

ANNUAL INSTRUCTIONAL PLAN
FITTER (2ND YEAR – 42 WEEKS)

Curriculum as per DGT / CSTARI Guidelines for Fitter Trade (CTS 2.0 / NSQF Level-4)

Trade Name	FITTER (Engineering Trade)
NSQF Level & Duration	NSQF Level-4 Two Years (Second Year - 42 Weeks)
Academic Session	20____ - 20____
Institute Name & Address	
Instructor Name & Designation	
Group Instructor (GI) Name	
Principal / Supt. Name	

WEEKLY INSTRUCTIONAL PLAN (WEEK 01 TO WEEK 42)

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
WEEK 01	Precision Fastening & 'H' Fitting: 1. Make 'H' fitting. 2. Power tools: Practice operation of power tool for fastening. 3. Tightening of bolt/screw with specified torque. 4. Selection of right tool for tightening or loosening as per accessibility.	Threaded Fasteners & Power Tools: 1. Screws: material, designation, specifications, Property classes (e.g. 9.8 on screw head). 2. Tools for tightening/loosening of screws/bolts, Torque wrench, screw joint calculations. 3. Power tools: constructional features, uses & maintenance.
WEEK 02	Sliding Assembly & Angular Fitting: 1. Assembly sliding for using keys, dowel pin and screw, ± 0.02 mm accuracy on plain surface and testing of sliding fitting job. 2. File & fit angular mating surface within accuracy of ± 0.02 mm & 10 minutes angular fitting.	Locking Devices & Keys: 1. Locking devices: Nuts - types (lock nut, castle nut, slotted nut, swan nut, grooved nut), description and uses. 2. Various types of keys, allowable clearances & tapers, types, uses of key pullers. 3. Special files: types (pillar, Dread naught, Barrow, warding) description & uses.
WEEK 03	Angular Drilling & Dovetail Fitting: 1. Drill through and blind holes at an angle using swivel table of drilling machine. 2. Precision drilling, reaming and tapping and Test-Job. 3. Make Dovetailed fitting and radius fitting.	Gauges & Precision Tools: 1. Templates and Radius/fillet gauge, feeler gauge, hole gauge, and their uses, care and maintenance. 2. Slip gauge: Necessity of using, classification & accuracy, set of blocks (English and Metric). 3. Details of slip gauge. Metric sets 46: 103: 112. Wringing and building up of slip gauge, care and maintenance.
WEEK 04	Sine Bar Inspection & Combined Fit: 1. File and fit, combined fit with straight, angular surface with ± 0.02 mm accuracy using Vernier calipers, micrometers. 2. Drilling and reaming, small dia. holes to accuracy & correct location for fitting. 3. Perform drilling using 'V' block and a clamp.	Sine Bar & Quality Standards: 1. Application of slip gauges for measuring, Sine Bar - Principle, application & specification. 2. Procedure to check adherence to specification and quality standards.
WEEK 05	Diamond Fitting & Flat Lapping: 1. Make male and female fitting parts, drill and ream holes not less than 12.7 mm. 2. Make Sliding Diamond fitting. 3. Lap flat surfaces using lapping plate.	Lapping & Surface Texture: 1. Lapping: Application of lapping, material for lapping tools, lapping abrasives, charging of lapping tool. 2. Surface finish importance, equipment for testing - terms relation to surface finish. 3. Equipment for testing surfaces quality - dimensional tolerances of surface finish.
WEEK 06	Keyed Fitting & Honing: 1. Prepare Stepped keyed fitting and test job. 2. Lapping holes and cylindrical surfaces. 3. Dovetail and Dowel pin assembly.	Honing & Frosting: 1. Honing: Application of honing, material for honing, tools shapes, grades, honing abrasives. 2. Frosting - its aim and the methods of performance.
WEEK 07	Bore Scraping & Heat Treatment: 1. Scrape cylindrical bore. 2. Scraping cylindrical bore and to make a fit. 3. Scraping cylindrical taper bore and check taper angle with sine bar.	Heat Treatment Processes: 1. Metallurgical and metal working processes such as Heat treatment, various heat treatment methods - normalizing, annealing, hardening and tempering. 2. Purpose of each method, tempering colour chart. 3. Annealing and normalizing, Case hardening and carburising and its methods (solid, liquid, gas).
WEEK 08	Cotter Jib Assembly & Protective Coatings: 1. Make a cotter jib assembly. 2. Hand reams and fit taper pin. 3. Drilling and reaming holes in correct location, fitting dowel pins, stud, and bolts.	Cotters & Surface Coatings: 1. Tapers on keys and cotters permissible by various standards. 2. The various coatings used to protect metals, protection coat by heat and electrical deposit treatments. 3. Treatments to provide a pleasing finish such as chromium silver plating, nickel plating and galvanizing.

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WEEK 09	Snap Gauge Fabrication & Selective Assembly: 1. Making a snap gauge for checking a dia. of 10 ± 0.02 mm. 2. Scrape external angular mating surface and check angle with sine bar.	Gauging Systems & Standardization: 1. Gauges and types of gauge commonly used in gauging finished product - Method of selective assembly. 2. 'Go' system of gauges, hole plug basis of standardization.
WEEK 10	Internal Surface Scraping & Ball Bearings: 1. Scrape on internal surface and check. 2. Practice in dovetail fitting assembly and dowel pins and cap screws assembly.	Anti-Friction Bearings (Ball Bearings): 1. Bearing - Introduction, classification (Journal and Thrust), Description of each. 2. Ball bearing: Single row, double row, description of each, and advantages of double row.
WEEK 11	Roller Bearings & Gap Gauges: 1. Preparation of gap gauges. 2. Perform lapping of gauges (hand lapping only). 3. Industrial visit to study precision bearing applications.	Roller Bearings & Mounting: 1. Roller and needle bearings: Types of roller bearing, description & use of each. 2. Method of fitting ball and roller bearings.
WEEK 12	Drill Gauges & Bearing Materials: 1. Preparation of drill gauges. 2. File and fit straight and angular surfaces internally. 3. Identify different ferrous metals by spark test.	Bearing Metals & Spark Testing: 1. Bearing metals - types, composition and uses. 2. Synthetic materials for bearing: The plastic laminate materials, properties and uses in bearings such as phenolic, Teflon polyamide (nylon). 3. The importance of keeping the work free from rust and corrosion.
WEEK 13	Pipe Cutting, Threading & Standard Sizes: 1. Flaring of pipes and pipe joints. 2. Cutting & Threading of pipe length. 3. Fitting of pipes as per sketch observing conditions used for pipe work.	Pipes & Pipe Fittings: 1. Pipes and pipe fitting - commonly used pipes, Pipe schedule and standard sizes. 2. Pipe bending methods, Use of bending fixture. 3. Pipe threads - Std. Pipe threads Die and Tap, pipe vices.
WEEK 14	Pipe Bending & Valve Servicing: 1. Bending of pipes - cold and hot. 2. Dismantling & assembling - globe valves, sluice valves, stop cocks, seat valves and non-return valve.	Pipe Tools & Valves: 1. Use of tools such as pipe cutters, pipe wrenches, pipe dies, and tap, pipe bending machine etc. 2. Construction and working of valves: globe, sluice, check, and seat valves.
WEEK 15	Pipe Assembly, Leak Testing & SPC: 1. Fit & assemble pipes, valves and test for leakage & functionality of valves. 2. Visual inspection for visual defects e.g. dents, surface finish. 3. Measuring, checking and recording in control chart.	Plumbing Repairs & Quality Control: 1. Standard pipefitting - Methods of fitting or replacing the above fitting, repairs and erection on rainwater drainage pipes and household taps and pipe work. 2. Inspection & Quality control - Basic SPC, Visual Inspection.
WEEK 16	Drill Jigs & Fixtures: 1. Make a simple drilling jig. 2. Use simple jigs and fixtures for drilling.	Jigs & Fixtures Theory: 1. Drilling jig - constructional features, types and uses. 2. Fixtures - Constructional features, types and uses.
WEEK 17	Non-Ferrous Fitting: 1. Marking out for angular outlines, filing and fitting the inserts into gaps. 2. Exercises on finished material such as aluminium/brass/copper/stainless steel, marking out, cutting to size, drilling, tapping without surface damage.	Non-Ferrous Alloys: 1. Aluminium and its alloys: Uses, advantages and disadvantages, weight and strength as compared with steel. 2. Nonferrous metals such as brass, phosphor bronze, gunmetal, copper: composition and purposes, surface wearing properties of bronze and brass.
WEEK 18	Adjustable Spanner & Flat Belt Transmission: 1. Making an adjustable spanner: - Marking out as per Blueprint, drilling, cutting, straight and curve filing, threading, cutting slot and internal threads with taps.	Power Transmission Belts: 1. Power transmission elements: The object of belts, their sizes and specifications, materials of which the belts are made. 2. Selection of belt type with consideration of weather, load and tension, methods of joining leather belts.

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WEEK 19	Pulleys, V-Belts & Key Maintenance: 1. Dismantling and mounting of pulleys. 2. Making & replacing damaged keys. 3. Repair & replacement of belts and check for workability.	V-Belts, Pulleys & Couplings: 1. Vee belts and their advantages and disadvantages, use of commercial belts, dressing and resin creep and slipping calculation. 2. Power transmissions - coupling types: flange coupling, Hooke's coupling, universal coupling. 3. Pulleys - types: solid, split and 'V' belt pulleys, crowning of faces, loose and fast pulleys, jockey pulley.
WEEK 20	Gear Inspection & Involute Profiles: 1. Making of template/gauge to check involute profile. 2. Dismounting, repairing damaged gears and mounting and check for workability.	Spur Gears & Belt Drives: 1. Types of drives - open and cross belt drives, geometrical explanation of belt drives at an angle. 2. Clutch: Type, positive clutch (straight tooth type, angular tooth type), Chains and wire ropes. 3. Power transmission by gears: spur gear essential parts, pitch circles, diametral pitch, velocity ratio of gear set.
WEEK 21	Gear Teeth Repair & Slide Fitting: 1. Repair of broken gear tooth by stud and repair broken gear teeth by dovetail. 2. Make hexagonal slide fitting.	Advanced Gearing & Maintenance: 1. Helical gear, herringbone gears, bevel gearing, spiral bevel gearing, hypoid gearing, pinion and rack, worm gearing, velocity ratio of worm gearing. 2. Repair of gear teeth by building up and dovetail method. 3. Method of fixing geared wheels, general causes of wear and tear and remedies, care and maintenance of gears.
WEEK 22	Industrial Documentation & Spline Fitting: 1. Prepare different types of documentation as per industrial need by different methods of recording information. 2. Marking out on the round sections for geometrical shaped fittings such as spline with 3 or 4 teeth. Finishing and fitting to size, checking up faces for universality.	Industrial Records & Fluid Power Intro: 1. Importance of Technical English terms used in industry, technical forms, process charts, activity logs, cycle time, productivity reports, job cards. 2. Fluid power, Pneumatics, Hydraulics, and their comparison. 3. Overview of a pneumatic system, Boyle's law; Overview of an industrial hydraulic system, Applications, Pascal's Law.
WEEK 23	Pneumatic Components & FRL Servicing: 1. Identify pneumatic components - Compressor, pressure gauge, Filter-Regulator-Lubricator (FRL) unit, and valves and actuators. 2. Dismantle, replace, and assemble FRL unit. 3. Demonstrate knowledge of safety procedures in pneumatic systems and Personal Protective Equipment (PPE).	Compressed Air & Actuators: 1. Compressed air generation and conditioning, Air compressors, Pressure regulation, Dryers, Air receiver, Conductors and fittings, FRL unit. 2. Applications of pneumatics, Hazards & safety precautions in pneumatic systems. 3. Pneumatic actuators: Types, Basic operation, Force, Stroke length, Single-acting and double-acting cylinders.
WEEK 24	Pneumatic Control Circuits: 1. Identify parts of pneumatic cylinder; dismantle and assemble a pneumatic cylinder. 2. Construct a circuit for direction & speed control of small-bore single-acting (s/a) pneumatic cylinder. 3. Construct control circuit for d/a pneumatic cylinder with momentary input signals.	Pneumatic Valves: 1. Pneumatic valves: Classification, Symbols of pneumatic components. 2. 3/2-way valves (NO & NC types) (manually-actuated & pneumatically-actuated) & 5/2-way valves. 3. Check valves, Flow control valves, One-way flow control valve.
WEEK 25	Electro-Pneumatics: 1. Construct a circuit for direct & indirect control of d/a pneumatic cylinder with single & double solenoid valve. 2. Dismantling & assembling of solenoid valves.	Logic Valves & Electro-Pneumatics: 1. Pneumatic valves: Roller valve, Shuttle valve, Two-pressure valve. 2. Electro-pneumatics: Introduction, 3/2-way single solenoid valve, 5/2-way single solenoid valve, 5/2-way double solenoid valve. 3. Control components: Pushbuttons (NO & NC type), Electromagnetic relay unit, Logic controls.

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
WEEK 26	Hydraulic Components & Safety: 1. Demonstrate knowledge of safety procedures in hydraulic systems (Demo by video). 2. Identify hydraulic components - Pumps, Reservoir, Fluids, Pressure relief valve (PRV), Filters, valves, actuators, and hoses. 3. Inspect fluid levels, service reservoirs, clean/replace filters.	Hydraulic Oils & Reservoirs: 1. Symbols of hydraulic components, Hydraulic oils - function, properties, and types, Contamination in oils and its control. 2. Hydraulic Filters - types, constructional features, typical installation locations, cavitation, Hazards & safety precautions. 3. Hydraulic reservoir & accessories.
WEEK 27	Hydraulic Pumps & Hoses: 1. Inspect hose for twist, kinks, and minimum bend radius, Inspect hose/tube fittings. 2. Identify internal parts of hydraulic cylinders, pumps/motors.	Pumps, PRVs & Hydraulic Hoses: 1. Pumps: Classification - Gear/vane/piston types. 2. Pressure relief valves - Direct acting and pilot-operated types. 3. Pipes, tubing, Hoses and fittings - Constructional details, Minimum bend radius, routing tips for hoses.
WEEK 28	Hydraulic Circuit Construction: 1. Construct a circuit for control of s/a hydraulic cylinder using 3/2-way valve (Weight loaded d/a cylinder may be used as s/a cylinder), 4/2 & 4/3-way valves.	Hydraulic Actuators & Directional Valves: 1. Hydraulic cylinders - Types; Hydraulic motors - Types. 2. Hydraulic valves: Classification, Directional Control valves - 2/2- and 3/2-way valves. 3. Hydraulic valves: 4/2- and 4/3-way valves, Centre positions of 4/3-way valves.
WEEK 29	Hydraulic Check Valves & Speed Control: 1. Maintenance, troubleshooting, and safety aspects of pneumatic and hydraulic systems (video demonstration). 2. Construct speed control circuits using meter-in and meter-out flow control valves.	Flow Control & Fluid Diagnostics: 1. Check valves and Pilot-operated check valves, Load holding function. 2. Flow control valves: Types, Speed control methods meter-in and meter-out. 3. Preventive maintenance & troubleshooting of pneumatic & hydraulic systems, System malfunctions due to contamination, leakage, friction, improper mountings, cavitation, and sampling of hydraulic oils.
WEEK 30	Lathe Carriage Overhaul: 1. Dismantle, overhauling & assemble cross-slide & hand-slide of lathe carriage. 2. Simple repair of machinery: - Making of packing gaskets.	Lubrication Systems & Machine Overhaul: 1. Method of lubrication - gravity feed, force (pressure) feed, splash lubrication. 2. Cutting lubricants and coolants: Soluble oil soaps, suds, paraffin, common lubricating oils and commercial names, selection of lubricants. 3. Washers - Types and calculation of washer sizes; The making of joints and fitting packing.
WEEK 31	Mechanical Fastener Replacement: 1. Check washers, gasket, clutch, keys, jibs, cotter, Circlip, etc. and replace/repair if needed. 2. Use hollow punches, extractor, drifts, various types of hammers and spanners, etc. for repair work.	Washers & Maintenance Tools: 1. Washers: spring, plain, tab, star washers; calculation of washer sizes. 2. Specialty repair tools: stud extractors, bearing pullers, drifts. 3. Circlips: internal/external circlip selection and fitting.
WEEK 32	Bearing Overhaul & Inspection: 1. Dismantling, assembling of different types of bearing and check for functionality. 2. Perform routine check of machine and do replenish as per requirement.	Lubricant Properties & Hydrodynamic Film: 1. Lubrication and lubricants - purpose of using different types, description and uses of each type. 2. A good lubricant, viscosity of the lubricant, Main properties of lubricant. 3. How a film of oil is formed in journal Bearings.
WEEK 33	Machine Tool Alignment & Levelling: 1. Inspection of Machine tools such as alignment, levelling.	Geometrical Alignment Testing: 1. Accuracy testing of Machine tools such as geometrical parameters. 2. Machine tool testing: levelling using precision spirit level, straightness, parallelism. 3. Permissible geometrical tolerances for machine tools.

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WEEK 34	Geometrical Accuracy Testing: 1. Accuracy testing of Machine tools: test mandrel checks, face plate truing, cross-slide perpendicularity.	Standard Accuracy Charts & Vibration: 1. Standard test charts for machine tool accuracy (lathe, pillar drill). 2. Vibration analysis basics and mounting adjustments for machine tools.
WEEK 35	Rigging, Slings & Knots: 1. Practicing, making various knots, correct loading of slings, correct and safe removal of parts.	Rigging & Slings: 1. The slings and handling of heavy machinery, special precautions in the removal and replacement of heavy parts. 2. Wire rope, manila rope, wooden block, crowbar, plumb bob.
WEEK 36	Lifting Appliances & Foundations: 1. Operation of pulley block, crowbar, jacks, extractor presses, plumb bob, spirit level.	Foundation Bolts & Mechanical Advantage: 1. Foundation bolt: types (Lewis cotter bolt) description of each, erection tools, pulley block, spirit level. 2. The use of lifting appliances, extractor presses and their use. 3. Practical method of obtaining mechanical advantage.
WEEK 37	Machine Erection (Part I): 1. Positioning, levelling, and foundation alignment for simple machine erection (lathe/drill machine).	Machine Installation Steps: 1. Machine installation steps: civil foundation preparation, vibration isolation pads, anchor bolt placement. 2. Grouting mixtures and curing procedures.
WEEK 38	Machine Erection (Part II) & Commissioning: 1. Final tightening of foundation bolts, alignment verification, trial test run, and commissioning of erected machine tool.	Commissioning & Handover: 1. Pre-commissioning checklists, electrical connection verification, no-load and load trial runs, handover protocols.
WEEK 39	On the Job Training (OJT) / Group Project Work	On the Job Training (OJT) / Group Project Work
WEEK 40	On the Job Training (OJT) / Group Project Work	On the Job Training (OJT) / Group Project Work
WEEK 41	On the Job Training (OJT) / Group Project Work	On the Job Training (OJT) / Group Project Work
WEEK 42	On the Job Training (OJT) / Group Project Work	On the Job Training (OJT) / Group Project Work

APPROVAL & SIGNATURES

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Sign of Instructor	Sign of Group Instructor (GI)	Sign of Superintendent / Principal