

SYLLABUS FOR THE TRADE OF FITTER

First Semester

(Semester Code no. FTR - 01)

Duration : Six Month

| Week No. | Trade Practical | Trade Theory |
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| 1. | <p>Importance of trade training, List of tools & Machinery used in the trade. Health & Safety: Introduction to safety equipments and their uses. Introduction of first aid, operation of Electrical mains.</p> <p>Occupational Safety & Health Importance of housekeeping & good shop floor practices. Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipments(PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Use of Fire extinguishers.</p> | <p>Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. Soft Skills: its importance and Job area after completion of training. Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure.</p> |
| 2. | <p>Identification of tools & equipments as per desired specifications for marking & sawing. Selection of material as per application Visual inspection of raw material for rusting, scaling, corrosion etc., Marking out lines, gripping suitably in vice jaws, hacksawing to given dimensions, sawing different types of metals of different sections.</p> | <p>Linear measurements- its units, dividers, calipers, hermaphrodite, centre punch, dot punch, their description and uses of different types of hammers. Description, use and care of 'V' Blocks, marking off table.</p> |
| 3. | <p>Filing Channel, Parallel. Filing- Flat and square (Rough finish). Filing practice, surface filing, marking of straight and parallel lines with odd leg calipers and steel rule, marking practice with dividers, odd leg calipers and steel rule (circles, arcs, parallel lines).</p> | <p>Bench vice construction, types, uses, care & maintenance, vice clamps, hacksaw frames and blades, specification, description, types and their uses, method of using hacksaws. Files- specifications, description, materials, grades, cuts, file elements, uses. Measuring standards (English, Metric Units), angular measurements, subdivisions, try square,</p> |

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| | | ordinary depth gauge, protractor- description, uses and cares. |
| 4. | Marking off straight lines and arcs using scribing block and dividers, chipping flat surfaces along a marked line. | Marking off and layout tools, dividers, scribing block, odd leg calipers, punches- description, classification, material, care & maintenance. |
| 5. | Marking, filing, filing square, use of tri-square. | Calipers- types, material, constructional details, uses, care & maintenance of cold chisels- materials, types, cutting angles. |
| 6&7 | Marking according to simple blue prints for locating, position of holes, scribing lines on chalked surfaces with marking tools, finding center of round bar with the help of 'V' block and marking block. Joining straight line to an arc. | Marking media, marking blue, Prussian blue, red lead, chalk and their special application, description. Use, care and maintenance of scribing block. |
| 8. | Chipping, Chip slots & oils grooves (Straight). Filing flat, square, and parallel to an accuracy of 0.5mm. Chip curve along a line-mark out, key ways at various angles & cut key ways. | Surface plate and auxiliary marking equipment, 'V' block, angle plates, parallel block, description, types and uses, workshop surface plate- their uses, accuracy, care and maintenance. Types of files- convexing, taper, needle, care and maintenance of files, various types of keys, allowable clearances & tapers, types, uses of key pullers. |
| 9. | File thin metal to an accuracy of 0.5 mm. Chip & chamfer, grooving and slotting | Physical properties of engineering metal: colour, weight, structure, and conductivity, magnetic, fusibility, specific gravity. Mechanical properties: ductility, malleability hardness, brittleness, toughness, tenacity, and elasticity. |
| 10. | Saw along a straight line, curved line, on different sections of metal. Straight saw on thick section, M.S. angle and pipes. | Power Saw ,band saw, Circular saw machines used for metal sections cutting |
| 11. | File steps and finish with smooth file accuracy ± 0.25 mm. File and saw on M.S. Square and pipe. | Micrometer- outside and inside – principle, constructional features, parts graduation, leading, use and care. Micrometer depth gauge, parts, graduation, leading, use and care. Digital micrometer. |
| 12. | File radius along a marked line (Convex & concave) & match. Chip sheet metal (shearing). Chip step and file. | Vernier calipers, principle, construction, graduations, reading, use and care. Vernier bevel protractor, construction, graduations, reading, use and care, dial Vernier Caliper, Digital vernier caliper. |
| 13. | Mark off and drill through holes, drill and tap on M.S. flat, Punch letter and number (letter punch and number punch), use of different punches. | Drilling processes: common type (bench type, pillar type, radial type), gang and multiple drilling machine. Determination of tap drill size. |

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| 14. | Revision & Test (Two days) Prepare forge. Fire for heating metals. Forge a square rod from round stock. Judge the forging temperature of various metals. | Revision & Test Safety precautions to be observed in a smith shop, forge - necessity, description uses, fuel used for heating, bellows blowers, description and uses |
| 15. | Forge M.S. round rod to square Forge flat chisel, grind. | Anvil and swage blocks. Description and uses. Forging tools- hammers- band and sledge, description and uses. Chisels, set hammers, flatters, hardier, fuller swage & uses. Measuring and checking tools- steel rule, brass rule, calipers, try square, description and uses. General idea about the main operations performed in a forging shop such as upsetting drawing, twisting, bending, punching, drilling, and welding. |
| 16. | Forge – punches, screw drivers, chisels, grind them to shape and heat treat to requirement, bending metals to angles, curves & twisting, Preparation of brackets. | Metallurgical and metal working processes such as Heat treatment, various heat treatment methods -normalizing, annealing, hardening, case hardening and tempering. Power hammer – construction, features, method of operating and uses. |
| 17. | Marking of straight lines, circles, profiles and various geometrical shapes and cutting the sheets with snips. Marking out of simple development, marking out for flaps for soldering and sweating. | Safety precautions to be observed in a sheet metal workshop, sheet and sizes, Commercial sizes and various types of metal sheets, coated sheets and their uses as per BIS specifications. |
| 18-19. | Make various joints: wiring, hemming, soldering and brazing, form locked, grooved and knocked up single hem straight and curved edges form double hemming,. Punch holes-using hollow and solid punches. Do lap and butt joints. | Marking and measuring tools, wing compass, Prick punch, tin man's square tools, snips, types and uses. Tin man's hammers and mallets type-sheet metal tools, Soldering iron, types, specifications, uses. Trammel- description, parts, uses. Hand grooves- specifications and uses. |
| 20. | Bend sheet metal into various curvature form, wired edges- straight and curves, fold sheet metal at angle using stakes. Bend sheet metal to various curvatures. Make simple Square, container with wired edge and fix handle. | Stakes-bench types, parts, their uses. Various types of metal joints, their selection and application, tolerance for various joints, their selection & application. Wired edges - |
| 21. | Make square tray with square soldered corner Practice in soft soldering and silver soldering. | Solders-composition of various types of solders, and their heating media of soldering iron, fluxes types, selection and application-joints |

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| 22. | <p>Make riveted lap and butt joint. Make funnel as per development and solder joints. Drilling for riveting. Riveting with as many types of rivet as available, use of counter sunk head rivets.</p> | <p>Rivets-Tin man's rivets types, sizes, and selection for various works. Riveting tools, dolly snaps description and uses. Method of riveting, shearing machine- description, parts and uses.</p> |
| 23-25 | Revision | |
| 26 | Examination | |

SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION
SEMESTER-I

| Week No | Workshop Science and Calculation |
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| 1 | - Introduction to Iron and Steel. Differences in Iron & steel. |
| 2 | - Introduction to Property and uses of C.I. and wrought Iron. - Iron and steel properties and uses. |
| 3 | - Properties and uses of plain carbon steel and alloy steel. |
| 4 | - Properties and uses of non ferrous metals and alloys Fraction and decimal - conversion fraction decimal and vice-versa. |
| 5 | - Properties and uses of copper, zinc, lead, tin, aluminum. |
| 6-7 | - Composition, properties and uses of brass, bronze, solder, bearing material, timber, rubber etc. |
| 8 | - System of units, British, metric and SI units for length, area, volume capacity, weight, time, angle, their conversions. - Effect of alloying elements in the properties of C.I. & steel. |
| 9 | - Unit of temperature for & related problems. Standard & absolute temp. |
| 10-11 | - Mass, volume, density, weight, sp. Gravity & specific weight. S.I. M.K.S. and F.P.S. units of force, weight etc. their conversion to related problems. |
| 12 | - Inertia, rest and motion, velocity and acceleration. |
| 13 | - Types of forces, its units and Weight calculation. |
| 14 | - Revision & Test - Power and roots Factor, Power base exponents number. Multiplication and division of power and root of a number. Square root of number and problems. |
| 15 | - Heat & temperature, thermometric scales, their conversions. |
| 16-17 | - Work energy and power, their units and applied problems. |
| 18-19 | - Percentage, changing percentage to decimal and fraction and vice versa. Applied problems. |
| 20 | - Problem on percentage related to trade. |
| 21 | - Different types of loads, stress, strain, modulus of elasticity. Ultimate strength, different types of stress, factor of safety, examples. |
| 22 | - Ratio & proportion- Ratio, finding forms ratio proportions, direct proportion and indirect proportion. Application of ratio and proportion & related problems. |
| 23-25 | Revision |
| 26 | Examination |

SYLLABUS FOR ENGINEERING DRAWING
SEMESTER-I

| Week No | Engineering Drawing |
|---------|---|
| 1-2 | - Engineering Drawing-- introduction to Engg. Drawing and its importance. |
| 3 | - Use of drawing instruments –Drawing of straight, inclined and curved lines. |
| 4 | - Exercise on linear and angular measurements. |
| 5 | - Types of lines their meaning & application as per BIS SP: 46-2003. |
| 6-7 | - Simple conventional symbols for material and parts as per BIS SP: 46-2003. - Geometrical construction of rectangles, square, circles. |
| 8 | - Geometrical construction of polygon and ellipse, parabola & hyperbola. |
| 9 | - Geometrical construction of involutes, oval, and helix. |
| 10-11 | - Free hand sketching of straight lines, rectangles, circles, square, polygons, ellipse. |
| 12 | - Standard printing style for letters and numbers as per BIS : SP: 46-2003 using stencils |
| 13 | - Free hand sketching of simple geometrical solids, cube, cone, prism, cylinder, sphere, pyramids. |
| 14 | - Scales- Types & its use. |
| 15 | - Revision & Test - Construction of diagonal scale. |
| 16 | - Simple dimensioning technique, size and location, dimensions of parts, holes angles, taper, screw etc. as per BIS SP: 46-2003. |
| 17 | - Transferring measurements for linear, angular, circular dimensions form the given object to the related free hand sketches using different measuring instruments. |
| 18-19 | - Pictorial drawings, isometric drawings of simple geometrical solids. |
| 20 | - Oblique/orthographic projection of simple geometrical solids. |
| 21 | - Orthographic drawings: Application of both the first angle and third angle. Isometric drawing of simple machined & casting blocks. |
| 22 | - Free hand sketches of trade related hand tools and measuring tools. |
| 23-25 | Revision |
| 26 | Examination |

SYLLABUS FOR EMPLOYABILITY SKILLS

SEMESTER-I

| 1. I.T. Literacy | |
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| Hours of Instruction : 20 Hrs. | Marks Allotted : 20 |
| Computer | - Introduction, Computer and its applications, Hardware and peripherals, Switching on and shutting down of computer. |
| WINDOWS | - Basics of Operating System, WINDOWS, The user interface of Windows OS, Customizing Windows Operating System, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications. |
| MS office | - Basic operations of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creation and Editing of Text, Formatting the Text, Printing document, Insertion & creation of Tables. - Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets |
| INTERNET | - Basic of Computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Applications of Internet : Browsing, Searching, Emailing, Social Networking |
| WEB Browser | - Meaning of World Wide Web (WWW), Search Engines with examples, Web Browsing, Accessing the Internet using Web Browser, Downloading Web Pages, Printing Web Pages - Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT – ACT, Importance of information security and IT act, types of cyber crimes. |
| 2. English Literacy | |
| Hours of Instruction: 15 Hrs. | Marks Allotted : 15 |
| Pronunciation | - Phonetics and pronouncing simple words. |
| Listening | - Interpreting conversation and discussions related to everyday life, Responding to spoken instructions in order to carry out requests and commands. |
| Speaking | - Asking and answering simple questions in English to describe people, things, situations and events. |
| Reading | - Reading and interpreting simple sentences, forms, hoardings, sign boards and notices. |
| Writing | - Writing sentences with simple words, reply to everyday office correspondence, - Writing CV & simple application forms. |
| 3. Communication skill | |
| Hours of Instruction: 15 Hrs. | Marks Allotted : 15 |
| Communication Skills | - Definition, Effective communication, Verbal communication, Use of right words, Non verbal communication, Body Languages. |
| Motivation | - Self awareness, Goal setting, Career planning, Values and Ethics |
| Time management | - Managing time effectively through planning |
| Facing Interviews | - Appearance and behaviour in an interview, Do's and don'ts |
| Behavioral Skills | - Attitude, Problem Solving, Thinking Skills, Confidence building |

Second Semester
(Semester Code no. FTR - 02)
Duration : Six Month

| Week No. | Trade Practical | Trade Theory |
|-----------------|---|--|
| 1 | Welding - Striking and maintaining arc, laying Straight-line bead. | Safety-importance of safety and general precautions observed in a welding shop. Precautions in electric and gas welding. (Before, during, after) Introduction to safety equipment and their uses. Machines and accessories, welding transformer, welding generators, |
| 2 | Making square, butt joint and 'T' fillet joint-gas and arc. Do setting up of flames, fusion runs with and without filler rod, and gas | Hand tools: Hammers, welding description, types and uses, description, principle, method of operating, carbon dioxide welding. H.P. welding equipment: description, principle, method of operating L.P. welding equipment: description, principle, method of operating. Types of Joints-Butt and fillet <u>as per BIS SP: 46-1988</u> specifications. Gases and gas cylinder description, kinds, main difference and uses. |
| 3 | Make butt weld and corner, fillet in arc welding | Setting up parameters for arc welding machines-selection of Welding electrodes |
| 4 | Gas cutting of MS plates | Oxygen acetylene cutting-machine description, parts, uses, method of handling, cutting torch-description, parts, function and uses. |
| 5 | Mark off and drill through holes, drill on M.S. flat, file radius and profile to suit gauge. | 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. |
| 6 | Counter sink, counter bore and ream split fit (three piece fitting). Form internal threads with taps to standard size (through | Counter sink, counter bore and spot facing-tools and nomenclature, Reamer- material, types (Hand and machine reamer), kinds, parts and |

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| | holes and blind holes) – Drill through hole and tap drill blind hole and tap, prepare studs and bolt. | their uses, determining hole size (or reaming), Reaming procedure. Screw threads: terminology, parts, types and their uses. Screw pitch gauge: material parts and uses. Taps British standard (B.S.W., B.S.F., B.A. & B.S.P.) and metric /BIS (course and fine) material, parts (shank body, flute, cutting edge). Tap wrench: material, parts, types (solid & adjustable types) and their uses removal of broken tap, studs (tap stud extractor). |
| 7 | Form external threads with dies to standard size. Prepare nuts and match with bolts. | Dies : British standard, metric and BIS standard, material, parts, types, Method of using dies. Die stock: material, parts and uses. |
| 8 | Step fit, angular fit, file and make angle, surfaces (Bevel gauge accuracy 1 degree) make simple open and sliding fits. | Drill troubles: causes and remedy. Equality of lips, correct clearance, dead centre, length of lips. Drill kinds : Fraction, metric, letters and numbers, grinding of drill. |
| 9 | Enlarge hole and increase internal dia. File cylindrical surfaces. Make open fitting of curved profiles. | Grinding wheel: Abrasive, grade structures, bond, specification, use, mounting and dressing. Bench grinder parts and use-radius gauge, fillet gauge, material, construction, parts function and metric, different dimensions, convex and concave uses care and maintenance. |
| 10 | Make the circles by binding previously drilled hole. Test angular match up. | Radius gauge, feeler gauge, hole gauge, and their uses. |
| 11 | Inside square fit, make combined open and sliding fit, straight sides ‘T’ fit. | Interchangeability: Necessity in Engg, field definition, BIS. Definition, types of limit, terminology of limits and fits-basic size, actual size, deviation, high and low limit, zero line, tolerance zone Different standard systems of fits and limits. British standard system, BIS system |
| 12 | File fit- combined, open angular and sliding sides. File internal angles 30 minutes accuracy open, angular fit. | Method of expressing tolerance as per BIS Fits : Definition, types description of each with sketch .Vernier height gauge : material construction, parts, graduations (English & Metric) uses, care and maintenance, Pig Iron : manufacturing process (by using)Blast furnace types, of pig Iron , properties and uses. |
| 13 | Make sliding fit with angles other than 90 ^o . sliding fit with an angle. | Cast Iron: manufacturing process by using (cupola furnace) types, properties and uses. Wrought iron- : manufacturing process (Fuddling and Astor process) properties and uses. Steel: manufacturing process plain carbon steels, types, properties and uses. |
| 14 | Make simple bracket by bending and twisting of non-ferrous metal. Drill small | Non-ferrous metals (copper, aluminum, tin, lead, zinc) properties and uses. |

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| | holes (2mm) Drill holes on sheet metal, bend short for round bracket. | |
| 15 | Counter sink, counter bore and ream split fit (three piece fitting). | Counter sink, counter bore and spot facing-tools and nomenclature, Reamer- material, types (Hand and machine reamer), kinds, parts and their uses, determining hole size (or reaming), Reaming procedure. |
| 16 | Scrap on flat surfaces, scrap on curved surfaces and scrap surface parallels and test. Make & assemble, sliding flats, plain surfaces. Check for blue math of bearing surfaces- both flat and curved surfaces by witworth method. | Simple scraper- cir., flat, half round, triangular and hook scraper and their uses. Blue matching of scraped surfaces (flat and curved bearing surfaces) |
| 17 | File and fit combined radius and angular surface (accuracy ± 0.5 mm), angular and radius fit. Locate accurate holes. Make accurate hole for stud fit. Fasten mechanical components / sub assemblies together using screws, bolts and collars using hand tools. | Vernier micrometer, material, parts, graduation, use, care and maintenance. Calibration of measuring instruments Introduction to mechanical fasteners and its uses. Screw thread micrometer: Construction, graduation and use. |
| 18 | Cutting threads using dies. Make sliding fits assembly with parallel and angular mating surface. (± 0.04 mm) | Dial test indicator, construction, parts, material, graduation, Method of use,. Care and maintenance. Digital dial indicator. Comparators-measurement of quality in the cylinder bores. |
| 19 & 20 | Simple repair work, simple assembly of machine parts from blue prints. Rectify possible assembly faults during assembly. | Preventive maintenance-objective and function of P.M., section inspection. Visual and detailed, lubrication survey, system of symbol and colour coding. Revision, simple estimation of materials, use of handbooks and reference table. Possible causes for assembly failures and remedies. |
| 21 | Assemble simple fitting using dowel pins and tap screw assembly using torque wrench. | Assembling techniques such as aligning, bending, fixing, mechanical jointing, threaded jointing, sealing, and torquing. Dowel pins: material, construction, types, accuracy and uses. |
| 22-23 | Implant training / Project work (work in a team) | |
| 24-25 | Revision | |
| 26 | Examination | |

SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION
SEMESTER-II

| Week No | Workshop Science and Calculation |
|---------|---|
| 1-2 | - Simple machines-principle, velocity ratio, mechanical advantage, efficiency, related problems. |
| 3 | - Algebraic symbols, fundamental algebra operations, sign and symbols used in algebra, coefficient terms, and unlike terms. |
| 4 | - Algebraic addition, subtraction, multiplication and division. |
| 5 | - Simple machines like winch pulley and compounding axle etc. |
| 6-7 | - Calculation of tap hole sizes for internal threads and blank size for cutting external threads. |
| 8 | - Factors and equations: Algebraic formula and solving simple equations. |
| 9 | - Factors and different types of factorization (LCM, HCF). |
| 10 | - Equations simple simultaneous equation. |
| 11 | - Simple simultaneous equation. |
| 12 | - Application, construction and solution of problems by equation. |
| 13-14 | - Atmospheric pressure, pressure gauge, gauge pressure and absolute pressure and their units. |
| 15 | - Simple problems on multiplication, division, power and root using calculator. |
| 16 | - Power and exponent. Laws of exponent. |
| 17 | - Relation between specific gravity and density simple experimental determination. |
| 18 | - Geometry: Fundamental geometrical definition- angles and properties of angles, triangles, and properties of triangles. |
| 19-20 | - Pythagoras theorem, properties of similar triangles. - Revision. |
| 21 | - Definition and units of torque. Pythagoras theorem, properties of similar triangles. - Revision. |
| 22-23 | Implant training / Project work (work in a team) |
| 24-25 | Revision |
| 26 | Examination |

SYLLABUS FOR ENGINEERING DRAWING
SEMESTER-II

| Week No | Engineering Drawing |
|---------|---|
| 1 | - Simple sketches of trade related hand tools & measuring instruments |
| 2 | - Introduction to Orthographic Views and its advantages. |
| 3-4 | - Orthographic drawings, application of both the first angle and third angle. Method of representing the drawings for simple and complex machine parts, exercises with dimensions. |
| 5 | - Standard method of sectioning as per BIS: SP: 46-2003. Exercises for different sectional views on the given orthographic drawing of machine part, castings etc. - Orthographic drawings in first angle projection. |
| 6 | - Orthographic drawings in the first angle projection. |
| 7-9 | - Orthographic drawings in the third angle projection |
| 10-11 | - Standard method of sectioning as per BIS. SP: 46-2003. Exercises for different sectional views on the given orthographic drawing of machine parts, casting etc. |
| 12-14 | - Conversion of isometric, oblique drawings to orthographic drawings and vice-versa. Related problems such as 'V' block oriented by various machining operations etc. |
| 15 | - Method of representing the drawings for simple and complex machine blocks given for exercises with dimensions. |
| 16 | - Reading of production drawing including machining symbol, GD&T. |
| 17-18 | - Surface development of simple geometrical solids like cube, rectangular block, cone, pyramid, cylinder, prism etc. |
| 19-20 | - Interpretation of solids and conventional application of intersectional curves on drawing. - Solution of NCVT test paper (preliminary) Revision. |
| 21 | - Sketches for bolts, nuts, screws and other screwed members. |
| 22-23 | Implant training / Project work (work in a team) |
| 24-25 | Revision |
| 26 | Examination |

SYLLABUS FOR EMPLOYABILITY SKILLS

SEMESTER-II

| 1. Entrepreneurship skill | |
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| Hours of Instruction : 10 Hrs. | |
| Marks Allotted : 10 | |
| Business & Consumer | Types of business in different trades and the importance of skill, Understanding the consumer, market through consumer behavior, market survey, Methods of Marketing, publicity and advertisement |
| Self Employment | Need and scope for self-employment, Qualities of a good Entrepreneur (values attitude, motive, etc.), SWOT and Risk Analysis |
| Govt Institutions | Role of various Schemes and Institutes for self-employment i.e. DIC, SIDBI, MSME, NSIC, Financial institutions and banks. |
| Initiation Formalities | Project Formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment Procedure - Loan Procurement - Agencies - banking Process |
| 2.Environment Education | |
| Hours of Instruction : 10 Hrs. | |
| Marks Allotted : 10 | |
| Ecosystem | Introduction to Environment, Relationship between Society and Environment, Ecosystem and Factors responsible for destruction. |
| Pollution | Pollution and pollutants including liquid, gaseous, solid and hazardous waste. |
| Energy Conservation | Conservation of Energy, re-use and recycle. |
| Global warming | Global warming, climate change and Ozone layer depletion. |
| Ground water | Hydrological cycle, ground and surface water and treatment of water. |
| Environment | Right attitude towards environment, Maintenance of in-house environment. |
| 3.Occupational Safety, Health & Environment | |
| Hours of Instruction : 10 Hrs. | |
| Marks Allotted : 10 | |
| Safety & Health | Introduction to Occupational Safety and Health and its importance at workplace |
| Occupational Hazards | Occupational health, Occupational hygiene, Occupational Diseases/ Disorders & its prevention |
| Accident & safety | Accident prevention techniques- control of accidents and safety measures |
| First Aid | Care of injured & Sick at the workplaces, First-aid & Transportation of sick person |
| Basic Provisions | Idea of basic provisions of safety, health, welfare under legislation of India |
| 4.Labour Welfare Legislation | |
| Hours of Instruction : 10 Hrs. | |
| Marks Allotted : 10 | |
| Welfare Acts | Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's Compensation Act |
| 5.Quality Tools | |
| Hours of Instruction : 10 Hrs. | |
| Marks Allotted : 10 | |
| Quality Consciousness | Meaning of quality, Quality Characteristic |
| Quality Circles | Definition, Advantage of small group activity, objectives of Quality Circle, Roles and Functions of Quality Circles in organisation, Operation of Quality Circle, Approaches to Starting Quality Circles, Steps for Continuation Quality Circles |
| Quality Management | Idea of ISO 9000 and BIS systems and its importance in maintaining |

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| System | qualities. |
| House Keeping | Purpose of Housekeeping, Practice of good Housekeeping. 5S Principles of Housekeeping: SEIRI – Segregation, SEITON – Arrangement, SEISO – Cleaning, SEIKETSU – maintenance of Standards, SHITSUKE - Discipline |

Third Semester
(Semester Code no. FTR - 03)
Duration : Six Month

| Week No. | Trade Practical | Trade Theory |
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| 01 | True job on four jaw chuck using knife tool, face both the ends for holding between centers, Using roughing tool parallel turn ± 0.1 mm. Measure the diameter using outside caliper and steel rule. | Safely precautions to be observed while working on a lathe, Lathe specifications, and constructional features. Lathe main parts descriptions- bed, head stock, carriage, tail stock, feeding and thread cutting mechanisms. Holding of job between centers, works with catch plate, dog, simple description of a facing and roughing tool and their applications. |
| 02 | Lathe operations- the facing, parting and form tools, plain turn, step turn, holding job in three jaw chuck- deburr, chamfer-corner, round, the ends, Shoulder turn: square, filleted, beveled undercut shoulder, turning- filleted under cut, square beveled. | Lathe cutting tools- Brief study of the nomenclature of Lathe cutting tools and necessity of correct grinding, solid and tipped, throw away type tools, cutting speed and feed and comparison for H.S.S., carbide tools. Use of coolants and lubricants. |
| 03 | Cut grooves- square, round 'V' groove, Make a mandrel-turn diameter to sizes. Knurl the job. | Chucks and chucking the independent four-jaw chuck. Reversible features of jaws, the back plate, Method of clearing the thread of the chuck-mounting and dismounting, chucks, chucking true, face plate, drilling - method of holding drills in the tail stock, Boring tools and enlargement of holes. |
| 04 | Bore holes –spot face, pilot drill, enlarge hole, using boring tools, make a bush step bore-cut recess, turn hole diameter to sizes. Turn taper (internal and external). Turn taper pins. Turn standard tapers to suit with gauge. | General turning operations- parallel or straight, turning. Stepped turning, grooving, and shape of tools for the above operations. Appropriate method of holding the tool on tool post or tool rest, Knurling: - tools description, grade, uses, speed and feed, coolant for knurling, speed, feed calculation. Taper – definition, use and method of expressing tapers. Standard tapers-taper, calculations morse taper. |
| 05 | Threading practice by using cut threads using taps, dies on lathe by hand, 'V' thread – external. Prepare a nut and match with the bolt. | Screw thread definition – uses and application. Terminology of screw threads, square, worm, buttress, acme (non standard-screw threads), Principle of cutting screw thread in centre lathe –principle of chasing the screw thread – use of centre gauge, setting tool for cutting internal and external threads, use of screw pitch gauge for checking the screw thread. |
| 06 | Assembly sliding for using keys and dowel pin and screw, ± 0.02 mm accuracy on plain surface. Testing of | Screws: material, different types (inch & metric), uses Testing scraped surfaces: ordinary surfaces |

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| | sliding fitting job, scrap on two flat surfaces and curved surfaces. | without a master plate. |
| 07 | File & fit angular mating surface plain within an accuracy of ± 0.02 mm & angular 15 minutes angular fitting. | Special files: types (pillar, Dread naught, Barrow, warding) description. |
| 08 | Drill through and blind holes at an angle, using swivel table of drilling machine, Precision drilling, reaming and tapping. Test- Job.. | System of drill size, Fractional size: number, letter and metric. Templates and gauges- Introduction, necessity, types. Limit gauge: Ring gauge, snap gauge, plug gauge, description and uses. |
| 09 | Dovetailed fitting, radius fitting. | Description and uses of gauge- types (feeler, screw, pitch, radius, wire gauge), |
| 10 | File and fit, combined fit with straight, angular surface with ± 0.02 mm accuracy, hexagonal fitting. Check adherence to specification and quality standards using equipments like Vernier calipers, micrometers etc., | Slip gauge: Necessity of using, classification & accuracy, set of blocks (English and Metric). Details of slip gauge. Metric sets 46: 103: 112. Wringing and building up of slip gauge and care and maintenance. Application of slip gauges for measuring, Sine bar-Principle, application & specification. Procedure to check adherence to specification and quality standards. |
| 11 | Drilling and reaming, small dia. holes to accuracy correct location for fitting Make male and female fitting parts, drill and ream holes not less than 12.7 mm. | Locking device: Nuts- types (lock nut castle nut, slotted nuts, swam nut, grooved nut) Description and use. |
| 12 | Sliding fitting, Diamond fitting, Lapping flat surfaces using lapping plate. | Lapping: Application of lapping, material for lapping tools, lapping abrasives, charging of lapping tool. Surface finish importance, equipment for testing-terms relation to surface finish. Equipment for tasting surfaces quality – dimensional tolerances of surface finish. |
| 13 | Stepped keyed fitting-test job. Lapping holes and cylindrical surfaces. | Honing: Application of honing, material for honing, tools shapes, grades, honing abrasives. Frosting- its aim and the methods of performance. |
| 14 | Making a snap gauge for checking a dia of 10 ± 0.02 mm. | . Manufacture: The name and types of gauge commonly used in gauging finished product-Method of selective assembly ‘Go’ system of gauges, hole plug basis of standardization |
| 15 | Scrape angular mating surface, scrape on internal surface. | Bearing-Introduction, classification (Journal and Thrust), Description of each, ball bearing: Single row, double row, description of each, and advantages of double row. |
| 16 | Practice in dovetail fitting assembly and dowel pins and cap screws | Roller and needle bearings: Types of roller bearing. Description & use of each |

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| | assembly. Industrial visit. | Industrial visit. |
| 17 | Preparation of gap gauges. | Synthetic materials for bearing: The plastic laminate materials, their properties and uses in bearings such as phenolic, teflon polyamide (nylon). |
| 18 | Dovetail and Dowel pin assembly, scraps cylindrical bore. | Method of fitting ball and roller bearings |
| 19 | Scrapping cylindrical bore and to make a fit-make a cotter jib assembly. | .. Bearing metals – types, composition and uses, lubricants purpose of using different types, description and uses of each type |
| 20 | Scrapping cylindrical taper bore, check taper angle with sine bar, check in per angle (flat) with sine bar. | . Hardening and tempering, purpose of each method, tempering colour chart. |
| 21 | Preparation of centre, squares, drills gauges. File and fit straight and angular surfaces internally Identify different ferrous metals by spark test | Annealing and normalising, purpose of each method. |
| 22-23 | Implant training / Project work (work in a team) | |
| 24-25 | Revision | |
| 26 | Examination | |

SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION
SEMESTER-III

| Week No | Workshop Science and Calculation |
|---------|---|
| 1 | - Revision of 1 st year course. |
| 2 | - Heat and temperature, thermometric scales their conversions. |
| 3 | - Rectangle, square, Rhombus, parallelogram and their properties. |
| 4 | - Circle and properties circle: regular polygons. - Application of geometrical to shop problems. |
| 5-6 | - Forces definition. - Compressive, tensile, shear forces and simple problems. |
| 7 | - Temperature measuring instruments. Specific heats of solids & liquids, quantity of heat. |
| 8 | - Heat loss and heat gain, with simple problems. |
| 9 | - Mensuration: Plain figures-triangles, square, rectangle, parallelogram. |
| 10 | - Mensuration : Plain figures-segment and sector of circle, ellipse, fillets. - Plain figures. Trapezium, regular polygons, circle, hollow circles. |
| 11 | - Mensuration: Solid figures : Prism, cylinder, pyramid, cone. - Solid figures: frustum of a cone, sphere, spherical segment. |
| 12 | - Material weight and cost problems related to trade. |
| 13 | - Trigonometry: trigonometric ratios, use of trigonometric table. |
| 14 | - Area of triangle by trigonometry. |
| 15 | - Finding height and distance by trigonometry. |
| 16 | - Application of trigonometry in shop problems. - Industrial visit. |
| 17-18 | - Application of trigonometry in shop problems. |
| 19-20 | - Levers-definition, types and principles of levers. |
| 21 | - Mechanical Advantage, velocity ratio and mechanical efficiency. |
| 22-23 | Implant training / Project work (work in a team) |
| 24-25 | Revision |
| 26 | Examination |

SYLLABUS FOR ENGINEERING DRAWING
SEMESTER-III

| Week No | Engineering Drawing |
|---------|---|
| 1 | - Revision of first year topics. |
| 2 | - Machined components and surface finish symbols. |
| 3 | - Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS. |
| 4 | - Sketches for bolts, nuts, screws and other screwed members. |
| 5 | - Sketching of foundation bolts and types of washers. |
| 6 | - Standard rivet forms as per BIS. |
| 7 | - Riveted joints-Butt & Lap. |
| 8-9 | - Sketches of keys, cotter and pin joints. |
| 10-11 | - Sketches for simple pipe, unions with simple pipe line drawings. |
| 12 | - Concept of preparation of assembly drawing and detailing. Simple assemblies & their details of trade related tools/job/exercises with the dimensions from the given sample or models. |
| 13 | - Single Tool post for the lathe with washer and screw. |
| 14 | - Details and assembly of Vee-blocks with clamps. |
| 15 | - Details and assembly of Vee-blocks with clamps. |
| 16 | - Details of assembly of shaft and pulley. - Industrial visit. |
| 17 | - Details1 of assembly of shaft and pulley. |
| 18 | - Details of assembly of bush bearing. |
| 19 | - Details of assembly bush bearing. |
| 20 | - Details of assembly of a simple coupling. |
| 21 | - Sketching of different gear wheels and nomenclature. |
| 22-23 | Implant training / Project work (work in a team) |
| 24-25 | Revision |
| 26 | Examination |

Fourth Semester
(Semester Code no. FTR - 04)
Duration : Six Month

| Week No. | Trade Practical | Trade Theory |
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| 01. | 'H' fitting- | Case hardening and carburising and its methods, process of carburising (solid, liquid and gas). |
| 02. | Exercises on lapping of gauges (hand lapping only) Hand reams and fit taper pin, drilling and reaming holes in correct location, fitting dowel pins, stud, and bolts. | Solder and soldering: Introduction-types of solder and flux. Method of soldering, Hard solder- Introduction, types and method of brazing. Production of gauges, templates and jigs. The objective of importance for preparing interchangeable components. |
| 03. | Simple jigs and fixtures for drilling. Prepare a 'V' block and a clamp. Marking out as per Blue print, drilling, straight and curve filing. Threading with die, cutting slot, and cutting internal threads with taps, making an adjustable spanner. | Drilling jig-constructional features, types and uses. Fixtures-Constructional features, types and uses. |
| 04. | Flaring of pipes and pipe joints, Cutting & Threading of pipe length. Fitting of pipes as per sketch. Conditions used for pipe work to be followed. Bending of pipes- cold and hot. | Pipes and pipe fitting- commonly used pipes. Pipe schedule and standard sizes. Pipe bending methods. Use of bending fixture, pipe threads- Std. Pipe threads Die and Tap, pipe vices. |
| 05. | Practice-dismantling & assembling – globe valves sluice valves, stop cocks, seat valves and non-return valve, fitting of pipes and testing for leakage. | Standard pipefitting-. Methods of fitting or replacing the above fitting, repairs and erection on rainwater drainage pipes and house hold taps and pipe work. Use of tools such as pipe cutters, pipe wrenches, pipe dies, and tap, pipe bending machine etc. |
| 06. | Practice in handling Fire extinguishers of different types, refilling of extinguishers. | Fire precautions-causes and types of fires, precautions against out break of fire. Fire Extinguishers-types and use. |
| 07. | Marking detail includes male & female screw cutting, male and female fitting parts. Making and tempering springs. | Working material with finished surface as aluminium, duralumin, stainless steel, the importance of keeping the work free from rust and corrosion. The various coatings used to protect metals, protection coat by heat and electrical deposit treatments. Treatments and provide a pleasing finish as chromium silver plating and nickel plating, and |

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| | | galvanising. |
| 08. | Exercises on finished material as aluminium and stainless steel, marking out, cutting to size, drilling etc. without damage to surface of finished articles. | Aluminium and its alloys. Uses, advantages and disadvantages, weight and strength as compared with steel. |
| 09. | Marking out for angular outlines, filing and fitting the inserts into gaps. Making a simple drilling jig, Marking out, filing to line, drilling and tapping brass and copper jobs. | Tapers on keys and cotters permissible by various standards. Discuss non-ferrous metals as brass, phosphor bronze, gunmetal, copper, aluminium etc. Their composition and purposes where and why used, advantages for specific purposes, surface wearing properties of bronze and brass. |
| 10. | Complete exercises covering the assembly of parts working to detail and arrangement – Drawings, Dismantling and mounting of pulleys. Making replacing damaged keys. Repairing damaged gears and mounting. Repair & replacement of belts. | Power transmission elements. The object of belts, their sizes and specifications, materials of which the belts are made, selection of the type of belts with the consideration of weather, load and tension methods of joining leather belts. Vee belts and their advantages and disadvantages, Use of commercial belts, dressing and resin creep and slipping, calculation. |
| 11. | Complete exercises covering the assembly of parts working to details and arrangements as per drawings. Dismantling and mounting of pulleys. Making, replacing damaged keys. Repairing damaged gears and mounting them on shafts. | Power transmissions, coupling types-flange coupling, -Hooks coupling-universal coupling and their different uses. |
| 12. | More difficult work in marking out including tangents, templates involving use of vernier protractor. | Pulleys-types-solid, split and 'V' belt pulleys, standard calculation for determining size crowning of faces-loose and fast pulleys-jockey pulley. Types of drives-open and cross belt drives. The geometrical explanation of the belt drivers at an angle. |
| 13. | Fitting of dovetail slides. | Power transmission –by gears, most common form spur gear, set names of some essential parts of the set-The pitch circles, Diametral pitch, velocity ratio of a gear set, Helical gear, herring bone gears, bevel gearing, spiral bevel gearing, hypoid gearing, pinion and rack, worm gearing, velocity ration of worm gearing. Repair to gear teeth by building up and dovetail method. |
| 14. | Male and female dovetail fitting repairs to geared teeth. Repair of broken gear tooth by stud. Repair broker gear teeth by dovetail. | Method or fixing geared wheels for various purpose drives. General cause of the wear and tear of the toothed wheels and their remedies, method of fitting spiral gears, helical gears, bevel gears, worm and worm wheels in relation to required drive. Care and maintenance of gears. |

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| 15 - 16 | Marking out on the round sections for geometrical shaped fittings. Finishing and fitting to size, checking up the faces for universality. | Lubrication and lubricants- Method of lubrication. A good lubricant, viscosity of the lubricant, Main property of lubricant. How a film of oil is formed in journal. Bearings, method of lubrication-gravity feed, force (pressure) feed, splash lubrication. Cutting lubricants and coolants: Soluble off soaps, suds-paraffin, soda water, common lubricating oils and their commercial names, selection of lubricants. Chains, wire ropes and clutches for power transmission. Their types and brief description. Discuss the various rivets shape and form of heads, riveting tools for drawing up the importance of correct head size. The spacing of rivets. Flash riveting, use of correct tools, compare hot and cold riveting. |
| 17 | Prepare different types of documentation as per industrial need by different methods of recording information. | Importance of Technical English terms used in industry –(in simple definition only)Technical forms, process charts, activity logs, in required formats of industry, estimation, cycle time, productivity reports, job cards. |
| 18 & 19 | Inspection of Machine tools. Accuracy testing of Machine tools. | Installation, maintenance and overhaul of machinery and engineering equipment and Hydraulics & pneumatic symbols & exercise. Hydraulics pneumatic circuits. Clutch: Type, positive clutch (straight tooth type, angular tooth type) . |
| 20. | Study of power transmission system in machine tools. | Washers-Types and calculation of washer sizes. The making of joints and fitting packing. The use of lifting appliances, extractor presses and their use. Practical method of obtaining mechanical advantage. The slings and handling of heavy machinery, special precautions in the removal and replacement of heavy parts. |
| 21. | Simple repair of machinery, making of packing gaskets, use of hollow punches, extractor ,drifts, various types of hammers and spanners, etc. | Foundation bolt: types (rag, Lewis cotter bolt) description of each erection tools, pulley block, crow bar, spirit level, Plumb bob, pipe 2 X 4', wire rope, manila rope, wooden block. |

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| | Practicing, making various knots, correct loading of slings, correct and safe removal of parts. Erect sample machines. | |
| 22-23 | Implant training / Project work (work in a team) | |
| 24-25 | Revision | |
| 26 | Examination | |

SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION
SEMESTER-IV

| Week No | Workshop Science and Calculation |
|---------|---|
| 1-2 | - Centre of gravity, simple experimental determination, stable, unstable & neutral equilibrium, simple explanation |
| 3 | - Friction- co-efficient of friction. Simple problem related to friction. |
| 4 | - Magnetic substances- natural and artificial magnets. |
| 5 | - Method of magnetisation. Use of magnets. |
| 6 | - Electricity & its uses. Electric current-positive & negative terminals. |
| 7 | - Use of fuses and switches, conductors and insulators. |
| 8 | - Simple electric circuits, simple calculations. |
| 9 | - Simple calculation based on Ohm's law. - electrical insulating materials. |
| 10-11 | - Transmission of power by belt, pulleys & gear drive. - Calculation of Transmission of power by belt pulley and gear drive. |
| 12-13 | - Read images, graphs, diagrams –bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities. |
| 14 | - Stress, strain, Hooks law, ultimate strength, factor of safety definitions and problems on them. |
| 15-16 | - Mechanical properties of metals. - Heat treatment and advantages. |
| 17 | - Basic Electronic: Introduction to wiring symbols, units, resistor, capacitor and inductor. |
| 18-21 | - Solution of NCVT test papers. |
| 22-23 | Implant training / Project work (work in a team) |
| 24-25 | Revision |
| 26 | Examination |

SYLLABUS FOR ENGINEERING DRAWING
SEMESTER-IV

| Week No | Engineering Drawing |
|----------------|---|
| 1-2 | - Details and assembly of simple hand – vice. |
| 3-4 | - Blue print Reading. Simple exercises related to missing lines. |
| 5-6 | - Simple exercises relating missing symbols. - Missing views |
| 7-10 | - Simple exercises related to missing section. |
| 11-12 | - Sketching of different types of bearings and its conventional representation. |
| 13 | - Solution of NCVT test. - Basic electrical and electronic symbols |
| 14 | - Study of drawing & Estimation of materials. |
| 15-16 | - Solution of NCVT test papers. |
| 17 | - Solution of NCVT test papers. |
| 18-21 | - Revision |
| 22-23 | Implant training / Project work (work in a team) |
| 24-25 | Revision |
| 26 | Examination |