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 UNIT OPERATIONS – I

L T P

RATIONALE **3 - 3**

A thorough knowledge of Unit Operations is essential for the study of polymer science and rubber processing. This course acquaints the students with the basic principles of stoichiometry, fluid and particle mechanics and mechanical operations.

DETAILED CONTENTS

1. Introduction to unit operation, unit processes and significance in rubber processing. Fundamentals of material and energy balance in the various processes relevant to rubber technology. (8 hrs)

2. Fluid Mechanics (16 hrs)
   - Fundamental of fluid flow
   - Newtons law of viscosity, effect of viscosity on temperature.
   - Different types of fluids (Newtonian and non-Newtonian) & their properties.
   - Laminar and turbulent flow, Reynolds numbers, friction factor, calculation of friction losses
   - Flow of fluids in pipes
   - Various types of pumps, compressors, blowers and their applications
   - Flow measurement devices (venturimeter, rotameter, orificemeter, pitot tube, weirs and notches)

3. Pressure Measurement (8 Hrs)

   Concept of Gauge Pressure, Absolute Pressure, Atmospheric Pressure, Measurement of Fluid Pressure, Piezometer Tube, Manometer, Simple Manometer, Micro manometer, Differential Manometer, Mechanical Gauge, Bourdon's Gauge, Diaphragm Pressure Gauge, Dead Weight Pressure Gauge.

4. Mechanical Operations (16 hrs)

- Characteristics of solid particles, properties of particulate masses, storage of solids
- Size reduction - energy and power requirement, Rittinger's Law, Bond's Law, Kick's Law, size reduction equipment, classification, construction and working of Blake, jaw and Dodge crusher, roll crusher, ball mill, grinders, ultra fine grinder
- Particle separation: solid-solid separation, screening and screening equipments and their effectiveness. Solid-liquid separation: filteration, continuous and batch filters. Pressure and vacuum filters, thickner etc. Solid-gas separation: cyclone separators.
- Mixing of solids and pastes, types of mixers, kneaders, dispersors, masticators, their construction and working.

LIST OF PRACTICALS

1. To verify Bernoulli's theorem and to determine the pressure drop due to friction in flow through pipe.
2. To determine the Reynolds number and observe the pattern of laminar and turbulent flow.
3. To observe the variation in discharge coefficient (C_d) with Reynolds number in orificemeter.
4. To observe the variation in discharge coefficient (C_d) with Reynolds number in venturimeter.
5. To study the constructional features of reciprocating and centrifugal pump.
6. To find the rate of Filtration using filter press.
7. To carry out the sieve analysis of a product obtained from size reduction equipment such as ball mill, grinder etc.
8. To perform an experiment on cyclone separator.
9. To perform an experiment on a mixer for liquid-liquid mixing.

INSTRUCTIONAL STRATEGY

Polymer based industrial problems (numericals) should be given as assignments to make students acquainted with basic principles of unit operations and unit processes..

RECOMMENDED BOOKS

1. Chemical Engineering I & II by Coulson & Richardson, Pergamon Press Publication.
2. Unit Operation of Chemical Engineering by Mcabe and Smith, McGraw Hill Publication.
3. Introduction to Chemical Engineering by Badger and Banchero, McGraw Hill Publication.
4. Unit operation by Brown, Published by M/S Wiley Eastern, London

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	8	15
2	16	35
3	8	15
4	16	35
Total	**48**	**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 RUBBER MATERIALS

L	T	P
3	-	-

RATIONALE

A diploma holder in Rubber Technology must have knowledge of different types of rubber materials, classification, properties and applications. This subject enables the students in acquiring the knowledge for selection for right type of materials for various applications.

DETAILED CONTENTS

1. Structure-Property Relationships in Rubbers (8 hrs)

   Rubber Elasticity - Requirements for rubber elasticity - Effect of chemical structure on the performance properties of rubbers, Effect of structure on processing properties of elastomers

2. Natural Rubber (8 hrs)

   Origin - Natural Rubber Latex, tapping, processing, properties and applications - Conversion of Latex into dry rubber - Properties of dry rubber - Classification based on technical specifications - Modifications of Natural Rubber- Applications - Synthetic polyisoprene.

3. Synthetic Elastomers (16 hrs)

   Polybutadiene and SBR, Nitrile Rubber, Butyl Rubber and Polychloprene Rubbers - Ethylene Propylene Rubber and Ethylene - Vinyl acetate copolymers - Elastomers based on modified polyethylene - Acrylate rubbers Polysulphide rubbers- polyether rubbers - polyalkenamers

4. High Performance Elastomers (8 hrs)

   Fluoroelastomers and silicone elastomers, Manufacturing, Structure, Properties and applications

5. Polyurethanes and Thermoplastics Elastomers (8 hrs)

   Reactions of di isocyanates - polyols- chain extenders-types of urethane elastomers - properties and uses - Requirements for thermoplastic elastomeric behaviour - SBS and SIS Block copolymers - Thermoplastic Polyurethane elastomers - Thermoplastic-co-polyesters - Thermoplastic elastomers based on Plastics - Rubber Blends - Dynamic Vulcanization.

INSTRUCTIONAL STRATEGY

This is the first basic course for rubber technology students. So basics should be clearly mentioned for better understanding of the subsequent subjects. Properties and types of rubber should be highlighted and sample of different types of rubbers should be shown for better understanding

RECOMMENDED BOOKS

1. Rubber Chemistry by Brydson, J.A.; Allied science Publishers, London.
2. Rubber Technology by Morton.M; Chapman Hall.
3. Elastomers and Rubber Compounding Materials by Franta Elsevier.
4. Synthetic Rubbers- their Chemistry and Technology by Blackely. D.C.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	8	15
2	8	15
3	16	35
4	8	15
5	8	20
Total	**48**	**100**

3.6 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.

3.7 GENERAL WORKSHOP PRACTICE- III

L	T	P
-	-	6

RATIONALE

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various machining processes, modern machining methods, CNC machining, tool is required to be imparted. Hence the subject of workshop technology.

NOTE :

1. Teaching of theory should be dovetailed with practical works.
2. The following topics may be taught in the laboratory along with the practical exercises.

DETAILED CONTENTS (Practicals)

1. Lathe Shop

- Description and function of various parts of a lathe
- Classification and specification of various types of lathe
- Work holding devices
- Lathe operations: - Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling
- Simple exercise on turning and step turning.
- A composite job involving turning, taper turning, thread cutting and knurling and Eccentric turning.
- Exercise on internal threading on lathe.

2. Machine Shop

2.1 Boring

- Principle of boring
- Classification of boring machines and their brief description.
- Specification of boring machines.
- Boring tools, boring bars and boring heads

2.2 Drilling

- Classification of drilling machines and their description.
- Various operations performed on drilling machine - drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping.
- Types of reamers.

2.3 Cutting Tools and Cutting Materials

- Various types of single point cutting tools and their uses.
- Single point cutting tool geometry, tool signature.
- Properties of cutting tool material.
- Study of various cutting tool materials viz. High speed steel, tungsten carbide, cobalt steel, cemented carbides, satellite, ceramics and diamond.
- Cutting fluid - their types, importance, properties & advantages and applications
- Marking and drilling practice using column and knee type drilling machine and radial drilling machine.
- A job on drilling, threading, reaming, counter boring and counter sinking.
- Exercise on boring with the help of boring bar.

3. Milling Shop

- Specification and working principle of milling machine
- Classification, brief description and applications of milling machines
- Milling machine accessories and attachment - Arbors, adaptors, collets, vices, circular table, indexing head and tail stock, vertical milling attachment, spiral milling attachment, slotting attachment and rack milling attachment.
- Milling methods - up milling and down milling
- Milling operations - face milling, angular milling, form milling, straddle milling and gang milling.
- Cutting speed and feed, depth of cut.
- Milling cutter grinding on tool and cutter grinder.

4. **Grinding**

- Purpose of grinding
- Specifications of grinding wheel - Abrasive, Grade, structure, Bond
- Common wheel shapes and types of wheel - built up wheels, mounted wheels and diamond wheels. Specification of grinding wheels as per BIS.
- Grinding methods - Surface grinding, cylindrical grinding and centreless grinding.
- Grinding machine - Cylindrical grinder, surface grinder, internal grinder, centreless grinder, tool and cutter grinder.

5. Shaping, Planing and Slotting

- Working principle of shaper, planer and slotter.
- Quick return mechanism applied to shaper, slotter and planer machine.
- Specification of shaper, planer and slotting machine.
- Speeds, feeds and depth of cut
- Prepare a V-block to ± 0.2 mm accuracy on shaper machine.
- Produce a rectangular block by face milling and prepare a slot on one face with a slotting cutter / side and face cutter.
- Milling cutter grinding on tool and cutter grinder.

6. Fabrication Shop

6.1 Electrical Discharge Machining (EDM)

Introduction, principle parts of EDM machine, EDM terminology. principal, metal removing rate, dielectric fluid and properties of electric fluid, applications. EDM.

6.2 Study of Coordinate Measuring Machine

6.3 CNC Wirecut

Introduction, principle parts of CNC Wirecut, terminology, principal, metal removing rate, dielectric fluid and properties of electric fluid, applications, Wire cut.

Exercise on EDM for preparation of electrodes (Core & Cavity).

RECOMMENDED BOOKS

1. Workshop Technology by Hazra, Choudary; published by Khanna Publishers, New Delhi
2. Workshop Technology by Manchanda, Khanna Publishers, New Delhi