3.1 ENGINEERING FUNDAMENTALS

L	T	P
4	-	2

RATIONALE

A diploma holder has to assist in activities of installation, operation and maintenance etc of different machines and equipments. These activities are not branch specific and instead require him to know basics of civil, electrical and mechanical engineering. The subject of Engineering Fundamentals has been included to impart basic knowledge of electrical, electronics and civil engineering to the students.

DETAILED CONTENTS

PART-A

1. ELECTRICAL ENGINEERING (25 Hrs)

Theory

(i) Application and Advantages of Electricity (4 Hrs)

- Difference between AC and DC
- Various applications of electricity
- Advantages of electrical energy over other types of energy

(ii) Basic Quantities of Electricity (4Hrs)

- Definition of voltage, current, power and energy with their units
- Name of the instruments used: voltmeter, ammeter, energy meter

(iii) Distribution System (4 Hrs)

(iv) Supply from Poles to Distribution Board (4 Hrs)

(v) Electric Motors: (4 Hrs)

- Definition, types and various applications of single phase and three phase motors
- Connection and starting of three phase motors by star delta starter

(vi) Measuring Instruments (5 Hrs)

Basics of measurement, principles of measurement of DC voltage and DC current, AC voltage and AC current and resistance using a multimeter block diagram of a CRO and use for the measurement of voltage (DC and AC), frequency and to study waves shape.

LIST OF PRACTICALS

1. Use of Megger:

   Objective: To make the students familiar with different uses of megger.

2. Connection of a three phase motor and starter including fuses and reversing of direction of rotation.

   Objective: Students may be made familiar with the equipment needed to control a three-phase motor.

   The students must experience that by changing any two phases, the direction of rotation is reversed.

3. Trouble shooting in a three-phase motor

   Note: The teacher may create anyone of the following faults

   (a) Loose connections
   (b) Blown fuse
   (c) Tripped overload protection
   (d) Incorrect direction of rotation
   (e) Single phasing
   (f) Burnt winding to be simulated by a loose connection behind a terminal box.

   Objective: The students must be able to detect the most common faults, which may occur in a three-phase motor, using meggar wherever necessary.

4. Treatment of electric shock

   Note: The teacher may give a demonstration how an electric shock must be treated.

   Objective: Students must be trained to treat the persons suffering from an electric shock.

5 Measurement of resistors by an ordinary multimeter and their verification on the basis of colour code.

PART B

2. ELECTRONICS ENGINEERING (21 Hrs)

Theory

(i) Introduction (9 Hrs)

Introduction to active and passive components, introduction to intrinsic and extrinsic semiconductor, PN junction diode, mechanism of current flow in PN junction, Diode (PN junction) as rectifier; half wave rectifier, full wave rectifier and filter circuits, brief idea and typical application of power diode, zener diode, photo diode. Concept of bipolar transistor - PNP ad NPN, their characteristics and uses. Field effect transistor and single stage CE amplifier circuit

(ii) Digital Electronics (8 Hrs)

Basic difference between analog and digital signal, binary and hexadecimal number system, binary addition, substraction, multiplication and division. Definition, symbols and truth table of NOT, AND, OR, NAND, NOR, EX-OR Gates, Boolean algebra, Demorgan's theorem

General principle of A/D and D/A conversion techniques and brief idea of their applications

(iii) Programmable Logic Controller (4 Hrs)

Basic concept of PLC, its block diagram and applications

LIST OF PRACTICALS

1. Plotting of formal V-1 characteristics of PN junction diode
2. Rectifier circuits using semiconductor diode, measurement of input and output voltage and plotting of input and output wave shape for (i) half wave rectifier (ii) full wave rectifier
3. Verification and interpretation of truth tables for AND, OR, NOT, NAND, NOR and EX-OR gates
4. Working of a PLC on PLC Trainer

PART C

3. CIVIL ENGINEERING (18 hrs)

Theory

(i) Construction Materials (8Hrs)

Basics of various construction materials such as stones, bricks, lime, cement and timber along with their properties, physical/ field testing and uses, elements of brick masonry.

(ii) Foundations (6Hrs)

Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines.

(iii) Factors to be considered for installation/erection and commissioning of plastic processing machinery. Vibrations- their effects, methods to control vibrations. General method of alignment/leveling. (4Hrs)

LIST OF PRACTICALS

a) The students should be taken to different construction sites to show them various construction materials, concreting process and construction of RCC structural elements, foundations and other civil works

Note: While imparting instructions, teachers are expected to lay more emphasis on concepts and principles. It will be better if the classes for general engineering are conducted in the laboratories and organized demonstrations for explaining various concepts and principles

INSTRUCTIONAL STRATEGY

Teachers should give emphasis on understanding of concept and explanation of various terms used in the subject. Industrial/field visits must be arranged for the students.

RECOMMENDED BOOKS

Electrical Engineering

1. Electrical Technology Part 1: Basic Electrical Engineering by Theraja, BL; S Chand and Company, New Delhi
2. Principles of Electrical Engineering by Gupta BR, S Chand and Company, New Delhi
3. Basic Electricity and Measurements by Suryanarayan NV and N Delhi; Tata McGraw Hill, 1987, New Delhi
4. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and sons, New Delhi

Electronics Engineering

1. Electronics Devices and Circuits by NN Bhargava; Tata McGraw Hill Publishing, New Delhi
2. Basic Electronics by VK Mehta; S Chand and Co., New Delhi

Civil Engineering

1. Materials of Construction by Ghosh; Tata McGraw Hill Publishing Co., Ltd., New Delhi
2. Civil Engineering Materials by TTTI, Chandigarh; Tata McGraw Hill Publishing Co. Ltd., New Delhi
3. Concrete Technology by Gambhir; Tata McGraw Hill Publishing Co., Ltd., New Delhi
4. Building Construction by J Jha and Sinha; Khanna Publishers, Delhi
5. Soil Mechanics and Foundation Engineering by SK Garg; Khanna Publishers, Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	25	39
2	21	33
3	18	28
Total	**64**	**100**

3.2 STRENGTH OF MATERIALS

L	T	P
4	-	2

RATIONALE

Diploma holders in this course are required to analyze reasons for failure of different components and select the required material for different applications. For this purpose, it is essential to teach them concepts, principles, applications and practices covering stress, strain, bending moment, shearing force, shafts, columns and springs. It is expected that efforts will be made to provide appropriate learning experiences in the use of basic principles in the solution of applied problems to develop the required competencies.

DETAILED CONTENTS

1. Stresses and Strains (08 hrs)

   1.1. Concept of load, stresses and strain

   1.2. Tensile compressive and shear stresses and strains

   1.3. Concept of Elasticity, Elastic limit and limit of proportionality.

      1.3.1. Hook's Law
      1.3.2. Young Modulus of elasticity
      1.3.3. Nominal stress
      1.3.4. Stress strain diagram
      1.3.5. Yield point, plastic stage
      1.3.6. Ultimate strength and breaking stress
      1.3.7. Percentage elongation
      1.3.8. Proof stress and working stress
      1.3.9. Factor of safety
      1.3.10. Poisson's ratio
      1.3.11. Shear modulus

   1.4. Longitudinal and circumferential stresses in seamless thin walled cylindrical shells (derivation of these formulae not required)

2. Resilience (06 hrs)

   2.1 Resilience, proof resilience and modulus of resilience
   2.2 Strain energy due to direct stresses
   2.3 Stresses due to gradual, sudden and falling load.
   2.4 Numerical problems

3 Moment of Inertia (06 hrs)

3.1. Concept of moment of Inertia and second moment of area
3.2. Radius of gyration , section modulus
3.3. Theorem of perpendicular axis and parallel axis (without derivation)
3.4. Second moment of area of common geometrical sections: Rectangle, Triangle, Circle (without derivation) Second moment of area for I,T, L, Z section
3.5 Simple numerical problems.

4. Bending Moment and Shearing Force (10 hrs)

4.1 Concept of beam and type of loading
4.2 Concept of end supports-Roller, hinged and fixed
4.3 Concept of bending moment and shearing force
4.4 B.M. and S.F. Diagram for cantilever and simply supported beams with and without overhang subjected to concentrated and U.D.L.
4.5 Simple numerical problems

5. Bending stresses (08 hrs)

5.1 Concept of Bending stresses
5.2. Theory of simple bending
5.3. Use of the equation $f/y = M/I = E/R$
5.4. Concept of moment of resistance
5.5. Bending stress diagram
5.6. Calculation of maximum bending stress in beams of rectangular, circular, and T section.
5.7 Permissible bending stress Section modulus for rectangular, circular and symmetrical I section.
5.8 Simple numerical problems

6 Columns (08 hrs)

6.1. Concept of column, modes of failure
6.2. Types of columns
6.3. Buckling load, crushing load
6.4. Slenderness ratio
6.5. Factors effecting strength of a column
6.6 End restraints
6.7 Effective length
6.8 Strength of column by Euler Formula without derivation
6.9. Rankine Gourdan formula (without derivation)
6.10 Simple numerical problems

7 Torsion (08hrs)

7.1 Concept of torsion- difference between torque and torsion.
7.2 Use of torque equation for circular shaft
7.3 Comparison between solid and hollow shaft with regard to their strength and weight.
7.4 Power transmitted by shaft
7.5 Concept of mean and maximum torque
7.6 Simple numerical problems

8. Springs (10 hrs)

8.1. Closed coil helical springs subjected to axial load and impact load
8.2 Stress deformation
8.3 Stiffness and angle of twist and strain energy
8.4 Proof resilience
8.5 Laminated spring (semi elliptical type only)
8.6 Determination of number of plates
8.7 Simple numerical problems

LIST OF PRACTICALS

1. Tensile test on bars of Mild steel and Aluminium.
2. Bending tests on a steel bar or a wooden beam.
3. Impact test on metals
   a) Izod test
   b) Charpy test
4. Torsion test on specimens of different metals for determining modulus of rigidity.
5. To determine the stiffness of a helical spring and to plot a graph between load and extension.
6. Hardness test on different metals.

INSTRUCTIONAL STRATEGY

1. Expose the students to real life problems.
2. Plan assignments so as to promote problem solving abilities and develop continued learning skills.

RECOMMENDED BOOKS

1. SOM by Birinder Singh,; Katson Publishing House, New Delhi.
2. SOM by RS Khurmi; S.Chand & Co; New Delhi
3. Elements of SOM by D.R. Malhotra & H.C.Gupta; Satya Prakashan, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	12
2	06	10
3	06	10
3	10	16
4	08	12
5	08	12
6	08	12
7	10	16
Total	**64**	**100**

3.3 FLUID FLOW

L	T	P
4	-	3

RATIONALE

This subject aims at the basic concepts of fluid flow, measurement techniques involved for the same and equipments used for the transportation of fluids. With this background, students will be able to quantitatively find out material and power requirement for a process.

DETAILED CONTENTS

1. Various types of flow – steady and unsteady, uniform and non-uniform flow, streamline flow, laminar and turbulent flow, rotational and irrotational flow. (7 hrs)

   - Types of fluid: compressible and incompressible fluid, Newtonian and non-Newtonian fluid, properties of fluids.

2. Fluid statics and dynamics, Pascal's law, hydrostatic law, various types of manometers : U tube manometer and differential manometer. (17 hrs)

   - Continuity equation, Bernoullis theorem, flow through pipes and open channels: Hagen poiseulli's equation, friction factor charts, friction losses in pipes, friction loss from sudden enlargement and contraction, effect of roughness in pipes.

   - Simple numerical problems related to the above topics.

3. Flow measurement: flow through venturimeter, orifice meter, flow nozzle, pitot tube, rotameter. (10 hrs)

4. Flow through Fluid Machinery. (30 hrs)

   - Classification of pumps, construction and working of reciprocating pump, centrifugal pump and rotary pump, priming and NPSH, cavitation, power requirement, efficiency of centrifugal pump, specific speed. Blowers and compressors.

   - Pipe and Fittings: Different types of pipes, schedule Number, ID and OD of pipe, colour coding of industrial piping used for transportation of various fluids, different types of valves and fittings: Globe valve, Butterfly valve, Gate valve, Ball valve and Needle valve.

   - Dimensional analysis: Rayleigh's method, Buckingham Pi method, dimensionless numbers and their significance.

LIST OF PRACTICALS

1. Verification of Bernoullis equation
2. Determination of friction loss in flow through pipe
3. Calibration of orifice meter and calculation of Cd, Cv, Cc
4. Calibration of Venturi meter
5. Calibration of Rotameter
6. Determination of discharge coefficient of V-notch
7. Study of constructional feature of centrifugal, gear, reciprocator diaphragm pump, blower and compressors and assembling and disassembling
8. Study of characteristics, curves of centrifugal, reciprocating pump
9. Study of fluidized bed characteristics
10. Calculation of Reynolds number

INSTRUCTIONAL STRATEGY

The students should be imparted theoretical as well as practical knowledge about all the topics supplementing with electronic media.

RECOMMENDED BOOKS

1. Unit Operations of Chemical Engineering by McCabe W.L. & Smith J.C. McGraw Hill.

2. Chemical Engineering Hand Book by Perry K. Chilton.

3. Chemical Engineering Vol.I and II by Coulson and Richardson. Pergamota Press Publications.

4. Introduction to Chemical Engineering by Bedger and Banchero, McGraw Hill Publication.

5. Principles of Unit Operations by Alen Foust, John Willey Publicaiton.

6. Chemical Engineering Fluid Mechanics by K.A. Gavahane, Nirali Publications.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	7	10
2.	17	30
3.	10	15
4.	30	45
Total	**64**	**100**

3.4 POLYMER SCIENCE

L	T	P
3	-	-

RATIONALE

The subject is designed to enable the students to acquire basic knowledge of polymers, their advantages, application, classification and conversion. This will help the students in identifying different polymeric materials to be processed in the industry and determine their quality based on physical and chemical properties.

DETAILED CONTENTS

1. Introduction to Polymers (6 hrs)

   Classification of polymers: Natural, Semisynthetic, Synthetic, Linear, Branched, Cross linked polymers, Thermoplastic, Thermoset, Commodity, Engineering, Speciality, Condensation, Addition, Polymer blends and alloys, Plastics, Elastomers, Fibers.

2. Brief history of Polymer Engineering. Scope of Polymer Engineering and Comparison with Conventional Materials (Metal, Wood etc.).Study of Polymers in new emerging areas like membrane separations, conducting polymers and biomedical applications. (4 hrs)

3. Degree of polymerization, molecular weight and molecular weight distribution, polydispersity, measurement of molecular weight by dilute solution, viscometry, membrane osmometry, vapourphase osmometry, cryoscopy, ebulliometry, light scattering, centrifugation, Gel. permeation chromatography. (4 hrs)

4. Physical states of polymers - amorphous and crystalline behaviour. Polymer dissolution - dissolution and solvent selection for polymers, thermodynamics of polymer solutions, solubility parameter (4 hrs)

5. Thermal transmissions in polymer - Glass transition temperature, its importance and the factors which influence it, techniques for its determination, melting temperature, relationship of polymer properties with structure (4 hrs)

6. Concept of functionality and Carother's equation for condensation, polymerization, relation between conversion and degree of polymerization, gel phenomenon. Macromolecular concept, secondary bonding in polymers, stereo isomerism in polymers. (6 hrs)

7. Free radical polymerization, different types of initiators, inhibition, retardation, chain transfer agents etc. Auto-acceleration, ceiling temperature, ionic polymerization. Ziegler-Natta polymerization (10 hrs)

8. Techniques of polymerization: bulk, solution, emulsion and suspension, their relative advantages and disadvantages, introduction to Rheology and Visco-elasticity, time dependent and time independent viscosity behaviour; power law fluids; Zero sheer viscosity, Maxwelll and Voigt models of visco-elastic materials (10 hrs)

INSTRUCTIONAL STRATEGY

Industrial visit or a laboratory scale polymerization should be shown to the students.

RECOMMENDED BOOKS

1. Polymer Science and Technology by Joel R., published by CRC Press, London
2. Polymer Science by Gowariker Fried, Prentice Hall of India publication, New Delhi, 2000
3. Polymer Material by J.A. Brydson, Published by M/S Butterworth Heinemann, Linacre House, Jordan Hill, UK

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	6	10
2	4	10
3	4	10
4	4	10
5	4	10
6	6	10
7	10	20
8	10	20
Total	**48**	**100**

3.5 CHEMICAL PROCESS CALCULATIONS

L	T	P
4	-	-

RATIONALE

The subject provides the knowledge of materials and energy requirements for a process and with this knowledge raw material requirements for a given process can be calculated.

DETAILED OF CONTENTS

1. Introduction (10 hrs)

   Dimensions, Units, Physical Quantities like density, pressure, volume, force, power, energy, temperature, heat in SI, CGS, FPS and MKS. Numerical problems related to interconversion in different system of units. Definition of mole, mole fraction, mass, mass fraction, molality, normality, molarity and simple numerical problems.

2. Behaviour of Ideal Gases (14 hrs)

   PVT relationships, standard conditions, partial pressure and pure component volume. Gas laws: Boyle's law, Charles law, Dalton's and Amagat's law, Ideal Gas equation, Equation for real gases i.e. Vanderwall's equation, simple numerical problems, relation calculation of composition, average molecular weight and density.

3. Material Balance (12 hrs)

   Concept of material balance, types of material balance, material balance for unit operation with bypass, recycle and purge, simple numericals based on material balance without chemical reactions and with chemical reactions.

4. Energy Balance (20 hrs)

   Concept of energy balance, Forms of energy, Definition of:

   - Exothermic and Endothermic Reactions
   - Standard Heat of Reaction.
   - Heat of Combustion
   - Heat of Formation.
   - Heat Capacity
   - Cp and Cv

   Calculation of:

   - Standard heat of reaction from heat of formation and combustion data.
   - Heat of reaction at constant pressure or constant volume
   - Heat of reaction at a temperature from standard conditions i.e. 25°C

5. Combustion processes (08 hrs)

Simple definition of
- Excess Air
- % Excess Air
- Air fuel ratio
- Theoretical O_2 required
- Analysis of products of combustion

INSTRUCTIONAL STRATEGY

Emphasis should be laid on problem solving in all the area of material and energy balance. Simple practicals relating to wet bulb temp, dry bulb temp and humidification chart should be done. Students should be encouraged to make flow sheets for various processes. This well help the students to understand the subject better and solve intricate problems in various areas.

RECOMMENDED BOOKS

1. Solved Example in Chemical Engineering by G.K. Roy, Khanna publication.
2. Chemical Process Principles by Hougen and Watson, Wiley International Edition.
3. Stoichiometry by Bhatt and Vohra, Tata MC Gran Hill publication
4. Basic Principles and Calculations in Chemical Engineering y Himmelblaw, prentice Hall publication.
5. Stoichiometry by K.A. Gavhane, Nirali Publishers

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1	10	14
2	14	22
3	12	20
4	20	32
5	08	12
Total	**64**	**100**

3.6 MECHANICAL OPERATIONS

L	T	P
3	-	3

RATIONALE

The subject gives the students the knowledge of working of individual mechanical operations and their significance in chemical industries. With this information, students will be able to control the operation of equipment and regulate production.

DETAILED CONTENTS

1. Characterization of Solid Particles (08 hrs)

   Particle shape, particle size, mixed particle sizes and size analysis, expressions for specific surface of mixture, average particle size, number of particles in mixture (expression and meaning of terms only, no derivation)

2. Size Reduction (14 hrs)

   i) Energy and power requirements in crushing, mechanical efficiency, expression for power required by machine

   ii) Crushing laws: Rittinger's law, Bond's law and Kick's law

   iii) Size reduction equipment: classification and names; study of machines: Blake crusher, Jaw crusher, Dodge crusher, Grinding rolls, Single roll toothed crusher, Impact or Attrition mill, Ball mill, Fluid energy mill, Colloid mill, Rotary knife cutter, Flow sheet for closed circuit grinding

3. Mechanical Separation (18 hrs)

   i) Screen analysis, Tyler standard screen series, screen effectiveness, Types of screening equipment i.e. gyrating screens, stationary screens and vibrating screens

   ii) Filtrations: Classification of filtrations, filter media, filter aids, mechanisms of filtrations, discontinuous Pressure filters, Filter press, Continuous: Vacuum filters, Rotary drum filters, Centrifugal filters; Suspended batch centrifuges.

   iii) Separation based on the motion of particles through fluids, Gravity classifiers, Sorting classifiers, Thickeners, Batch sedimentation, rate of sedimentation, centrifugal settling process, Tubular centrifuge, Disk centrifuge.

4. Mixing of Solids: Types of mixers, Ribbon blenders, Double Conemixer, Twin- shell blender. (8 hrs)

LIST OF PRACTICALS

1. To find the sieve analysis of a given sample of solid particles by sieve shaker
2. To determine the grind ability of solids by ball-mill
3. To determine the crushing efficiency by a roll crusher using a sample of solid particles
4. To find the rate of filtration with the help of filter press
5. To perform an experiment on rotary vacuum filter and find rate of filtration
6. To perform an experiment on a cyclone separator and find collection efficiency
7. To perform an experiment on mixer for solid-liquid mixing and find rate of mixing

INSTRUCTIONAL STRATEGY

Mechanical operations has significant importance in the area of chemical engineering. Adequate competency needs to be developed by giving sufficient practical knowledge to mechanical operation (characterization of solid particles, size reduction, energy requirement and mechanical separation). A field visit may be conducted to expose the working of various conveyers and filtration equipment in industries.

RECOMMENDED BOOKS

1. Mechanical Operations by Swain, Tata McGraw Hill Publication
11. Mechanical Operations by Kiran D. Patil, Nirali Publication
12. Chemical Engineering, Vol. I and II by Coulson and Richardson, Pergamon Press Publication
13. Unit Operation of Chemical Engineering by McCabe and Smith; McGraw Hill Publication
14. Introduction to Chemical Technology by Badger and Banchero, McGraw Hill Publication
15. Fluid Mechanics and Its Applications by Gupta and Gupta, Wiley Eastern Publication
16. Principles of Unit Operations by Alen Foust, John Wiley Publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	15
2	14	30
3	18	40
4	08	15
Total	**48**	**100**

3.7 COMPUTER AIDED DRAFTING

L	T	P
-	-	3

RATIONALE

Computer aided drafting these days is extensively being used in the industry. This subject has been added to enable a diploma holder to make drawings using computer software and take prints/plots.

PRACTICE WORK

1. Introduction to AutoCAD : Starting up, practice on – how to create a new drawing file, setting drawing limits & saving a file, drawing lines in different ways using absolute co-ordinates, user co-ordinates, WCS, UCS, drawing circles, drawing arcs, drawing ellipses. Drawing polygons, drawings splines. Drawing polylines, using window, zoom commands.

2. Practice on Edit commands such as erase, copy, mirror, array, offset, rotate, oops, undo, redo, scale, stretch, trim, break, extend, chamfer, fillet, O snap command

3. Practice on Text commands: editing text, text size, text styles, change properties commands.

4. Practice on Layer Commands: creating layer, freeze, layer on/off colour assigning, current layer, load line type, lock & unlock layer, move from one layer to other.

5. Practice on Hatching, Hatch pattern selection.

6. Practice on Dimensioning, linear dimensioning, angular dimensioning radius/.diameter dimensioning O-snap command, aligned dimensioning, editing of dimensioning, tolerances in dimensioning.

7. Practice on print/plot commands. Export/import commands.

8. Practice on making complete drawings of components by doing following exercises:

   a) Detail and assembly drawing of the following using AUTOCAD (2D) (4 sheets)

      - Plummer Block
      - Wall Bracket
      - Stepped pulley, V-belt pulley
      - Flanged coupling
      - Machine tool Holder (Three views)
      - Screw jack or knuckle joint

b) Isometric Drawing by CAD using Auto CAD (one sheet)

Drawings of following on computer:
- Cone
- Cylinder
- Isometric view of objects

9. Modelling (02 sheets)

3D modelling, Transformations, scaling, rotation, translation

10. Creating Chamfer and Fillet

Practice on surface modeling, create part file, practice on assembly of parts, creating assembly view, orthographic views, section view (Practice on different views, practice on data transfer)

11. Introduction to Other Softwares;

(Pro Engineer/CATIA / Inventor/Unigraphics/Solid Work: Salient features.

INSTRUCTIONAL STRATEGY

1. Teachers should show model or realia of the component/part whose drawing is to be made.
2. Emphasis should be given on cleanliness, dimensioning, & layout of sheet.
3. Teachers should ensure use of IS codes related to drawing.

RECOMMENDED BOOKS

1. Engineering Drawing with AutoCAD 2000 by T. Jeyapooran; Vikas Publishing House, Delhi.
2. AutoCAD for Engineering Drawing Made Easy by P. Nageswara Rao; Tata McGraw Hill, New Delhi.
3. AutoCAD 2000 for you by Umesh Shettigar and Abdul Khader; Janatha Publishers, Udupi.
4. Auto CAD 2000 by Ajit Singh, TMH, New Delhi.