SYLLABUS FOR FITTER

GENRAL INFORMATION

1.	**Name of the Trade**	**:**	**FITTER**
2.	**N.C.O. Code No.**	**:**	**842.10, 842.15.**
3.	**Entry Qualification.**	**:**	**Passed in VIII Class Examination under 10 + 2 System of education**
or			**its equivalent.**
4.	**Duration of Craftsman**	**:**	**Two years.**
5.	**Duration of Apprenticeships**	**:**	**3 years including Basic Training of one year.**
6.	**Rebate to Ex-I.T.I Trainees**	**:**	**(a) 2years for Ex-ITI Fitter** **(b) 1 year for Ex-ITI** **(c) 2 years for Ex-ITI Tool and Die Maker.**
7.	**Ratio of Apprentices to Workers .**	**:**	**1 : 7**

WEEK NO.	PRACTICAL	THEORY	ENGINEERING DRWAING	WORKSHOP SCIENCE AND CALCULATION
1	2	3	4	5
1	Familiarization with the institute , Impotence of trade training , Machinery used in the trade , types of work done by trainees in the trade, introduction o safety equipment and their uses	Importance of softy and general precaution observed in the institute and in the section. Importance of the trade in the development of industrial economy of the county .What is the related instructions subject to the taught parchment to made . Recreational, medical facilities and other extra curricular activities of the institute.(All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute System included stores procedures.		
2	Marking out lines gripping suitable in vice jaws, hacks awing to given dimension sawing different types of metals of different types of metals of different sections.	Safety accident prevention linear measurements its units dividers, calipers, hermaphrodite, calipers, hermaphrodite, center punch, dot punch dot punch, their description and uses of different types of hammers, description, use and care of 'v' Blocks, marking off table.	Engg. Drawing introduction to Engg. Drawing its importance.	Introduction properties and uses of C.I and W.I
3	Filing Channel Parallel Filing Flat and Square (Rough Finish.)	Bench vice construction, types, uses care & maintenance, vice clamps, hacksaw frames and blades specification description, types and their uses, method of using hacksaws.	Types of lines their meaning & application as per IS-696	Arithmetic: Fundamental operations, addition, subtraction. Multiplication, division decimals number.
4	Filing practice, surface filing marking off straight and parallel lines	Files specification, description, materials grads, cuts file elements uses, Measuring standards (English	Simple conventional symbols for material and	Properties and uses of plain carbon steel and alloy steel.

	with odd leg calipers and steel rule, marking practice with dividers odd leg calipers and	Metric Units)angular measurements subdivision, try square, or depth gauge protractor description, use and care	parts as per IS-696	
5	Marking off straight lines and arcs using scribing block and dividers chipping flat surfaces along a marked line.	Marking off and lay out tools, dividers, scribing block, odd leg calipers, punches description, classification material care & maintenance.	Use or drawing instruments in the construction of Geometrical drawing angles. Triangles.	Fraction and decimals conversion fraction to decimal and vice-versa.
6	Marking, filing, filing square, use of tri-square.	Calipers types material constructional details, uses care & maintenance of cold chisels, materials, Types, cutting angles.	Geometrical construction of rectangles, square, circles.	Properties and uses of copper, zinc, lead, tin, aluminum.
7.& 8	Marking according to simple blue prints locating position of holes scribing lines on chalked surfaces with making tools finding centre of round bar with the help of “V” block and marking block. Joining St. line to and arc.	Marking media marking blue Prussian blue-red lead, chalk and their special application description. Use, care and maintenance of scribing block.	Geometrical construction of polygons and ellipse, parabola & hyper-bola.	Composition, properties and uses of brass, solder, bearing, metal, timber, rubber, etc.
9	Chipping chip slots & oils grooves (Straight.)	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.	Geometrical construction of involutes, oval, and helix.	System of units, British, metric and SI units for length area, volume, capacity, weight time, angle, their conversions.
10	Filing flat, square, and parallel to an accuracy of 0.5 mm. Chip curve along a line-mark out, key ways at various angles & cut key ways.	Types of files convening taper, needle care and maintenance of files, various types of keys, allowable clearances & tapers; types, uses of key pullers.	---do---	Effect of alloying elements on the property of C.I. & steel.
11	File thin metal to and accuracy of 0.5 mm. chip chamfer.	Physical properties of engineering metal : color, weight, structure,	Free hand sketching of st. lines, rectangles,	Unit of temperature force & related

	Grooves and slots.	conductivity, magnetic, fusibility specific gravity, fusibility specific gravity. Mechanical properties: ductility, malleability hardness, brittleness, toughness, tenacity, elasticity.	circles, square, polygons, ellipse.	problems.
12	Saw along a straight line curved line, on different section of metal. Straight saw on thick section. M.S angle and pipes.	-----do-----	Free hand sketching of simple geometrical solids cube, cone, prism, cylinder, sphere pyramids.	Mass, volume density, sp. Gravity & specific weight S.I. M.K.S. and F.P.S. units of force, weight etc. their conversion to related problems.
13	File steps and finish with smooth file accuracy =0.25 mm. File and saw on M.S. Square and pipe weds.	Micrometer outside and inside principle constructional features, parts graduation reading, use and care. Micrometer depth gauge, parts, graduation, reading, use and care.	Standard printing style for letters and numbers as per IS:696	Mass, volume, density, weight. S.I., M.K.S and F.P.S. units of force weight etc. their conversion to related problems.
	Industrial Visit	Industrial Visit	Industrial Visit	Industrial Visit
ACHIEVMENT; The trainee should be able to: 1 Use fitters hand tools. 2 Do simple marking out according to simple Blue print. 3 Do filing\hack sawing and chipping.				
14	File radius along a marked line (Convex & Concave) & match. 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.	Free hand practice of printing style for standard letters & numbers.	Inertia, rest and motion velocity and acceleration.
15	Punch letter and number (letter number punch) Use of different punches.	Drill holding devices: material, construction and their uses. Drill processes: Common type (bench type, pillar type) gang and multiple drilling machine.	Scales construction of plain scale. Representing fraction.	Concept of scalar and vector quantity with examples, Newton's Law of motion.
16	Prepare forge. Fire for heating metals Forge a square rod from found stock. Judge the forging temperature of various metals.	Safety precautions to be observed in a smith shop forge: Necessity, description uses, fuel used for heating, bellows blowers description and uses.	Construction of diagonal scale.	Revision &Test power and roots Factor, power base exponents number
17	Forge M.S. bar to	Anvil and swage blocks	Simple	Multiplication

	square Octagon and hexagon.	Description and uses Forging tools hammers band and sledge description and uses. Chisels, set hammers, flatters, hardier, fuller swage & uses.	dimensioning technique size and location dimension for parts, holes angles , taper, screw etc. as per IS : 696	and division of power and root of a number.
19	Forge punches, screw drivers, chisels, grind them to shape and heat treat to requirement, bending metals to angles, curves & twisting , Preparation of brackets	Heat treatment necessary various heat treatment methods such as normalizing annealing, hardening and tempering. Power hammer construction feature ,method of operating and uses.	Pictorial drawings isometric drawings of simple geometrical solids.	Work energy and power ,their units and applied problems.
20	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 precaution to be observed in a sheet metal work-shop sheet and size. Commercial sizes and various types of metal sheets coated sheets and their uses as per ISI specifications.	-do-	-do-
21	Make various joints, wiring hemming, soldering and brazing from locked, grooved and knocked up single hem straight and curved edges from 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, stakes-bench types , parts their uses. Soldering iron ,types, specifications, uses. Trammel, description ,parts, uses. Hand grooves specifications and uses.	Oblique projection of simple geometric-al solids.	Percentage, changing percentage to decimal and fraction and vice-versa. Applied problems.

22	Bend sheet metal into various curvature - form wired edges straight & curves fold sheet metal at an angle using stakes ,Bend sheet metal to various curvature make simple square – container with wired edge and fix handle .	Solders – composition of various types of solders and their heating media of soldering iron . fluxes : types ,selection and application – joints wiring various types of metals joints, their selection and application tolerance for various joints, their selection and application.	Oblique projection of simple geometrical solids.	Problem on percentage related to trade .
23	Make square tray with square soldered corner make funnel as per development & solder joints. Make riveted left & belt joint.	Rivets – tin man's rivets , types, size, selection for various work. Riveting tool, dolly, snaps, descriptions and uses. Method of riveting shearing machine description, parts and uses	Isometric drawing of simple machined and testing blocks	Different types of load, stress, strain modulus of elasticity
24	Striking and maintaining arc, straight line head	Safety – importance of safety &general precaution observed in a welding shop.precaution in electric & gas welding(before,during,after) introduction to safety equipment and their uses	Isometric drawing of simple machine and casting block s	Altimate strength different types of stress, factor safety examples.
25	Make squarae butt joint and 'T' fillet joint-gas and arc.do setting up of flames, fusion runs with and without filler rod,gas and arc.	Hand tools:hammers,welding description, types and uses, machine and accessories welding transformer, welding generators, description principle, merhod of operating		
26	Make square batt joint and 'T' fillet joint-gas and arc.	H.P.welding equipment description, principle method of operating L.P welding equipment, description, principle, method of operating types: joints-Butt and fillet as per BIS specifications.	Free hand sketches of trade related hand tools measuring tools.	Ratio & proportion, Ratio, finding forms and ratio proportions, direct proportion and indirect proportion.

27	Do gas cutting.	Oxygen cutting machine description, parts, uses, method of handling cutting torch-description, parts function and uses. Gases and gas cylinder description. Kinds main difference and uses	-------do-----	Application of ratio and proportion to related problems.
	Industrial Visit	Industrial Visit	Industrial Visit	Industrial Visit
	ACHOEVEMENT:	The trainee should be able to do:		
		1. Simple jumping, drawing and bending.2. Simple heat treating operations like hardening, tempering and annealing. 3. Simple square container, round container with wired edge and fit handle. 4. Rivet lap and butt joint. 5. Butt and fillet welds-gas and arc. 6. Gas cutting.		
28	True job on four jaw chuck using knife tool face both the ends for holding between centres. Using roughing tool parallel turn=0.1 mm. Measure the diameter using outside caliper and steel rule.	Safety 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. Between centre work catch plate, dig, simple description of a facing and roughing tool and their applications.		Simple machines-principle velocity ratio mechanical advantage, efficiency simple problems.

29	Grind 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 under cut shoulders.	Lathe cutting tools Brier study of the ncmenclature of Lathe cutting tools and necessity of correct grinding, solid and tipped, throw away type tools cutting speed and feed and comparison for H.H.S., carbide tools. Use of coolants and lubricants.	Machines basic principles, velocity, ratio, mechanical advantage, efficient, simple problems.	Simple machnes principle velocity ratio mechanical advantage, efficiency. Symple problems.
30	Cut groves 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 in method of holding drills in the tail stock, Boring tools and enlarement of holes.	Orthographic drawings, application of both the first angle and third angle. Method in representing the drawing for simple and complex machine given for exercises with dimensions.	Algebraic symbols fundamental algebra operations. Sign and symbols use in algebra coefficient terms. And unlike terms.
31	Bore holes-spot face, pilot drill, enlarge hole, using boring tools make a bush. Step bore-cut recess turn hole diameter to sizes.	General turning operations parallel or straight, turning. Stepped turning grooving, 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.	--------do-------	Algebraic addition,sub-traction, multiplication and division.

32	Turn taper (internal and external.) Turn taper pins. Turn standard tapers to suit with Gauge.	Taper-definition use and method of expressing tapers. Standard tapers-taper calculations.	Orthographic drawings application of both the first angle and third andgle. Method in representing the drawings for simple and simple and complex machine blocks given for exercise with dimensions.	Power and exponent Laws of exponent
33	Cut threads using taps & dies on lathe by hand cut “V” thread-external. Prepare a nut and match with. The bolt.	Screw thread definition-uses and application. Terminology of screw threads, square worm buttress (non standard-scres threads), Principle of cutting screw thread in centre lathe principle of chasing scres thread-use of centre gauge setting tool for cutting internal and external thread cutting use of screw pitch gauge checking the screw thread.	-----do----	Algebraic simplification problems.
34	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.	Standard method of sectioning as per IS : 696 Exercises for different sectional views on the given orthographic drawing of machine parts, castings etc.	Simple machines like winch pulley and compound axle etc.

35	Step fit angular fit file and make angle surfaces (Bevel gauge accuracy 1 degree) make simple open and siding fits.	Droll troubles : causes ad remedy. Equality of lips, correct clearance dead centre langth of lips. Drill dinds: fractions metric, letters and numbers, grinding of drill	------do-----	Factors and equations" Algebraic formuls.
36	Enlarge hole and increase internal dia. File cylindrical surfaces. Make open fitting of curved proriles.	Grinding wheel : Abrasive grift grade structure bond specification us mounting and dressing Bench grinder parts and use-radius gauge fillet gauge material construction, parts fraction and metric different dimensions convex and concave uses care and maintenance.		Factors and different types of factorization.
37	Make the circles by bridging a previously drilled hole. Test angular match up.	Radius gauge feeler hole gauge, and their uses.	Standare method of sectioning as per IS : 696 Exercises for different sectional views on the given orthographic drawing of machine parts, castint etc.	Equations simple simultaneous.

	ACHIVEMNT :	The trainees should be able to do:1 Chucking centering plain turning taper boring and thread cutting. 2 Position marking fit contours and geometrical figures and make male and female parts.		
38	Inside square fit make combined open and sliding fit straight sides :T: fit	Vernier height gauge : material construcetion, parts graduations (English & Metric) uses care and maintenance pig iron : manufacturing process (Blast furnace) Types propcrties and uses.	Interconversion ofisometric oblique drawings to orthographic drawings and vice-versa Related problems such a "V" block oriented by various machining operation etc.	Equations simple simultaneous, quadratic.
39	File fit combined open angular and sliding sides. File internal angles 30 minutes accuracy open angular fit.	Cast iron : manufacturing process (cupola furnce) types properties and uses. Wrought iron: manufacturing process (Fudding and Astor process) properties and uses.		Application construction and solution of problems byequation.

40	Make sliding fit with angles other than 90 sliding fit with an angle.	Steel : manufacturing process plain carbon steels types properties and uses.	-------do--------	Atmospheric pressure pressure pressure and absolute pressure and their units.
41	Make simple bracket by bending and twisting nonferrous metsl. Drill small hole (2mm) Drill holes on sheet metal, bend sheet for round bracket.	Non-ferrous metals (copper, aluminium tin, lead, zinc.) properties and uses.	-------do--------	Lo garithms and use of logarithms tables : Logarithms: logarithm and exponent.
42	Form internal threads with taps to standars size (through holes and blind holes) Drill through hole and tap drill blind hole and tap; prepare studs and bolt.	Screw threads : its 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 boad flute cutting edge) Method of using and use of calculating tap hole sizes. Tap wrench : material parts types (solid & adjustable types) and their uses removal of broken tap, studs (tap stud extractor).	----do---	Use of logarithms and anti-logarithm table.

43	From external threads with dies to standard size. Prepare nuts and match with bplts.	Dies : British standard metric and BIS standard material, parts, types, Method of using dies. Die stick: material parts and uses.	-----do-----	Artothmetical operations involving logarithms in the computations.44
44	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 Scrapers and their types, methods of scraping.	-----do-----	Problem related to be trade using logarithm tables.45
45	Filing & scraping of bearing to close precision.	Scrapers and their types, methods of scraping.	Surface development of simple geometrical solids like cube rectangular block cone, pyramid, cylinder prism etc.	-------do-----

46	File and fit combined radius and angular surface (accuracy =.5 mm.) angular and radius fit. Locate accurate holes. Make accratehole for stud fit.	Vernier micrometer, material, parts graduation, use, care and maintenance.	--------do--------	Specific gravity principle of Archimedes.
47	Make assemble for dovetail sliding fits using lower pins and screw (o.04mm.) (	Screw thread micrometer: construction, graduation and use.	-------do-------	Relation between specific gravity and density simple experimental determination.
48	Make sliding fits assembly with parallel and angular mating surface. (+_0.04mm)	Dial test indicator, construction, parts material, graduation, Method of use. Care and maintenance.	Interetation of solids and conventional application of Intersectional curves on drawing.	Geometry: Fundamental geometrical definition angles and pronerties of angles, triangles, and properties of triangles.

49	Practice on testing of machine tools and general shop maintenance.	Preventive maintenance objective and function of P.M. section inspection. Visual and detailed lubrication survey system of symbol and colour coating.	------do------	Pythagoras theorem, properties of similar triangles.
50 & 51	Simple repair work. Simple assembly machine parts from blue prints.	Revision simple estimation of materials use of hand books and reference table.	Solution of NCVT test paper (preliminary)Revision.	Revision.
52	Test	Test ACHIEVEMENT: The Trainee should be to do: 1. Drill holes, counter bore and spot face. 2. Sharpen drill. 3. Use height and depth gauge micrometer and vernir calipers to an accuracy of 1\1000\100mm. 4. Mark panch cut, chip, and file jobs as per blue prints as per blue prints and able to finish an accuracy of 0.003'\0.08mm	Test (Preliminary)	

		5. Operate a banch drill and to drill ream holes. 6. Use of taps and dies.		
53	Prepare triangle, hexagon on ends of a cylinder bar prepare female end and fit.	Keys and keyways. Types and their uses construction (shape).	Revision of first year topics.	Revision of 1st year course.
54	Make key and keyways on the shaft and fit. ;V; grooves and slots on the cast iron block	Spring material types and uses.	------do------	-------do------

55	Make riveted joints (lap and butt joints)	Bolts and Nuts: Material types (Hexagonal and square head) and their uses.	Screw thread their standard forms as per ISI, external and internal thread, conventions on the features for drawing as per ISI.	Rectangle, square, Rhombus parallelogram and their properties
56	Drill on cylindrical surface.	Washers : Material, types (spring, tab plain washer and fiber washer)	-------do-----	Circle and properties of circle : regular polyons.
57	Scrap on fat surfacesscrap on curved surfaces and scrap surface parallels and test. Make & assemble sliding fits-plain surfaces.			

58	Make simple dowel pinsfitting dowel pins and tap screw assemble.	Dowel pins: material construction types accuracy and uses.	Sketches for bolts, nuts, screws and other screwed members.	Heat & temperature thermos metric scales-their conversions.
59	Assembly sliding for using keys and sowel pin and screw +0.02 mm plin surfaces.	Screws : material, different types (inch & metric) uses.	Standard river forms as per ISI	Temperature measuring instruments.
60	Testing of sliding fitting job scrap on two flat surfaces-and curved surfaces.	Testing scraped surfaces: or dinary surfaces without a master plate.	--------do------	Specific heats of solids & liquids, quantity of heat.

61	File & fit angular mating surface plain within an accuracy of + 0.02mm & angular + 15 minutes angular fitting.	Special files : types (Pillar, Dreadnought Barrow Warding) description.	Riveted joint	Heat loss and heat gain, with simple problems.
62	Drill through and blind holes at an angle-drill blind holes “Y” fitting	System of drill size. Fractional size: number, latter and metric. Templates and gauges. Introduction, necessity types..	Riveted joints butt.	Mensuration : Plain fig ures triangles, square, rectangle, parallelogram.
63	Dovetailed fitting radius fitting	Gauges: Introduction, types sity types-description and uses of gauge-types (Feeler screw, pitch, radius, Wire gauge)	Sketches of keys cutter, and pin joints.	Plain figures. Trapezium regular polygons, circle hollow cirecles.

64	Precision drilling reaming and hpping. Test-job ACHIEVEMENT :	Description and use. Limit gauge: Ring gauge, snap gauge, plug gauge, description and use. The Trainee should be able to do: 1. Make key and key ways on the on shaft and fit. 2. Make riveted joints. 3. Scrap on flat and curved .	--------do----	Plain figures-segment and sector of circle ellipse, fillets.
65	File and fit combined fit with straight angular surface +0.02mm, hexagonal fitting	Slip gauge : Necessity of accuracy set of block (English and Metric) Details of slip gauge. Mets 46:103:112 . Wrining and building up of slip gauge and care and maintenance. Application of slip gauges for measuring, sine bar-principle, application & specification.		
66	Drill and ream small dia holes to accuracy-correct location for fitting. Make male and female fitting parts-drill and ream holes not less that 12.7 mm.	Locking device : Nuts types (lock nut castle nut, slotted nuts, swam nut, grooved nut). Description and use.	--------do--------	Solid figures : Ffustum of a cone, sphere spherical segment.

67	Sliding fitting Diamond fittng, Lapping flat surfaces using lapping plate.	Lapping: Application of lapping material for lapping tools, lapping abrasives charging of lapping tool. Sur face finish importance equipment for testing- terms relation to surface finish. Equipment for testing surfaces quality dimensional tolerances of surface finish.	Concept of preparation of assembly drawing and detailing. Simple assemblies & their details of trade related tools\job\exercis es with the dimensions from the given sample of models. Tool post for the lathe with washer and screw.	Material weight and cost problems related to trade.
68	Stepped keyed fitting-test job. Lapping holes and cylindrical surfaces.	Honing;Application of honing –material for honing tools shapes, grades-honing abrasives. Frosting its am and the methods of performance.	-------do-------	Trigonometry: trigonometrical ratios use of trigonometrical table.
69	Make a snap gauge + 0.02 mm.	Interchangeability : Necessity in Engg. Field definition BIS Definition, types of limit terminology of limits and fits basic size, actual size, deviation high and lowlimit zero ine, tolerance zone.	Details and assembly of vee-blocks with clamps.	Area of triangle by trigonometry.

70	Scrape angular mating surface, scrap on internal surface.	Different standard systems of fits and limits. British standard system. BIS system. Method of expressing tolerance as per BIS.	Details assembly of vee-block with clamps.	Finding height and distance by trigonometry.
71	Practice in dovetail fitting assembly and dowel pins Industrial visit	Fits: Definition, types, description of each with sketch.	Details of assembly of shaft and pulley	Application of trigonometry to shop problems.
72	Preparation of gap gauges.	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.	Industrial visit Details of assembly shaft and pulley.	Industrial visit

73	Dovetail and Dowel pin assembly scrape cylindrical bore.	Bearing introduction. Classification (journal and Thrust Description of each ball bearing: sigle row double row, description of each, advantages of double row.	Details of assembly of bush bearing.	Tringle of forces, parallelogram of forces.
74	Scrap cylindrical bore and to make a fit make a cotter jib assembly.	Roller and needle bearings: Types of roller bearing Description & use of each Method of fitting bal and roller bearings.	Details of assembly bush bearing.	Composition and resolution of forces.
75	Scrap cylindrical taper bore check taper angle (flat) with sine bar.	Bearing metals types, composition and lubricants pupose of using different types description and uses of each type.	--------do--------	-------do--------

76	Preparation of centre squares, drill gauges. ACHOEVEMENT	Synthetic materials for bearing: The plastic laminate and materials, their properties and uses in bearings such as phonolic pejlon polymide (nylon) The Trainee should be able to do: 1. File to an accuracy of + 0.04mm on flat surfaces and on angular surfaces +5 minutes.	-------DO-----	-----do-----
		2. Drill and ream to +0.04 mm. 3. Fit dowel pin, studs, bolts and dovetailed sides etc. 4. Use of slip gauges inspect angles to +1 minite. 5. Remetal, scrap and assemble bearings.		
77	File and fit straight and angular surfaces internally	Hardening and tempering purpose of each method, tempering colour chart.	Details and assembly of a simple hand vice.	Moments of force couples.

78	Heat treatment of tools.	Annealing and normalizing purpose of each method	-------do-----	Simple problems on straight and bel cranked laver.
79	Flaring of pipes andpipe joints-heat treatment of cold chisels.	Case hardning and carburizing and its methods-process of carburizing (solid liquid and gas)	Details and assembly of simple hand vice	Centre of gravity, simple experimental determination stable unstable & neutral equilibrium-simple explanation.
80	“H” fitting exercises on lapping of gauges (hand lapping only)	Solder and soldering introduction types of solder and Flux. Method of soldering hard solder introduction types and method brazing.	-------do------	--------do-------

81	Hand ream and fit taper pin drilling and reaming hole in correct lo9cation, fitting dowel pins stud, and bolts.	Production of gauges templates and jigs. The object of importance for preparing interchangeable components.	---------do------	Friction co efficient of friction
82	Simple jigs and fixtures for drilling.	Drilling jig constructional features, types and uses.	Blue print Reading simple exercises related to missing lines.	Simple problem related to fricetion.

83	Prepare a “V” block and clamp.	Fixtures-constructionfeatures types and uses.	Blue print reading. Simple exercises related to missing lines.	Magnetic substances natural and artificial magnets.
84	Marking out as per blue print drilling straight and curve filing threading with die cutting solt cutting internal threads with taps making and adjustable spanner	Revision.	Blue print reading simple exercises related to missing views.	Method of magnetization. Use of magnets/
85	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. Pipes hending fixture pipe threads std. pipe threads die and tap pipe vices	Blue print reading simple exercises related to missing views.	Electricity & its uses electric current positive & negative terminals.8

87	Practice in handling fire extinguishers of different types refilling of extinguishers.	Fire precautions causes and types of fires precautions against out break of fire. Rire extinguishers types and uses.	Simple exercises relating to missing symbols.	Simple electric circuits simple calculations.
88	Marking detail include male & female screw cutting male and female fitting parts. Making and tempering .	Working material with finished surface as aluminium, duralumin stainless steel, the importance of keeping the work free from scratdes or rust and corrosion. The various coatings used to protect metals, protection coat by heat and elecetrical deposit treatments. - Treatments and provide a plasing finish as chromium silver plating and nickel plating and galvanizing.	Simple exercises re;ated tp mssing secton.	Ohm"s Law simple calculation, electrical insulating materials.
	ACHIVEMENT:	The Trainee should be able to do: 1. Carry out simple plumbing assembly. 2. Make simple jigs and fixtures. 3. Make male and female parts of regular contours including tongue and groove, dovetailed silde to and accuracy of + 0.04mm.		
89	Exercise on finished material as aluminium out catting to size drilling etc. without damage to surface of finished articles.	Aluminium and its alloys Used advantages and disad-vantage : weight and strength as compared with steel.	Simple exercises related to missing section.	Graphs: Abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.

90	Making out for angular outlines-filing and fitting the inserts into gaps. Making a siple drilling jig Marking out-filing to line drilling and rapping brass and copper jobs.	Tapers on deys and cotters permissible by various standards. Discuss non-ferrous metals as brass, phosphor bronze, gun metal, copper, aluminium etc. Their composition and purposes where and why used-advantages fir specific purposes-surface wearing properties of bronze and brass.	Simple exercisers related to missing dimensions.	-do-
91	Complete exercises covering the assembly of parts working to detail and arrangement-Drawings. Dismantling and mounting Of pulleys. Making replacing damaged gears keys. Repairing damaged keys. Repairing damaged gears and mounting. Repair & replacement of belts. Industrial visits.	Power transmission elements. The object of belts-their sizes and specifications-marerials of which the belts are madeselection of the type of belts with the consideration of weather load and tensionmethods of joining leather belts. Vee belts and their advantages and disadvantages-Use commercial belts dressing and redin-creep and slipping-cal-culations.	-do- Industrial Visits.	Further practice ogarithm.
92.	Complete exercises covering the assembly of parts working to details and arrangements drawings. Dismantling and mounting of pulleys. Making replacing	Power trsansmissipns-coupling types flange coupling Hooks coupling universal coupling and ther different uses.	Futher practicice logarithm.	Mechanical properties of metals.

93	More difficult work in marking out including tangents templates involving us of vernierprotractor.	Pulley-types-solic, split and "V" belt pulleys standard calculation for determining size crowing of pulleys width of faces loose and fast pulleys jockey pulley types of drives-open and cross belt drives. The geometrical explanation of the belt drivers at and angle	---------d0------	------do-----
94	Fitting of dovetail slides.	Power transmission by gears, most common form spur gear, set names of some essential parts of the set-The ptch circles Diametal pitch velocity ratio of a gear set Helical gear, herring bone gears, bevel gearintg spiral bevel gearing hypoid gearing pinion and rack, worm gearing, velocity ratio of worm gearing Repair to gear teeth by building up and dovetail method.	Solution of NCVT test.	Heat treatment of steel hardening annealing, tempering, normalsing, case hardening standard and measurement.
95.	Male and remale dovetail fitting repairs to geared teeth. Repair of broken gear tooth by stud. Repair broker gear teeth by dovetail.	Method of fixing geared wheels for various purpose drives. General cause of the wear and tear of thetoothed wheels and their remedies-method of fitting spiral gears-helical gears-bevel gears-worm and worm wheels in relation to required drieve. Care and maintenance of gears.	Solution of NCVT test papers.	Heat treatment of steel hardening annealing, tempering, normalizing, case hardening standard and measurement.
96	Marking out on the round sections for geometrical shaped fittings. Finishing and fitting to size, checking up the faces for universality.	LaBrication and lubricants. How lubrication is done. 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: Solube oil soaps suds paraffin soda water common lubrication of lubficants.	-------do-----	Transmission power by belt pulley & gear drive.

97	Shaping-parlled block & W-block.	Chains, wire ropes and clutches for power transmission. Their types and beief description.	Solution of NCVT test papers.	Transmission of power by belt pulley and gear drive.
98	Drilling for riveting. Riveting with as many types of rivet as available use of connter sunk head rivets use of counter bore tool to fit cheese head bolts. Use of pop rivets and gun.	Discuss the various rivets shape and from of heads rive ting 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.	Revision	-----do-----
99	Dimantling removal and reassemble of a simple machine tool. Dismantling and assemble of pillar type drilling machine.	Intallation, maintenance and overhaul of machinery and engineering equipment and alignment of machines.	Revision	Solution of NCVT papers.
100	Milling-Plain, slot & angular cutting.	Clutch: Type positive clutch (straight tooth types, angular tooth type) friction type (flat and conical type)	Revision	-----do-----
101	Grinding-Surface & circular.	Washers-Types and calculation of washer sizes. The making of joints and fittig packing-The us 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.	Revision	-----do-----

102 \	Simple repair of machinery making of packings gaskets-use of hollow panches, extractor drifts various types of hammers and spanners, etc. practicing making various knots correct loading and safe removal of parts. Erect sample machines.	Foundation bolt: types (rag, lewis cotter bolt) description of each erection tools, pulley block, crow bar, spirit level,plumb bob 2+4, wire rope, manil rope, wooden block.	-----do-----	Revision
103	Revision	Revision	Institute Test	Institute Test
104 ACHIEVEMENT: The Trainess should be able to: 1. Dismantle and assemble simple machine parts and accessories. 2. Repair broken gear tooth. 3. Make simple drilling jig. 4. Erect machine.				

TRADE : FITTER

List of Tools and Equipment for the first 52-weeks (1 year)

For a Batch of 16 trainees

SL NO.	NAME OF THE TOOLS & EQUIPMENT			
1	2	3	4	5
1	Rule steel 15 cm with metric graduations	1	16	17
2	Square try 10 cm blade	1	16	17
3	Caliper outside 15 cm spring	1	16	17
4	Caliper inside 15 cm spring	1	16	17
5	Caliper 15 cm hermachrodite	1	16	17
6	Divider 15 cm spring	1	16	17
7	Scriber 15 cm	1	16	17
8	Punch centre 10 cm.	1	16	17
9	Screw driver 15 cm.	1	16	17
10	Chisel cold 10.	1	16	17
11	Hammer ball pein 0.45 kg. with handle	1	16	17
12	Hammer ball pein 0.22 kg.with handle	1	16	17

13	File flat 25 cm second cut	1	16	17
14	File flat 25 cm smooth	1	16	17
15	File flat round second cut 15 cm	1	16	17
16	Hacksaw frame adjustable 20-30 cm	1	16	17
17	Safety goggles	1	16	17
18	Dot slot punch	1	16	17
	TOOLS INSTRUMENTS & GENERAL SHOP OUTFIT PER UNIT			
19	Rule steel 30 cm to read metric	4		
20	Rule steel 60 cm	4		
21	Straight edge 45 cm steel	2		
22	Flate surface 45 cm *45 cm	2		
23	Marking table 91*91*122 cm	1		
24	Universal scribing block 22 cm	2		
25	Block-vee pair 7 cm 15 cm with clamps	2		
26	Square adjustable 15cm blade	2		
27	Angle plate 10*20 cm	2		
28	Level sprit 15 cm metal	1		
29	Punch letter 3mm set	1		
30	Punch number set 3mm	1		
31	Punch hillow 6mm to 19 set of 5	2		
32	Punch round 3mm*4mm set of 2	2		
33	Portable hand drill 0to 6 mm	2		
34	Drill brace hand 0to12 mm	2		
35	Drill twist s/s 1.5 to 12 mmby 0.4 mm	1set		
36	Drill twist s/s 8mm to 15 mmby 1/2mm	1set		
37	Brace ratchet with pillar	1		
38	Tapes and dies complete set in box B.A	1		
39	Tapes and dies complete set in box B.S.F>	1		
40	Tapes and dies complete set in box White-Worth	1		
41	Tapes, dies complete set in box American	1		
42	Tapes and dies complete set in box	1		
43	File warding 15 cm smooth	4		
44	File knife edge 15 cm amooth	4		
45	File cut saw 15 cm smooth	4		
46	File feather 15 cm smooth	4		
47	File triangular 15 cm smooth	2		
48	File round 20 cm second cut	8		
49	File round 15 cm second cut	4		
50	File square 25 cm second cut	4		
51	Feeler gauge 10 blades	1 set		
52	File triangular 20 cm second cut	8		

53	File flat 30 cm second cut	8		
54	File flat 20 cm bastard	8		
55	File flat 30 cm bastard	8		
56	File swiss type needle set of 12	2 set		
57	File half round 25 cm second cut	8		
58	File half round cm bastard	4		
59	File round 30 cm bastard	4		
60	File hand 15 cm second cut	8		
61	Card file	8		
62	Stone oil 15 cm *5 cm*2.5cm	4		
63	Stone carborandam 15 cm*5cm*5cm *4cm	2		
64	Can oil 0.25 litres	2		
65	Plier combination 15 cm	2		
66	Iron soldering 350gm.	2		
67	Lamp blow 0.55 liters	2		
68	Spanner white –worth D.E. 6 mm.to 25 mm set of	8		
69	Spanner adjustable 15 cm	2		
70	Interchangeable 15 cm	2		
71	“Apollo” box spanner set in mm 3*4, 6*7,9*11,12*14,15*19,22*25,set of 6	2		
72	Glass magnifying 7 cm	2		
73	Clamp tool maker 5 cmm and 7.5cm set of 2	2		
74	Clamp “c” 5 cm	2		
75	Clamp “C” 10 cm	2		
76	Reamer adjustable max. 9 mm 12 mm,19 mm-set of 3	1set		
77	Reamer taper 4mm to 9mm set of 4	1		
78	Reamer parallel 16mm to 12 mm set of 5	1		
79	Scraper flat 15 cm	8		
80	Scraper 3 corner 15 cm	8		
81	Scraper half round 15 cm	8		
82	Chisel cold 9 mm cross cut 9mm diamond	8each		
83	Chisel cold 19 mm flat	8		
84	Chisel cold 9 mm round noze.	8		
85	Extractor stud EZY-out.	2		
86	Set combination 30cm.	2		
87	Micrometer 0-2.5cm outside.	3		
88	Micrometer25-50 mm outside.	3		
89	Micrometer 0-25mm outside	4		
90	Micrometer 50-75mm outside	2		
91	Micrometer inside 25 mm to50mm with Extension rods.	1		
92	Vernier caliper 20cm.	1		

93	Vernier height gauge 30cm.	1		
94	Vernier bevel protractor.	1		
95	Screw pitch gauge.	1		
96	Wire gauge,metric standard			
97	Drill twist T\s 6 mm to 25 mm* 1.5mm	1 1 set		
98	Drill chuck 12mm	1		
99	Pipe wrench 40cm	1		
100	Pipe wrench 30cm	1		
101	Pipe vice No.4	2		
102	Adjustable pipe die 0-205cm cap	1		
103	Wheel dresser (one for 4 units).	1		
104	Machine vice 10cm.	1		
105	Machine vice 15cm.	1		
106	Sleeve drill morce 0-1,1-2,2-3.	1 set		
107	Vcie bench 12cm jaw.	16		
108	Vice leg 10cm jaw.	2		
109	Bench working 240*120*60cm	4		
110	Almirah 180*90*30cm	2		
111	Lockers with 6 drawers(standard	2		
	Size).			
112	Metal rack 182*182*4.5cm	1		
113	Desk.	1		
114	Stool.	1		
115	Black board witheasel.	1		
116	Fire extinguisher(for 4 units)	2		
117	Fire buckets.	2		
118	Machines vice.	2		
119	Wing compass 25.4cm orl 30cm	2		
120	Hand hammer 1kg. with handle.	2		
	Tools for Allied Trade-Blacksmithy & Sheet Metal Work			
121	Hammer smith 2kg. with handle.	2		
122	Tongs round.	2		
123	Tong flat.	1		
124	Smith's square 45cm*30cm	1		
125	Cold set rodded.	2		
126	Hot set rodded.	1		
127	Swages top & bottom 12mm\19 Mm,25mm(pait).	1		
128	Swage block 35*35*12cm.	1		
129	Flatters(rodded)55 mm square.	2		
130	Fuller top & bottom 6 mm, 9 mm (pair).	2		
131	Anvil 50 kg.	2		
132	Anvil Stand.	2		
133	Shovel.	2		

134	Trammer.	1		
135	Rake,	2		
136	Quenching tank.	1 (To be made in the Institute).		
137	Pocker.	2		
138	Hardle.	2		
139	Leather apron.	2		
140	Prick punch.	2		
141	Mallet.	2		
142	Snips straight 25 cm.	2		
143	Setting hammer with handle.	2		
144	Planishing hammer.	2		
145	Snip bent 25 cm.	2		
146	Stake hatchet.	2		
147	Stakemgrooving.	2		
148	Gauge imperial sheet.	1		
General Machinery Installation				
1	Anvil 50 kg. on stand.	1		
2	Drilling machine pillar sensitive 0-20 mm cap with swivel table motorized with chuck & key.	1		
3	Drilling machine bench sensitive 0-12 mm cap motorized with chuck and key.	2		
4	Forge portable hand blower 38 cm to 45 cm.	1		
5	Grinding machine (General purpose) D.E. Pedestal with 20 cm dia. Drill grinding attachment.	1		

Note

1. No additional items of the above list are required to be provided for a batch of 16 trainees working in the second shift except the item under “Trainees Tool Kit and Lockers.”

2 No additional number of items

(*) market are required to be provided upto four batches of trainees (i.e.two batches in the first shift and two in the second shift).

3 Drilling machine (Bench Type) one additional number is require to be provided for each additional batches i.e , in the 1st and 2nd shift.

The specifications of the items in the above list have been given in Metric Units. The items which are available in the market nearest of the specification as mentioned above , if not available as prescribed should be procured. Measuring instruments such as steel rule which are graduated both English and Metric Units may be procured, if available.

MODIFIED LIST OF TOOLS FOR

THE 2ND YEAR FOR FITTER TRADE
[vide letter no. DGET-21 (1)/88 – CD Dtd. 5.7.88].

1.	Gauge slip as Johnson metric set.	1 set	
2.	Carbide Wear Block 1 mm-2mm.	2 each	
3.	Gauge snap go and no go 25 to 50 mm by 5 mm.	1 set	
4.	Gauge plug single 3 ended 5 to 55 by 1 mm.	1 set	
5.	Gauge telescopic	1	
6.	Dial test indicator .01 mm on stand	1	
7.	Sine bar 125 mm.	1	
8.	Sine bar 250 mm.	1	
9.	Lathe tools H.S.S. tipped set	2	
10.	Lathe tools bit 6 mm * 75mm.		12
11.	Lathe tools bit 7 mm * 75mm	12	
12.	Lathe tools bit 9 mm * 85mm	12	
13.	Arm strong type tool bit holder R.H.	2	
14.	Arm strong type tool bit holder L.H	2	
15.	Arm strong type tool bit holder straight		2
16.	Stilson wrenches 20 cm.	2	
17.	Spanner monkey upto 5 cm.	2	
18.	Pipe cutter 6 mm to 50 mm wheel type		1
19.	Pipe face to grip pipe upto 50 mm.	2	
20.	Pipe stock and dies complete with stocks, bushing, holders, tap and tap wrenches sizes covered 6 mm, 9mm, 12mm,19mm,25mm, 32mm, 38mm, 50mm.		1 set
21	Pipe bender spool type with stand manually operated		1
22	Adjustable spanner 38 cm long.	1	
23.	Adjustable pipe chain tonge 22 cm long to take pipes from 3 cm to 63 cm	1	
24.	Dial vernier caliper 0-130 mm L.C.O. 0.05 mm (Universal Type)	1	
25.	Screw thread micrometer with interchangeable 0.4-1.75 mm. Pitch anvils for checking metric threads 60.		1
26.	Depth micrometer 0-100 mm 0.01 mm		1
27.	Vernier caliper with thumb block 0-130 mm L.C.O. 0.2 mm		1
28.	Comparator stand with dial indicator	1	
29.	Engineer's try square (Knife-wedge).	1	
30	Surface roughness comparison plates "Roberts".	1 set	

General Machinery Installation

*1.	Electric Furnace with Capacity 600c To 1400 c.	1 No	
2.	Lathe all geared head stock S.S. and S.C. height of centre over		2 Nos.

Bed 15 cm-gap head compete with accessories e.g. pump, all fittings
And splash guard driver plate with drives; face plate 3 jaw and 4 jaws
Chucks fixed and traveling steady compound turret tool post, taper
Turning attachment, fixed and running centers, driving dogs straight
And bent tails.

Note: * No additional number of items are requires to be provided up to four batches of trainees i.e. two batches in the shift an d two in the shift.

- Only one number need be provided in each I.T.I. respecting No. of Units.

LIST OF ISI BOOKS FOR REFERANCE FITTER TRADE

(For use of Instructors only)

SL. No.	Titles	Codes
1	2	3
1.	Spring calipers.	IS: 4052 – 1967
2.	Punches	IS: 413 - 1974
3.	Metric steel scales for Engineers.	IS: 1481 – 1970
4.	Engineers square edges.	IS: 2013 – 1972
5.	V-Block.	IS: 2049 -1974
6.	Steel straight edges.	IS: 2220 – 1962
7.	Hacksaw blades.	IS: 2504 – 1977
8.	Bench vices	ARE: 2586 – 1975
9.	Chisels (Cold)	IS: 402 – 1974
10.	Engineer's file.	IS: 1931 – 1972
11.	Surface plates (C.I.)	IS: 2285 – 1974
12	Twist drills.	IS: 5100 – 1960
13.	Vernier depth gauges.	IS: 4213 -1967
14.	External micrometers.	IS: 2967 -1964
15.	Dimensions for counter-sinks & counter bores.	IS: 3406 – 1975
16.	Internal micrometers.	IS: 2966 – 1964
17.	Vernier calipers.	IS: 3651 – 1974
18.	Vernier height gauges	IS: 2021 -1964
19.	Gib-head keys and key ways	ARE: 2203 – 1974
20.	Tapper keys and key ways	ARE: 2292 – 1974
21.	Screw drivers	IS: 884 – 1972
22.	Bevel protractor	IS: 4229 -1970
23.	Reamers.	IS: 1836 -1961
24.	Thread cutting dies.	IS: 1859 -1961
25.	Metric screw threads (Metric thread pitch-gauges)	IS: 4211 -1967
26.	Dial gauges.	IS: 2092 -1962
27.	Hexagonal bolts and nuts.	IS: 2038 – 1968
28.	Feeler gauges (mm. ranges).	IS: 3179 – 1976
29.	Spanners, open jaw	IS: 2028 – 1968
30.	Thickness of sheet & diameters of wire.	IS: 1137 – 1950
31.	Centre drills	IS: 6703 – 1977 to 6710
32.	Lathe, sizes for general purpose	IS: 2392 – 1963

33.	Recommendations for tapping drill sizes.	IS: 3230 – 1970
34.	Needle files.	IS: 3152 – 1965
35.	Plain plug gauges.	IS: 6137 – 1971 To 1638
36.	Plain ring gauges (G0).	IS: 3435 – 1973
37.	Snap gauges (Go & No Go)	IS: 3477 1973
38.	Slip gauges	IS: 2984 – 1966
39.	Ball & roller bearings gauging practice for	IS: 4025 – 1967
40	V-belt for Industrial purposes.	IS: 2404 -1974
41.	Limits & fits for engineering, recommendations for	IS: 919 – 1963
42.	Plain limit gauges tolerances for.	IS: 3455 – 1971
43	Rivets for general purposes.	IS: 2155 – 1961 1921 – 1961
44	Tapers for general engineering purposes.	IS: 3458 – 1944
45	General Engineering Drawing.	IS: 696 - 1972

List of Additional Tools for Allied Trade in Weldin1

1.	Transformer welding set 300 amps- continuous Welding current, with all accessories and electrode holder.	1 set
2.	Welding cable to carry 400 amps with flexible rubber cover.	50 meter
3.	Lugs for cable.	12 Nos.
4.	Earth clamps.	2 Nos.
5.	Arc welding table (all metal top) 122 cm: 12 cm: 60 cm positioned.	1 No.
6.	Oxy-acetylene gas welding set equipment with hoses, regulator and their accessories.	1 Set
7.	Gas welding table with positioned.	1 Set
8.	Welding-torch tips of different sizes.	1 Set
9.	Gas lighter.	6 Nos
10.	Trolley for gas cylinders.	1 No.
11.	Chipping hammer.	2 Nos
12.	Gloves (Leather).	2 Pairs
13.	Leather apron.	

14.	Welding torches 5 to 10 nozzles.	1 Set
15.	Spindle key for cylinder valve.	2 Nos
16.	Welding goggles.	4 Pairs
17.	Welding helmet with colored glass.	2 Nos.
18.	Ti cleaner.	10 Sets.

Note: Those additional items are to be proviede4 for the Allied Trade Training where the welding trade does not exist.

SYLLABUS FOR RELATED INSTRUCTIONS

3rd Year

Related instructions should be imparted to all the apprentices during the entire period of training including basic training . The subject to be taught to the apprentices in related instructions:

(1)	**Trade Theory**	**3 Weeks**	**or**	**105hrs.**
(2)	**W/S Cal. & Sc.**	**2 Weeks**	**or**	**70hrs.**
(3)	**Engg. Drawings.**	**2 Weeks**	**or**	**70hrs.**
(4)	**Social Studies**	**1 Weeks**	**or**	**35hrs.**

	Total =	**8 Weeks**	**or**	**280hrs**

Trade Theory

1st Weeks: Safety work-accident their causes : General safety rules and apprentices in a workshop : Safe working devices, guards, attachment etc. ;

Machine tools and operative-Constructional features,types,functions, and uses of Lathe, drilling m/c, Shaping m/c,grinding m/c and their care and immanence.

Common Turing operative, cutting spear and feeds, cutting tools-it's different angles ;Chucks and checking ; Threads and threading-use of accident ; gear boxes and drives .

Common drilling, boring and reaming operations-its tools and materials, speed and feet's ; different drilling techniques.

Description of grinding machines-surface grinder, portable grinder and pedestal grinder Common grinding operation.

Common shaping operations tools-it's materials speed and feed ; different work holding
Methods.

Limits fits and interchangeability ; Definitions of inter changeability and it necessity in Engg.
Field.

Terms of limits as per IS : 91-1963. Definition, types of limit, basic size, deviation, high and low limit.

Method of expressing tolerance as per IS, tolerance, zero, Clearance and Interference
(Max. min. and mean).

Fits : Definition, types, descriptions of each with sketches. System of limit – Hole and shaft basic .

Simple, problems on limit-Fits using relevant I.S.I.

2nd Week : Heat treatment of metal- annealing, tempering, normalizing and case hardening of mild steel
components. Heat treatment of cutting tools. Changes, in the properties of material due to effects.

Jointing and Fastening devices-permanent, semi-permanent and Temporary Fasteners of different types and their functions-Bolts, nuts, rivets, studs, pins, cotters, keys,
Screws, tapers. Etc.

Power transmission & Drives- Belts and belting-its types, size and use of belts ; belt fastener, speed parallel and crow- drives Use of commercial belt dressing resins, creep and slip calculation for the size of the new belt.

Toothed gear and gearing-type and of spur, helical, bevel ,herring bone, spiral bevel gearing Rack and pinion, and worm for various purpose devices.

Chains and sprockets-description types, uses and method of fixing.

Mechanical, hydraulic and pneumatic drives-base principles.

Prime movers-Lines shaft drive system and self drive system. Different drives- reciprocating, reverse, eccentric, crank, cam, rotary to liner and vice-versa.

System of speed variation using stepped pulleys, gear box, disconnect-speed control(Electrically and hydraulically).

Bearing-necessity and classification, description of each. Ball bearing single row and double row-description and advantage. Roller and needle bearing- type and description of each.

Lubrication and lubricants-necessity and types of lubricants, semi-liquid and solid, properties of lubricants-viscosity, oiliness, sp. Gravity, flash point, fire points, freezing point ; qualities of good lubricants and importance of correct use of lubricants and their commercial names.

System of lubrication-gravity feed, force feed, splash method etc.

3rd Week : **Inspection-need of inspection, types of inspection, stage inspection, routine inspection, final inspection. Types of instruments and equipments.**

Introduction to work simplifications related to the trade-job study, job analysis , planning of Sequence of operations.

Maintenance-it's importance in productivity, safety, service life of tools/equipments ;

General maintenance work-cleaning, lubrication, adjustments of parts, repairing, inspection/testing, overhauling and painting ; system of maintenance-routine, preventive, breakdown, details of daily maintenance-daily, weekly.

Material Handling-different types of appliances and tackle for shifting Loading and unloading of machine and equipment.

Screw-jack-use and working principle.

Chain pulley blocks-use and working principle.

Cranes and hoists for lifting purposes-working principle and main constructional features.

Working principle and use of other tackles like crab wrenches, slings, rollers, bars and levers.

Special precautions in the handling of heavy equipments, removal and replacement of heavy parts.

Quality and finish of work –Surface finish-necessity-degree of surface finish symbol and its numerical value, method of surface finish processes such as lapping, honing, buffing.

Protection of finished surface- like pickling, oxidizing electroplating, galvanizing, metal spraying, metallization and anodizing.

WORKSHOP CALCULATION & SCIENCE

1st Week : **Revision and further problem in relation to trade.**

Problem on menstruations, work , power and energy.

Mechanical properties-tenacity, elasticity, malleability.

Stress, strain, modulus of elasticity, ultimate ten site strength, factor of safety and different types of stresses.

Gear and belt drive, Determination of horse power, speed and size of pulleys and gears.

2nd Week : **Difference between pressure and force.**

Velocity, acceleration and retardation.

Description and explanation of solids, liquids and gases due to heat ; co-efficient of expansion.

Description of transfer heat, conduction, convection and radition.

ENGINEERING DRAWING

1st Week : **Advance blue print reading.**

Free hand sketching of details from assembly drawingsFurthce-versa.

2nd Week : **Code practice for General Engineering Drawing according to IS : 696-1960.**

Further free hand sketching of isometric view of different parts.