**SYLLABUS OF SEMESTER SYSTEM**

**FOR THE TRADE OF**

**FITTER**

**SEMESTER PATTERN**

**Under**

**Craftsmen Training Scheme (CTS)**

**(Two years/Four Semesters)**

**Revised in**

**2014**

**By**

**Government of India**

**Ministry of Labour & Employment (DGE&T)**

**SYLLABUS FOR THE TRADE OF FITTER**

**First Semester**

**(Semester Code no. FTR - 01)**

**Duration : Six Month**

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

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|  |  | ordinary depth gauge, protractor- |
|  |  | description, uses and cares. |
| 4. | Marking off straight lines and arcs using | Marking off and layout tools, dividers, |
|  | scribing block and dividers, chipping flat | scribing block, odd leg calipers, punches- |
|  | surfaces along a marked line. | description, classification, material, care & |
|  |  | maintenance. |
|  |  |  |
| 5. | Marking, filing, filing square, use of tri- | Calipers- types, material, constructional |
|  | square. | details, uses, care & maintenance of cold |
|  |  | chisels- materials, types, cutting angles. |
| 6&7 | Marking according to simple blue prints | Marking media, marking blue, Prussian |
|  | for locating, position of holes, scribing | blue, red lead, chalk and their special |
|  | lines on chalked surfaces with marking | application, description. Use, care and |
|  | tools, finding center of round bar with the | maintenance of scribing block. |
|  | help of „V‟ block and marking block. |  |
|  | Joining straight line to an arc. |  |
| 8. | Chipping, Chip slots & oils grooves | Surface plate and auxiliary marking |
|  | (Straight). | equipment, „V‟ block, angle plates, parallel |
|  | Filing flat, square, and parallel to an | block, description, types and uses, |
|  | accuracy of 0.5mm. Chip curve along a | workshop surface plate- their uses, |
|  | line-mark out, key ways at various angles | accuracy, care and maintenance. |
|  | & cut key ways. | 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. | Physical properties of engineering metal: |
|  | Chip | colour, weight, structure, and conductivity, |
|  | & chamfer, grooving and slotting | magnetic, fusibility, specific gravity. |
|  |  | Mechanical properties: ductility, |
|  |  | malleability hardness, brittleness, |
|  |  | toughness, tenacity, and elasticity. |
| 10. | Saw along a straight line, curved line, on | Power Saw ,band saw, Circular saw |
|  | different sections of metal. Straight saw on | machines used for metal sections cutting |
|  | thick section, M.S. angle and pipes. |  |
|  |  |  |
| 11. | File steps and finish with smooth file | Micrometer- outside and inside – principle, |
|  | accuracy ± 0.25 mm. File and saw on | constructional features, parts graduation, |
|  | M.S. Square and pipe. | leading, use and care. Micrometer depth |
|  |  | gauge, parts, graduation, leading, use and |
|  |  | care. Digital micrometer. |
|  |  |  |
| 12. | File radius along a marked line (Convex & | Vernier calipers, principle, construction, |
|  | concave) & match. Chip sheet metal | graduations, reading, use and care. Vernier |
|  | (shearing). Chip step and file. | bevel protractor, construction, graduations, |
|  |  | reading, use and care, dial Vernier Caliper, |
|  |  | Digital vernier caliper. |
| 13. | Mark off and drill through holes, drill and | Drilling processes: common type (bench |
|  | tap on M.S. flat, Punch letter and number | type, pillar type, radial type), gang and |
|  | (letter punch and number punch), use of | multiple drilling machine. |
|  | different punches. | Determination of tap drill size. |
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| 14. | **Revision & Test** (Two days) Prepare | **Revision & Test** |
|  | forge. Fire for heating metals. Forge a | Safety precautions to be observed in a |
|  | square rod from round stock. Judge the | smith shop, forge - necessity, description |
|  | forging temperature of various metals. | uses, fuel used for heating, bellows |
|  |  | blowers, description and uses |
| 15. | Forge M.S. round rod to square Forge flat | Anvil and swage blocks. Description and |
|  | chisel, grind. | 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, | Metallurgical and metal working processes |
|  | grind them to shape and heat treat to | such as Heat treatment, various heat |
|  | requirement, bending metals to angles, | treatment methods -normalizing, annealing, |
|  | curves & twisting, Preparation of brackets. | hardening, case hardening and tempering. |
|  |  | Power hammer – construction, features, |
|  |  | method of operating and uses. |
| 17. | Marking of straight lines, circles, profiles | Safety precautions to be observed in a |
|  | and various geometrical shapes and cutting | sheet metal workshop, sheet and sizes, |
|  | the sheets with snips. Marking out of | Commercial sizes and various types of |
|  | simple development, marking out for flaps | metal sheets, coated sheets and their uses |
|  | for soldering and sweating. | as per BIS specifications. |
|  |  |  |
| 18- | Make various joints: wiring, hemming, | Marking and measuring tools, wing |
| 19. | soldering and brazing, form locked, | compass, Prick punch, tin man‟s square |
|  | grooved and knocked up single hem | tools, snips, types and uses. Tin man‟s |
|  | straight and curved edges form double | hammers and mallets type-sheet metal |
|  | hemming,. Punch holes-using hollow and | tools, Soldering iron, types, specifications, |
|  | solid punches. Do lap and butt joints. | uses. Trammel- description, parts, uses. |
|  |  | Hand grooves- specifications and uses. |
| 20. | Bend sheet metal into various curvature | Stakes-bench types, parts, their uses. |
|  | form, wired edges- straight and curves, | Various types of metal joints, their |
|  | fold sheet metal at angle using stakes. | selection and application, tolerance for |
|  | Bend sheet metal to various curvatures. | various joints, their selection & |
|  | Make simple | application. Wired edges - |
|  | Square, container with wired edge and fix |  |
|  | handle. |  |
| 21. | Make square tray with square soldered | Solders-composition of various types of |
|  | corner Practice in soft soldering and silver | solders, and their heating media of |
|  | soldering. | soldering iron, fluxes types, selection and |
|  |  | application-joints |
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| 22. | Make riveted lap and butt joint. |  | Rivets-Tin man‟s rivets types, sizes, and |
|  | Make funnel as per development and |  | selection for various works. |
|  | solder joints. |  | Riveting tools, dolly snaps description and |
|  | Drilling for riveting. Riveting with as many | uses. Method of riveting, shearing |
|  | types of rivet as available, use of counter | machine- description, parts and uses. |
|  | sunk head rivets. |  |  |
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| 23-25 |  | **Revision** |
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| 26 |  | **Examination** |
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**Second Semester**

**(Semester Code no. FTR - 02)**

**Duration : Six Month**

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| **Week** | **Trade Practical** |  | **Trade Theory** |
| **No.** |  |  |  |  |  |  |
| 1 | Welding - Striking and maintaining arc, |  | Safety-importance of safety and general |
|  | laying Straight-line bead. |  | 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 |  | Hand tools: Hammers, welding description, |
|  | joint-gas and arc. Do setting up of flames, |  | types and uses, description, principle, method |
|  | fusion runs with and without filler rod, and |  | of operating, carbon dioxide welding. H.P. |
|  | gas |  | welding equipment: description, principle, |
|  |  |  | method of operating L.P. welding equipment: |
|  |  |  | description, principle, method of operating. |
|  |  |  | Types of Joints-Butt and fillet as per BIS SP: |
|  |  |  |  |  |  |  |
|  |  |  | 46-1988 specifications. Gases and gas cylinder |
|  |  |  |  |  |
|  |  |  | description, kinds, main difference and uses. |
|  |  |  |  |
| 3 | Make butt weld and corner, fillet in arc |  | Setting up parameters for arc welding |
|  | 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 |  | Drill- material, types, (Taper shank, straight |
|  | M.S. flat, file radius and profile to suit |  | shank) parts and sizes. Drill angle-cutting angle |
|  | gauge. |  | 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 |  | Counter sink, counter bore and spot facing-tools |
|  | fit (three piece fitting). Form internal |  | and nomenclature, Reamer- material, types |
|  | threads with taps to standard size (through |  | (Hand and machine reamer), kinds, parts and |

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|  | holes and blind holes) – Drill through hole | their uses, determining hole size (or reaming), |
|  | and tap drill blind hole and tap, prepare | Reaming procedure. Screw threads: |
|  | studs and bolt. | 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 | Dies : British standard, metric and BIS |
|  | size. Prepare nuts and match with bolts. | standard, material, parts, types, Method of using |
|  |  | dies. Die stock: material, parts and uses. |
| 8 | Step fit, angular fit, file and make angle, | Drill troubles: causes and remedy. Equality of |
|  | surfaces (Bevel gauge accuracy 1 degree) | lips, correct clearance, dead centre, length of |
|  | make simple open and sliding fits. | lips. Drill kinds : Fraction, metric, letters and |
|  |  | numbers, grinding of drill. |
| 9 | Enlarge hole and increase internal dia. File | Grinding wheel: Abrasive, grade structures, |
|  | cylindrical surfaces. Make open fitting of | bond, specification, use, mounting and dressing. |
|  | curved profiles. | 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 | Radius gauge, feeler gauge, hole gauge, and |
|  | drilled hole. Test angular match up. | their uses. |
| 11 | Inside square fit, make combined open and | Interchangeability: Necessity in Engg, field |
|  | sliding fit, straight sides „T‟ fit. | 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 | Method of expressing tolerance as per BIS |
|  | sliding sides. File internal angles 30 | Fits : Definition, types description of each with |
|  | minutes accuracy open, angular fit. | 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 90o, | Cast Iron: manufacturing process by using |
|  | sliding fit with an angle. | (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. |
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| 14 | Make simple bracket by bending and | Non-ferrous metals (copper, aluminum, tin, |
|  | twisting of non-ferrous metal. Drill small | 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 |  | Counter sink, counter bore and spot facing-tools |
|  | fit (three piece fitting). |  | 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 |  | Simple scraper- cir., flat, half round, triangular |
|  | surfaces and scrap surface parallels and |  | and hook scraper and their uses. Blue matching |
|  | test. Make & assemble, sliding flats, plain |  | of scraped surfaces (flat and curved bearing |
|  | surfaces. Check for blue math of bearing |  | surfaces) |
|  | surfaces- both flat and curved surfaces by |  |  |
|  | witworth method. |  |  |
| 17 | File and fit combined radius and angular |  | Vernier micrometer, material, parts, graduation, |
|  | surface (accuracy ± 0.5 mm), angular and |  | use, care and maintenance. Calibration of |
|  | radius fit. Locate accurate holes. Make |  | measuring instruments |
|  | accurate hole for stud fit. |  | Introduction to mechanical fasteners and its |
|  | Fasten mechanical components / sub |  | uses. |
|  | assemblies together using screws, bolts and | Screw thread micrometer: Construction, |
|  | collars using hand tools. |  | graduation and use. |
|  |  |  |  |
| 18 | Cutting threads using dies. Make sliding |  | Dial test indicator, construction, parts, material, |
|  | fits assembly with parallel and angular |  | graduation, Method of use,. Care and |
|  | mating surface. (± 0.04 mm) |  | maintenance. Digital dial indicator. |
|  |  |  | Comparators-measurement of quality in the |
|  |  |  | cylinder bores. |
| 19 & | Simple repair work, simple assembly of |  | Preventive maintenance-objective and function |
| 20 | machine parts from blue prints. Rectify |  | of P.M., section inspection. Visual and detailed, |
|  | possible assembly faults during assembly. |  | 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 |  | Assembling techniques such as aligning, |
|  | and tap screw assembly using torque |  | bending, fixing, mechanical jointing, threaded |
|  | wrench. |  | 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 |

**Third Semester**

**(Semester Code no. FTR - 03)**

**Duration : Six Month**

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| **Week** | **Trade Practical** | **Trade Theory** |
| **No.** |
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|  | True job on four jaw chuck using | Safely precautions to be observed while |
|  | knife tool, face both the ends for | working on a lathe, Lathe specifications, |
|  | holding between centers, Using | and constructional features. Lathe main |
|  | roughing tool parallel turn ± O.1 mm. | parts descriptions- bed, head stock, carriage, |
| 01 | Measure the diameter using outside | tail stock, feeding and thread cutting |
|  | caliper and steel rule. | mechanisms. Holding of job between |
|  |  | centers, works with catch plate, dog, simple |
|  |  | description of a facing and roughing tool |
|  |  | and their applications. |
|  | Lathe operations- the facing, parting | Lathe cutting tools- Brief study of the |
|  | and form tools, plain turn, step turn, | nomenclature of Lathe cutting tools and |
|  | holding job in three jaw chuck- | necessity of correct grinding, solid and |
| 02 | deburr, chamfer-corner, round, the | tipped, throw away type tools, cutting speed |
|  | ends, Shoulder turn: square, filleted, | and feed and comparison for H.S.S., carbide |
|  | beveled undercut shoulder, turning- | tools. Use of coolants and lubricants. |
|  | filleted under cut, square beveled. |  |
|  | Cut grooves- square, round „V‟ | Chucks and chucking the independent four- |
|  | groove, Make a mandrel-turn | jaw chuck. Reversible features of jaws, the |
|  | diameter to sizes. Knurl the job. | back plate, Method of clearing the thread of |
| 03 |  | 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. |
|  | Bore holes –spot face, pilot drill, | General turning operations- parallel or |
|  | enlarge hole, using boring tools, | straight, turning. Stepped turning, grooving, |
|  | make a bush step bore-cut recess, | and shape of tools for the above operations. |
|  | turn hole diameter to sizes. | Appropriate method of holding the tool on |
| 04 | Turn taper (internal and external). | tool post or tool rest, Knurling: - tools |
| Turn taper pins. Turn standard tapers | description, grade, uses, speed and feed, |
|  |
|  | to suit with gauge. | coolant for knurling, speed, feed |
|  |  | calculation. |
|  |  | Taper – definition, use and |
|  |  | method of expressing tapers. Standard |
|  |  | tapers-taper, calculations morse taper. |
|  | Threading practice by using cut | Screw thread definition – uses and |
|  | threads using taps, dies on lathe by | application. Terminology of screw threads, |
|  | hand, „V‟ thread – external. Prepare a | square, worm, buttress, acme ( non |
|  | nut and match with the bolt. | standard-screw threads),Principle of cutting |
| 05 |  | 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. |
|  | Assembly sliding for using keys and | Screws: material, different types (inch & |
| 06 | dowel pin and screw, ± 0.02 mm | metric), uses |
|  | accuracy on plain surface. Testing of | Testing scraped surfaces: ordinary surfaces |
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|  | sliding fitting job, scrap on two flat | without a master plate. |
|  | surfaces and curved surfaces. |  |
|  | File & fit angular mating surface | Special files: types (pillar, Dread naught, |
| 07 | plain within an accuracy of ± 0.02 | Barrow, warding) description. |
| mm & angular 15 minutes angular |  |
|  |  |
|  | fitting. |  |
|  | Drill through and blind holes at an | System of drill size, Fractional size: |
|  | angle, using swivel table of drilling | number, letter and metric. Templates and |
| 08 | machine, Precision drilling, | gauges- Introduction, necessity, types. Limit |
|  | reaming and tapping. Test- Job.. | 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), |
|  |  |
|  | File and fit, combined fit with | Slip gauge: Necessity of using, |
|  | straight, angular surface with ± 0.02 | classification & accuracy, set of blocks |
|  | mm accuracy, hexagonal fitting. | (English and Metric). Details of slip gauge. |
|  | Check adherence to specification and | Metric sets 46: 103: 112. Wringing and |
|  | quality standards using equipments | building up of slip gauge and care and |
| 10 | like Vernier calipers, micrometers | maintenance. Application of slip gauges for |
|  | etc., | measuring, Sine bar-Principle, application |
|  |  | & specification. Procedure to check |
|  |  | adherence to specification and quality |
|  |  | standards. |
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|  | Drilling and reaming, small dia. holes | Locking device: Nuts- types (lock nut castle |
|  | to accuracy correct location for fitting | nut, slotted nuts, swam nut, grooved nut) |
| 11 | Make male and female fitting parts, | Description and use. |
|  | drill and ream holes not less than |  |
|  | 12.7 mm. |  |
|  | Sliding fitting, Diamond fitting, | Lapping: Application of lapping, material |
|  | Lapping flat surfaces using lapping | for lapping tools, lapping abrasives, |
|  | plate. | charging of lapping tool. Surface finish |
| 12 |  | importance, equipment for testing-terms |
|  |  | relation to surface finish. Equipment for |
|  |  | tasting surfaces quality – dimensional |
|  |  | tolerances of surface finish. |
|  | Stepped keyed fitting-test job. | Honing: Application of honing, material for |
| 13 | Lapping holes and cylindrical | honing, tools shapes, grades, honing |
| surfaces. | abrasives. Frosting- its aim and the methods |
|  |
|  |  | of performance. |
|  | Making a snap gauge for checking a | . Manufacture: The name and types of |
|  | dia of 10 ± 0.02 mm. | gauge commonly used in gauging finished |
| 14 |  | product-Method of selective assembly „Go‟ |
|  |  | system of gauges, hole plug basis of |
|  |  | standardization |
|  | Scrape angular mating surface, scrape | Bearing-Introduction, classification (Journal |
|  | on internal surface. | and Thrust), Description of each, ball |
| 15 |  | bearing: Single row, double row, |
|  |  | description of each, and advantages of |
|  |  | double row. |
| 16 | Practice in dovetail fitting assembly | Roller and needle bearings: Types of roller |
| and dowel pins and cap screws | bearing. Description & use of each |
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|  | assembly. |  | **Industrial visit.** |
|  | **Industrial visit.** |  |  |
|  | Preparation of gap gauges. |  | Synthetic materials for bearing: The plastic |
|  |  |  | laminate materials, their properties and uses |
| 17 |  |  | in bearings such as phenolic, teflon |
|  |  |  | polyamide (nylon). |
|  |  |  |  |
| 18 | Dovetail and Dowel pin assembly, |  | Method of fitting ball and roller bearings |
| scraps cylindrical bore. |  |  |
|  |  |  |
|  | Scrapping cylindrical bore and to |  | .. Bearing metals – types, composition and |
| 19 | make a fit-make a cotter jib |  | uses, lubricants purpose of using different |
|  | assembly. |  | types, description and uses of each type |
|  | Scrapping cylindrical taper bore, |  | . Hardening and tempering, purpose of each |
| 20 | check taper angle with sine bar, |  | method, tempering colour chart. |
| check in per angle (flat) with sine |  |  |
|  |  |  |
|  | bar. |  |  |
|  | Preparation of centre, squares, drills |  | Annealing and normalising, purpose of each |
|  | gauges. |  | method. |
| 21 | File and fit straight and angular |  |  |
|  | surfaces internally Identify different |  |
|  | ferrous metals by spark test |  |  |
| 22-23 | **Implant training** / Project work (work in a team) |
| 24-25 |  | **Revision** |
| 26 |  | Examination |

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|  |  |  |  | **Fourth Semester** |  |
|  |  | **(Semester Code no. FTR - 04)** |  |
|  |  |  | **Duration : Six Month** |  |
|  |  |  |
| **Week** | **Trade Practical** | **Trade Theory** |
| **No.** |  |  |  |  |  |  |  |  |
| 01. | „H‟ fitting- | Case hardening and carburising and its |
|  |  |  |  |  | methods, process of carburising (solid, liquid |
|  |  |  |  |  | and gas). |
| 02. | Exercises on lapping of gauges (hand | Solder and soldering: Introduction-types of |
|  | lapping only) | solder and flux. Method of soldering, Hard |
|  | Hand reams and fit taper pin, drilling | solder- Introduction, types and method of |
|  | and reaming holes in correct location, | brazing. |
|  | fitting dowel pins, stud, and bolts. | Production of gauges, templates and jigs. The |
|  | objective of importance for preparing |
|  |  |  |  |  |
|  |  |  |  |  | interchangeable components. |
|  |  |  |
| 03. | Simple jigs and fixtures for drilling. | Drilling jig-constructional features, types and |
|  | Prepare a „V‟ block and a clamp. | uses. Fixtures-Constructional features, types |
|  | Marking out as per Blue print, | and uses. |
|  | drilling, straight and curve filing. |  |  |  |  |
|  | Threading with die, cutting slot, and |  |  |  |  |
|  | cutting internal threads with taps, |  |  |  |  |
|  | making an adjustable spanner. |  |  |  |  |
|  |  |  |
| 04. | Flaring of pipes and pipe joints, | Pipes and pipe fitting- commonly used pipes. |
|  | Cutting & Threading of pipe length. | Pipe schedule and standard sizes. Pipe bending |
|  | Fitting of pipes as per sketch. | methods. Use of bending fixture, pipe threads- |
|  | Conditions used for pipe work to be | Std. Pipe threads Die and Tap, pipe vices. |
|  | followed. Bending of pipes- cold and |  |  |  |  |
|  | hot. |  |  |  |  |
| 05. | Practice-dismantling & assembling – | Standard pipefitting-. Methods of fitting or |
|  | globe valves sluice valves, stop | replacing the above fitting, repairs and erection |
|  | cocks, seat valves and non-return | on rainwater drainage pipes and house hold taps |
|  | valve, fitting of pipes and testing for | and pipe work. Use of tools such as pipe |
|  | leakage. | cutters, pipe wrenches, pipe dies, and tap, pipe |
|  |  |  |  |  | bending machine etc. |
| 06. | Practice in handling Fire | Fire precautions-causes and types of fires, |
|  | extinguishers of different types, | precautions against out break of fire. Fire |
|  | refilling of extinguishers. | Extinguishers-types and use. |
| 07. | Marking detail includes male & | Working material with finished surface as |
|  | female screw cutting, male and | aluminium, duralumin, stainless steel, the |
|  | female fitting parts. Making and | importance of keeping the work free from rust |
|  | tempering springs. | 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 its alloys. Uses, advantages and |
|  | aluminium and stainless steel, | disadvantages, weight and strength as compared |
|  | marking out, cutting to size, drilling | with steel. |
|  | etc. without damage to surface of |  |
|  | finished articles. |  |
| 09. | Marking out for angular outlines, | Tapers on keys and cotters permissible by |
|  | filing and fitting the inserts into gaps. | various standards. Discuss non-ferrous metals |
|  | Making a simple drilling jig, Marking | as brass, phosphor bronze, gunmetal, copper, |
|  | out, filing to line, drilling and tapping | aluminium etc. Their composition and purposes |
|  | brass and copper jobs. | where and why used, advantages for specific |
|  |  | purposes, surface wearing properties of bronze |
|  |  | and brass. |
| 10. | Complete exercises covering the | Power transmission elements. The object of |
|  | assembly of parts working to detail | belts, their sizes and specifications, materials of |
|  | and arrangement – Drawings, | which the belts are made, selection of the type |
|  | Dismantling and mounting of pulleys. | of belts with the consideration of weather, load |
|  | Making replacing damaged keys. | and tension methods of joining leather belts. |
|  | Repairing damaged gears and |  |
|  | mounting. Repair & replacement of | Vee belts and their advantages and |
|  | belts. | disadvantages, Use of commercial belts, |
|  |  | dressing and resin creep and slipping, |
|  |  | calculation. |
| 11. | Complete exercises covering the | Power transmissions, coupling types-flange |
|  | assembly of parts working to details | coupling,-Hooks coupling-universal coupling |
|  | and arrangements as per drawings. | and their different uses. |
|  | Dismantling and mounting of pulleys. |  |
|  | Making, replacing damaged keys. |  |
|  | Repairing damaged gears and |  |
|  | mounting them on shafts. |  |
| 12. | More difficult work in marking out | Pulleys-types-solid, split and „V‟ belt pulleys, |
|  | including tangents, templates | standard calculation for determining size |
|  | involving use of vernier protractor. | 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 | Method or fixing geared wheels for various |
|  | repairs to geared teeth. Repair of | purpose drives. General cause of the wear and |
|  | broken gear tooth by stud. Repair | tear of the toothed wheels and their remedies, |
|  | broker gear teeth by dovetail. | 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 - | Marking out on the round sections for | Lubrication and lubricants- Method of |
| 16 | geometrical shaped fittings. Finishing | lubrication. A good lubricant, viscosity of the |
|  | and fitting to size, checking up the | lubricant, Main property of lubricant. How a |
|  | faces for universality. | 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 | Importance of Technical English terms used in |
|  | documentation as per industrial need | industry –(in simple definition only)Technical |
|  | by different methods of recording | forms, process charts, activity logs, in required |
|  | information. | formats of industry, estimation, cycle time, |
|  |  | productivity reports, job cards. |
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| 18 | Inspection of Machine tools. | Installation, maintenance and overhaul of |
| & | Accuracy testing of Machine tools. | machinery and engineering equipment and |
| 19 |  | Hydraulics & pneumatic symbols & exercise. |
|  |  | Hydraulics pneumatic circuits. Clutch: Type, |
|  |  | positive clutch (straight tooth type, angular |
|  |  | tooth type) . |
| 20. | Study of power transmission system | Washers-Types and calculation of washer sizes. |
|  | in machine tools. | 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 | Foundation bolt: types (rag, Lewis cotter bolt) |
|  | of packing gaskets, use of hollow | description of each erection tools, pulley block, |
|  | punches, extractor ,drifts, various | crow bar, spirit level, Plumb bob, pipe 2 X 4‟, |
|  | types of hammers and spanners, etc. | 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 |