V.B.Sikka. Katson Publishing, Ludhiana Civil Engineering Drawing by NS Kumar; IPH, New Delhi
3. Principles of Building Drawing by MG Shah and CM Kale, MacMillan, Delhi Building Construction by Moorthy NRK
4. Civil Engg Drawing by LayalZaidi, SKA and Siddiqui, Suhail; Drawing and Design of Residential and Commercial Buildings, Standard Publishers and Distributors, Delhi.
5. SP : 20
6. National Building Code

ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution. This is to be organized at a stretch for 3 to 4 days. Lectures will be delivered on following broad topics. There will be no examination for this subject.

1. Basics of ecology, eco system and sustainable development.
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table.
3. Sources of pollution - natural and manmade, their effects on living and non-living organisms
4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms
5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms Sources of noise pollution and its effects
6. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods, methods of vermicomposting.
7. Mining, blasting, deforestation and their effects.
8. Legislation to control pollution and protect environment
9. Environmental Impact Assessment (EIA), Elements for preparing EIA statements
10. Current issues in environmental pollution and its control, Global warming Green house gases, non-conventional sources of energy, introduction to clean technology, carbon credits.
11. Introduction to Green buildings, site selection, material efficiency, energy efficiency, water efficiency, building form.

ELECTIVE-I

UNIT I

Environmental Pollution And Control: Introduction, Environment, Ecosystem, Environmental Pollution and its types, Causes of Pollution, Effects of Pollution, Control of Pollution, Existing laws related to Environmental Pollution.

UNIT II

Domestic Sewage: Introduction, Importance and necessity of sanitation, Necessity to treat domestic sewage, Recycling and Reuse of domestic waste. Definitions- Sewage, sullage , types of sewage.

UNIT III

Environmental Pollution: Air Pollution and Noise Pollution Sources, Effects and Control of Air Pollution, Sources , Effects and Control of Noise Pollution (only brief idea) Global warming, Acid Rain.

UNIT IV

Solid Wastes From The Society: Solid Waste Management, Definitions – Refuse, Rubbish, Garbage, Ashes, Constituents of solid wastes, Sources of solid wastes, Collection of Solid Wastes. Methods of collection of solid wastes. Emerging Trends (only brief idea), Sant Gadge Baba Swachhatha Abhiyan Low cost Latrines Jalswarajya Scheme.

UNIT V

Industrial Waste: Industrial Waste Water Characteristics of Industrial waste water from sugar, Dairy, Distillery, Textile, Paper and Pulp and Oil industry; and their suggestive treatments.

Recommended Books

1. Deswal DS and Deswal SS “Environmental Engineering” Dhanpat Rai and Company (P) Ltd., Delhi
2. Odum EP, “Fundamentals of Ecology”, Amarind Publication Co., Delhi
3. DhamijaSK “Environmental Engineering and Management ; SK Kataria and Sons, Delhi
4. DeAK, “Engineers Chemistry”, New Age Publication, Delhi
5. KendeighSC, “Ecology”, Prentice Hall of India, Delhi
6. Khitoliya, RK, “Environmental Pollution’, S Chand & Co. Ltd., New Delhi
7. Bhatia, HS, “A text book of Environmental Pollution and Control”, Galgotia. Publishers, Delhi

UNIT I

Plumbing: Elements of plumbing. Objectives of plumbing, purpose of plumbing, role of plumber, licensing of plumbers their functions, sewer Air, supply pipes, drainage & vent pipes application for obtaining supply connection.

UNIT II

Pipes joints & fittings. Introduction. Types of Pipe – G.I. Pipes, PVC Pipes, Copper pipes, C.I. Pipes, A.C. Pipes, prestressed concrete pipes, joints in pipes, method of fixing pipes such as G.I. fitting C.I. fitting.

UNIT III

Valves & Terminal Fittings. Types of valves & its purpose, sluice valve, reflux valve, scour valve, Air relief valve, pressure relief valve, gate valves, Bio-taps & stop valve self closing valve. Flush valve, mixing valve.

UNIT IV

Sanitary fixture & Building drainage system. Building sanitary fittings – water closet, flushing appliances, urinals, washbasins, flushing cisterns, principles of building drainage siphonic action, traps & its types. Capacity & sizing of pipe, soil pipe, waste pipe, rain water pipe, system of plumbing. Installation of pipes, testing of pipes.

UNIT V

Water Proofing Treatment: Introduction, material required for water proofing and its specification. Water proofing of water closet and bath room procedure & Cross section. Terrace and basement water proofing, Precautions to be taken while water proofing.

Rationale

Civil Engineering diploma holders must have the knowledge to distinguish between different types of causes of damage, decide the appropriate technique according to failure. identify causes of failure of masonry building & its retrofitting, list causes of failure of R.C.C. building, its retrofitting, find the strength, age of building & maintenance of life lines, Prepare estimates & tenders for structure damage due to hazards.

UNIT I

Introduction: Necessity, operation, maintenance & repairs of structures. Classification of maintenance, Rehabilitation (restoration), strengthening, retrofitting. Methodical approach to repairs, inspection-annual, emergency, special, repairs- minor, special and renovation.

UNIT II

Causes & detection of damages: Causes of damages, damages due to earthquakes, fire hazards, flood,hazards, dilapidation, List of basic equipments for investigation.

UNIT III

Materials for repairs: Epoxy resin, epoxy mortar, gypsum cement mortar, quick setting, cement mortar, Shotcreting, Mechanical anchors.

UNIT IV

Concept of repairs & strengthening of RCC structures: Concept of repairs of RCC structures Physical examination of common defects, Structural repairs & strengthening repairs by new developments.

UNIT V

Maintenance of life lines: Maintenance of electric supply, water supply leaking pipejoints and sewerage systems, closed drains, sewers. Maintenance of roads, road berms, side drain maintenance of bridges, culverts causeways

Books Recommended:

1. Maintenance and Repairs of Buildings by P.K. Guha, New Central book Agencies.
2. Maintenance Engineering For Civil Engineers by Nayak B. S, Khanna Publication.
3. Maintenance and Repairs of Buildings by Hutchin Son, BD , Newnes –Butterworth.

Rationale

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

Detailed Contents**UNIT I**

Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields, Definition of Applied Mechanics. Definition, basic quantities and derived quantities of basic units and derived units. Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration. Concept of rigid body, scalar and vector quantities

UNIT II

Definition of force, measurement of force in SI units, its representation, types of force. Point force/concentrated force & uniformly distributed force, effects of force, characteristics of a force. Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of superposition. Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components, Free body diagram, Equilibrant force and its determination, Lami's theorem (concept only).

UNIT III

Moments: Concept of moment, Moment of a force and units of moment, Varignon's theorem (definition only), Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support), Parallel forces (like and unlike parallel force), calculating their resultant, Concept of couple, its properties and effects, General conditions of equilibrium of bodies under coplanar forces, Position of resultant force by moment.

UNIT IV

Definition and concept of friction, types of friction, force of friction, Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction, Equilibrium of a body lying on a horizontal

plane, equilibrium of a body lying on a rough inclined plane, Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies, Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion, Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed/[Simple problems on the above topics]

UNIT V

Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines, Simple and compound machine (Examples), Definition of ideal machine, reversible and self locking machine, Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency, System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency, Working principle and application of wheel and axle, Weston's Differential Pulley Block, simple screw jack, worm and worm wheel, single and double winch crab, Expression for their velocity ratio, and field of their application, Torsion in shafts/bars Modulus of rigidity, Torsional Equation (simple numerical problems), Power Transmission in shafts (simple numerical problems)

Recommended Books:

1. A Text Book of Applied Mechanics by S Ramamurtham, Dhanpat Rai Publishing Co. Ltd.
2. Applied Mechanics By, Col. Harbhajan Singh, TL Singha and Parmod Kumar Singla, Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
3. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
4. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi..
5. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.

Rationale

A diploma holder in this course is supposed to maintain steam generators, turbines, compressors and other power plant equipment. Therefore, it is essential to impart him basic concepts of thermodynamics, steam generators, steam turbines, and compressors and about IC engines.

Detailed Contents**UNIT I**

Thermodynamic state and system, boundary, surrounding, universe, thermodynamic systems – closed, open, isolated, adiabatic, homogeneous and heterogeneous, properties of system – intensive and extensive, thermodynamic equilibrium, quasi – static process, reversible and irreversible processes, Zeroth law of thermodynamics, definition of properties like pressure, volume, temperature, enthalpy, internal energy. Definition of gases, explanation of perfect gas laws – Boyle's law, Charles's law, Avagadro's law, Regnault's law, Universal gas constant, Characteristic gas constants, derivation. Specific heat at constant pressure and constant volume of gas, derivation of an expression for specific heats with characteristics, simple problems on gas equation. Types of thermodynamic processes – isochoric, isobaric, isothermal, hyperbolic, isentropic, polytropic and throttling processes, equations representing the processes. Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above processes

UNIT II

Laws of conservation of energy, first law of thermodynamics (Joule's experiment), Application of first law of thermodynamics to non-flow systems – Constant volume, constant pressure, Adiabatic and polytropic processes, steady flow energy equation, Application of steady flow energy to equation, turbines, pump, boilers, compressors, nozzles, evaporators, limitations. Heat source and heat sinks, statement of second laws of thermodynamics: Kelvin Planck's statement, Clausius statement, equivalence of statements, Perpetual motion Machine of first kind, second kind, Carnot engine, Introduction of third law of thermodynamics, concept of irreversibility, entropy. Concept of ideal gas, enthalpy and specific heat capacities of an ideal gas, $P - V - T$ surface of an ideal gas, triple point, real gases, Vander-Wall's equation.

UNIT III

Formation of steam and related terms, thermodynamics properties of steam, steam tables, internal latent heat, internal energy of steam, entropy of water, entropy of steam, T- S diagrams, Mollier diagram (H – S Chart), Expansion of steam, Hyperbolic, reversible adiabatic and throttling processes. Quality of steam (dryness fraction), finding dryness fraction using separating and throttling calorimeter, Rankine cycle. Uses of steam, classification of boilers, comparison of fire tube and water tube boilers. Construction features of Lancashire boiler, nestler boiler, Babcock & Wilcox Boiler. Introduction to modern boilers.

UNIT IV

Meaning of air standard cycle – its use, condition of reversibility of a cycle. Description of Carnot cycle, Otto cycle, Diesel cycle, simple problems on efficiency, calculation for different cycles Comparison of Otto, Diesel cycles for same compression ratio or same peak pressure developed. Reasons for highest efficiency of Carnot cycle and all other cycles working between same temperature limits

UNIT V

Functions of air compressor – uses of compressed air, type of air compressors. Single stage reciprocating air compressor, its construction and working, representation of processes involved on P – V diagram, calculation of work done. Multistage compressors – advantages over single stage compressors, use of air cooler – condition of minimum work in two stage compressor (without proof), simple problems. Rotary compressors – types, descriptive treatment of centrifugal compressor, axial flow compressor, vane type compressor.

Instructional Strategy

1. Expose the students to real life problems.
2. Plan assignment so as to promote problem solving abilities.

Recommended Books:

1. Engineering Thermodynamics by PK Nag; Tata McGraw Hill, Delhi.
2. Basic Engineering Thermodynamics by Roy Chaudhary; Tata McGraw Hill, Delhi.
3. Engineering Thermodynamics by CP Arora; Tata McGraw Hill, Delhi.

Rationale

For a diploma holder in electrical engineering, it becomes imperative to know the fundamentals of the subject in order to grasp the knowledge of the field. This subject will provide acquaintance with various terms knowledge of fundamental concepts of electricity, magnetism and various principles related to it.

Detailed Contents**UNIT I**

Application and Advantages of Electrical Energy & DC circuits: Different forms of energy, Advantages of electrical energy, Use of electrical energy, Basic Electrical Quantities; Basic concept of charge, current, voltage, resistance, power, energy and their units. Conversion of units of work, power and energy from one form to another. DC Circuits: Ohm's law, resistances in series and parallel, Kirchhoff's laws and their applications in solving electrical network problems, Network theorems such as Thevenin's theorem, superposition theorem, Maximum power transfer theorem and Norton's theorem.

UNIT II

Batteries: Basic idea about primary and secondary cells, Working principle, construction and applications of Lead acid, Nickel Cadmium and Silver Oxide Cells. Charging methods used for lead acid accumulator, Care and maintenance of a lead acid battery, grouping of cells in series and parallel (simple numerical problems). Testing of lead Acid battery for fully charged conditions and their specifications.

UNIT III

Magnetism and Electromagnetism, Electromagnetic Induction: Introduction to electromagnetism, Magnetic field due to a straight current carrying conductor and a solenoid and rules for finding its direction, force between two parallel current carrying conductors. Force on a conductor placed in the magnetic field, Series magnetic circuits, simple problems, Concept of hysteresis loop and hysteresis loss. Electromagnetic Induction; Faraday's Laws of electromagnetic induction, Lenz's law, Fleming's Right and Left Hand Rule, Principle of self and mutually induced e.m.f. and simple problems, Inductances in series and parallel, Energy stored in a magnetic field, Concept of eddy currents and eddy current loss

UNIT IV

AC fundamentals & AC circuits: Concept of a.c generation(single phase and three phase),Difference between a.c and d.c, Concept of alternating current and voltage, equations for instantaneous values, average values, r.m.s value, form factor, power factor etc. Concept of phasor and phase difference, Representation of alternating sinusoidal quantities by vectors,Phasor algebra (addition, subtraction, multiplication and division of complex quantities),AC through pure resistance, inductance and capacitance, Alternating voltage applied to RL,RC and RLC series and parallel circuits (impedance triangle, phasor diagram and their solutions),Concept of susceptance, conductance and admittance, J-notation and its application in solving problems in ac circuits, Power in pure resistance, inductance, capacitance and series RL, RC, RLC circuits, Active and reactive components of current and their significance, Power factor and its practical significance

UNIT V

Poly-phase Systems : Advantages of 3 phase over single phase system, Star and delta connections (Derive relationship between phase and line voltages, phase and line currents in star delta connections, Power in 3 phase circuits and measurement by two wattmeter method, Measurement of power and power factor of a 3-phase load by two wattmeter method using balanced/unbalanced load.

Instructional Strategy

Basic electrical engineering being a fundamental subject need to be handled very carefully and in a manner such that students develop clear understanding of principles and concepts and develop skill in their application in solving related problems. Teacher may lay emphasis on laboratory experiments and give lot of tutorial work to students in order to give them an opportunity in mastering the basics in solving related problems

Recommended Books

1. Fundamentals of Electrical Engineering by Sahdev, Uneek Publication, Jalandhar
2. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill Education Pvt. Ltd., New Delhi
3. Electrical Science by VK Mehta, S Chand and Co., New Delhi
4. Electrical Engineering by DR Akrota, Ishan Publications, Ambala

5. Electrical Technology by JB Gupta, SK Kataria and Sons, New Delhi
6. Electrical Technology by BL Theraja, S Chand & Co., New Delhi
7. Electrical Science by S. Chandhni, R Chakrabarti and PK Chattopadhyay. Narosa Publishing House Pvt. Ltd., New Delhi
8. Basic Electrical Engineering by Mool Singh, Galgotia Publication Pvt. Ltd. New Delhi
9. Principles of Electrical Engineering by BR Gupta, S Chand & Co., New Delhi

Rationale

At present, electronics gadgets are being extensively used in various manufacturing processes in industries, power system operations, communication systems, computers etc. Even for an electrical diploma holder, it is absolutely necessary to have a basic understanding of electronic components, their function and applications. This understanding should facilitate in operation and maintenance equipment, which are electronically controlled. In this course, topics like semi-conductor theory, semi-conductor Diodes, Bipolar transistors, rectifiers, single stage and multistage amplifiers and field effect transistors have been included.

Detailed Contents**Unit-1**

Introduction of Electronics & Semiconductor Theory: Brief history of development of electronics, Active and passive components, Concept of current and voltage sources, constant voltage and current sources, their graphical representation. Conversion of voltage source into current source and vice-versa, Difference between actual voltage source and constant voltage source, Atomic structure, crystalline structure, Energy band theory of crystals, energy band structure of insulator, semiconductor and conductor, generation and recombination of electron hole pairs. Energy band structure of Silicon and Germanium, Silicon versus Germanium for mobility and conductivity, Concept of Doping, intrinsic and extrinsic semiconductors, Effect of temperature on intrinsic and extrinsic semiconductors

UNIT II

Semiconductor Diodes: PN Junction, mechanism of current flow in PN junction, drift and diffusion currents, depletion layer, potential barrier, effect of forward and reverse biasing in a PN junction. Concept of junction capacitance in forward and reverse biased conditions. Breakdown mechanism, Ideal diode, Semiconductor diode, characteristics, static and dynamic resistance, Use of diode as half wave and full wave rectifiers (centre tapped and bridge type), relation between DC output and AC input voltage, rectifier efficiency, Concept of ripples, filter circuits – shunt capacitor, series inductor, and pie (π) filters and their applications, Diode ratings/specifications. Various types of diodes such as zener diode, varactor diode, schottky diode, light emitting diode, tunnel diode, photo diode; their working characteristics and applications, Zener diode and its characteristics, Use of zener diode for voltage stabilization.

UNIT III

Bipolar Transistors, Transistor Biasing & Stabilization: Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current flow, Transistor configurations: common base (CB), common emitter (CE) and common collector (CC), current relation and their input/output characteristics; comparison of the three configurations.

Transistor biasing, its need, operating point, effect of temperature on the operating point of a transistor and need of stabilization of operating point. Different biasing circuits, limitations, simple problems to calculate operating point in different biasing circuits. Use of Thevenin's theorem to determine operating point, Concept of h-parameters of a transistor, Use of data book to know the parameters of a given transistor.

UNIT IV

Single-stage Transistor Amplifiers & Multistage Transistor Amplifiers: Single stage transistor amplifier circuit in CE configuration, function of each component, working of single stage transistor amplifier, physical and graphical explanation, phase reversal, Concept of DC and AC load line, Voltage gain of single stage transistor amplifier using characteristics of the device, Concept of input and output impedance. AC equivalent circuit of single stage transistor amplifiers, Calculation of voltage gain using AC equivalent circuit, Frequency response of a single stage transistor amplifier. Need of multi-stage transistor amplifiers – different types of couplings, their purpose and applications, Knowledge of various terms such as voltage gain, current gain, power gain, frequency response, decibel gain and band width, RC coupled two-stage amplifiers, circuit details, working, frequency response, applications, loading effect in multistage amplifier

UNIT V

Field Effect Transistor (FET): Construction, operation, characteristics and applications of a N channel JFET and P channel JFET, JFET as an amplifier. Types, construction, operation, characteristics and applications of a MOSFET. Comparison between BJT, JFET and MOSFET Elementary idea about direct coupled amplifier, its limitations and applications, Transformer coupled amplifiers, its frequency response. Effect of co-efficient of coupling on frequency response. Applications of transformer coupled amplifiers.

