SYLLABUS FOR INSTRUCTOR

(FITTER)

FITTER

1. Metrology and Measurements:

Linear measurements and angular measurements: Types, devices and its application; Micrometre, Micrometer depth gauge, Digital micrometer, Vernier micrometer, Screw thread micrometer, Vernier caliper, Vernier bevel protractor, dial Vernier Caliper, Digital Vernier caliper, Vernier height gauge, Dial test indicator, Digital dial indicator, Slip gauge – principle, constructional features, parts graduation, reading, use and care; **Marking off and layout tools-** description, classification, material, care & maintenance; cold chisels - materials, types, cutting angles; **Marking media** types, description and application; scribing block; Surface plate and auxiliary marking equipment, 'V' block, angle plates, parallel block, description, types, uses, accuracy, care and maintenance; **Marking and measuring tools-** types, specification; hammers and mallets type-sheet metal tools, types, specifications, uses. Trammel- description, parts, uses; Hand grooves-specifications and uses; **Gauges-** Introduction, necessity, types. Limit gauge: Ring gauge, snap gauge, plug gauge, description and uses. Description and uses of gauge types (feeler, screw, pitch, radius, wire gauge).
Interchange ability, types of limits, terminology of limits, fits and tolerance, standard systems of fits and limits. British standard system, BIS system. Go Gauge and Not-Go gauge; Simple scraper- types and their uses; Sine Bar-Principle, application & specification.

2. Workshops:

Bench vice- construction, types, uses, care & maintenance; vice clamps, hacksaw frames and blade-specification, description, types and their uses, method of using hacksaws. Files - specifications, description, materials, grades, cuts, file elements, uses. Types of files, care and maintenance of files; Stakes-bench types, parts, their uses. Various types of metal joints, their selection and application, tolerance for various joints, their selection& application; Wired edges.
Lathe: specifications, and constructional features, main parts descriptions, Operations performed on Lathe; Cutting tool geometry (Single and multiple point)- Nomenclature, description and specifications; Tool selection; Use of coolants and lubricants; independent four-jaw chuck, chuck-mounting and dismounting, chucks, chucking true, face plate; drilling - method of holding drills in the tail stock, Boring tools; Knurling; Taper – Standard tapers-taper, calculations Morse taper; Screw thread – types of thread, uses and application; Power tools: its constructional features, uses & maintenance.
Locking device: Nuts- types (lock nut castle nut, slotted nuts, swam nut, grooved nut), Description and use; Various types of keys, allowable clearances & tapers, types, uses of key pullers.

3. Engineering Materials:

Physical properties and Mechanical properties of engineering metal; Pig Iron, Cast Iron, wrought iron, Steel-types properties and uses; Non-ferrous metals (Aluminium, copper and its alloy, aluminium, tin, lead, zinc) properties and uses. Heat treatment process- normalizing, annealing, hardening and tempering, Case hardening and carburising.

4. Manufacturing Technology:

Drilling processes: common type (bench type, pillar type, radial type); gang and multiple drilling machine; drill size; Drill- material, types, (Taper shank, straight shank) parts and sizes; Drill angle-cutting angle for different materials, cutting speed feed. R.P.M. for different materials; Drill holding devices- material, construction and their uses; Counter sink, counter bore and spot facing-tools and nomenclature; **Reamer-** material, types (Hand and machine reamer), kinds, parts and their uses; Screw threads: terminology, parts, types and their uses. Screw pitch gauge: material parts and uses. Tap wrench: material, parts, types (solid &adjustable types) and their uses removal of broken tap, studs (tap stud extractor). Dies: British standard, metric and BIS standard, material, parts, types, Method of using dies; Die stock: material, parts and uses; Drill troubles: causes and remedy; Equality of lips, correct clearance, dead centre, length of lips; grinding of drill; Drilling jig-constructional features, types and uses. Fixtures-Constructional features, types and uses.

Solder and soldering: Introduction-types of solder and flux.

Welding hand tools; welding description (Gas and Arc welding)- types and uses, description, principle, method of operating; carbon dioxide welding; H.P. welding- equipment, description, principle, method of operating; L.P. welding- equipment's, description, principle, method of operating; selection of Welding electrodes; Oxygen acetylene cutting machine description, parts, uses, method of handling, cutting torch-description, parts, function and uses.

Grinding wheel: Abrasive, grade structures, bond, specification, use, mounting and dressing. Selection of grinding wheels. Bench grinder parts and use.

Lapping: Application, material; lapping abrasives; Surface finish-importance, equipment for testing-terms relation to surface finish. Equipment for tasting surfaces quality – dimensional tolerances of surface finish, **Honing**- Application, material, tools shapes, grades, honing abrasives; Frosting- its aim and the methods of performance.

Method of **lubrication**; Cutting lubricants and coolants- Properties and its types; selection of lubricants.

5. Machine Design:

Rivets and Riveting, Riveting tools; hot and cold riveting; Tapers on keys and cotters permissible by various standards

Bearing-Introduction, classification (Journal and Thrust), Description; ball bearing; Roller and needle bearings; Bearing metals; **Power transmission elements**: belts, Coupling, Pulleys-types, sizes and specifications, applications.

Power transmission by gears- Types, cause of the wear and tear, remedies, Care and maintenance of gears.

6. Fluid Mechanics:

Boyle's law; Pascal's Law; industrial hydraulic system, Applications;

Compressed air generation and conditioning, Air compressors, Pressure regulation, Dryers, Air receiver. Conductors and fittings, FRL unit; Pneumatic actuators:- Types. Basic operation, Force, Stroke length, Single-acting and double-acting cylinders.

Fluid power, Pneumatics and Hydraulics; Preventive maintenance; Pneumatic valves:- Classification, Symbols of pneumatic components and its types, Control components - Pushbuttons (NO & NC type) and Electromagnetic relay unit, Logic controls; Symbols of hydraulic components, Hydraulic oils –function, properties, and types, Hydraulic Filters – types, constructional features; Hydraulic reservoir & accessories, Pumps Classification – Gear/vane/ piston types; Pressure relief valves – Direct acting and pilot-operated types - Pipes, tubing, Hoses and fittings – Constructional details, Minimum bend radius, routing tips for hoses

Hydraulic cylinders –Types; Hydraulic motors –Types; Hydraulic valves and Pilot-operated check valves; Load holding function - Flow control valves: Types.

Engineering Drawing:

Introduction to Engineering Drawing and Drawing Instruments – Conventions, Sizes and layout of drawing sheets; Drawing Instrument Lines- Types and applications; Free hand drawing of – Geometrical figures and blocks with dimension, hand tools and measuring tools; Drawing of Geometrical figures-Angle, Triangle, Circle, Rectangle, Square, Parallelogram; Lettering & Numbering; Concept of axes plane and quadrant, Orthographic and Isometric projections ; angle and third angle projections; Reading of drawing of nuts, bolt, screw thread, locking devices e.g., Double nut, Castle nut, Pin, etc.; Reading of foundation drawing; Reading of Rivets and rivetted joints, welded joints, pipes and pipe joints Job Drawing; Sectional View & Assembly view.

7. Basic Mathematics & Basic Science:

Fractions; unit system; HCF, LCM and problems Fractions - Addition, subtraction, multiplication & division;

Decimal fractions - Addition, subtraction, multiplication; Ratio and Proportions, Percentage; Square and

square root; Applications of Pythagoras theorem; Mensuration Area and perimeter of common geometrical plane; volume of solids of common geometrical plane;; Trigonometry Measurement of angles; Trigonometrical ratios; Trigonometrical tables.

Levers and Simple machines - Effort and load, mechanical advantage, velocity ratio, efficiency of machine, relationship between efficiency, velocity ratio and mechanical advantage

Related problems for mass, volume, density, weight and specific gravity, Speed and Velocity, Work, Power and Energy Work, power, energy, HP, IHP, BHP and efficiency Heat & Temperature; boiling point & melting point of different metals and non-metals; Concept of pressure;

Basic Electricity Introduction and uses of electricity, molecule, atom; electric current AC,DC their comparison, voltage, resistance and their units;

Friction - Advantages and disadvantages, Laws of friction, coefficient of friction, angle of friction; Centre of Gravity- practical application Area of cut out regular surfaces and area of irregular surfaces; Area of cut out regular surfaces and application; Elasticity- Elastic, plastic materials, stress, strain and their units and young's modulus Elasticity - Ultimate stress and working stress.