

Syllabus for the subject

of

**TRADE THEORY-I
&
TRADE PRACTICAL-I**

Under

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

Trade: Fitter

Re-Designed in

- 2014 -

By

**Government of India
Ministry of Labour & Employment
Directorate General of Employment & Training**

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A.RATIONALE

Success & Sustainability of any Training System depends upon, given other things, availability of good quality instructors. An Instructor should possess good trade skills to impart skill training.

Ability to understand and interpret the course content is imperative to ensure proper delivery. It is the domain Skills and Knowledge which enable comprehending the prescribed contents and subsequent lesson/demonstration planning for effective delivery. Thus it is imperative for any trade instructor to have adequate domain skills so that same can be transferred.

To deliver effectively, both knowledge and skills, in depth know how are very much needed. At the same time the main objective of Instructor training programme is enabling instructors to demonstrate higher productivity and higher accuracy in performing a task/job.

Recognizing this importance more emphasis has been given to the Trade Practical & Trade Theory in all Engineering Trades in Craft Instructors Training Scheme (CITS) under NCVT.

B. GENERAL INFORMATION

1. **Name of the Course** : Craft Instructor Training
2. **Duration of Instructor Training** : 1 Year (Two semesters each of six months duration).
3. **Subjects covered in the Semesters** : Detailed in Section - C
4. **Name of the Subject** : **TRADE THEORY –I & TRADE PRACTICAL-I**
5. **Applicability** : **FITTER TRADE**
6. **Examination** : AITT to be held at the end of each semester.
7. **Space Norms** :
(a) One class room of minimum 30sq.m. area having Minimum width of 5 m. and with 6000 lumen
(b) Workshop: 120 sq. meters having minimum width of 8 m. and with 30000 lumen
The electrical equipments of Class room should conform to minimum 3 star Building energy rating as per Bureau of Energy Efficiency (B.E.E.)
8. **Power Norms** :
(a) 1 KW for Class room
(b) 10 KW for Workshop.
9. **Unit strength(Batch Size)** : 20
10. **Entry qualification** : Diploma/Degree in Mechanical/Production Engineering from AICTE recognized Board / University OR
National Trade Certificate in the FITTER trade OR
National Apprenticeship Certificate in the FITTER trade.
11. **Trainers' Qualification** : Diploma or Degree in Mechanical / Production Engineering from AICTE recognized Board / University with five / two years experience respectively.
12. **Desirable** : Passed National Craft Instructor Training course in Fitter trade.
In case of two units, one trainer must be Degree in Engineering.

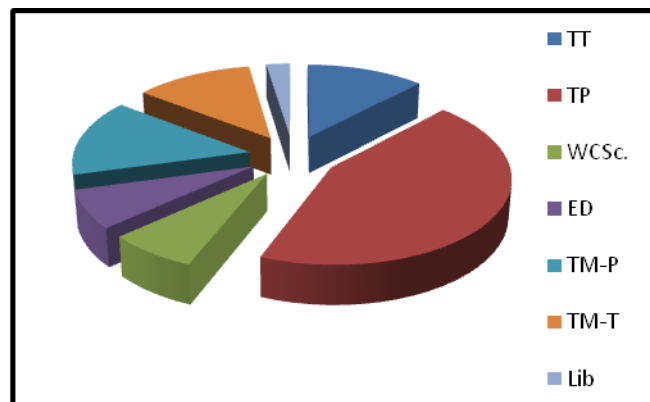
Note: Degree/Diploma candidate may directly appear for Semester-I exam without attending classes for lateral entry in semester-II.

C. SEMESTER WISE ALLOTMENT OF TIME & MARKS AMONG THE SUBJECTS FOR CITS

	SUBJECTS	Hrs. / Week	% of time allotted	Marks	Sessional	Full Marks	Pass Marks		
							Exam.	Sessional	Total
First semester	Trade Practical – 1	20	50	200	30	230	120	18	138
	Trade Theory - 1	6	15	100	20	120	60	12	72
	Workshop Cal. & Sc.	6	15	50	-	50	30	-	30
	Engineering Drawing	6	15	100	-	100	60	-	60
	Library	2	5	-	-				
	TOTAL for Sem. - I	40		450	50	500	270	30	300
Second semester	Trade Practical – 2	16	40	200	30	230	120	18	138
	Trade Theory - 2	4	10	100	20	120	60	12	72
	Training Methodology - Practical	12	30	200	30	230	120	18	138
	Training Methodology - Theory + IT	6+2	20	100	20	120	60	12	72
	TOTAL	40		600	100	700	360	60	420
	GRAND TOTAL	80		1050	150	1200	630	90	720

Hourly Distribution

TOTAL: 1200 marks for 2 semesters Pass marks: 720



Subject	Time in %	Marks in %
Trade Practical	45	38
Trade Theory	12.5	20
Total for Trade	57.5	58
Training Methodology (Practical)	15	19
Training Methodology (Theory) + IT	12.5	10
Total for Training Methodology & IT	27.5	29
Engineering Drawing	7.5	12
Workshop Cal. & Sc.	7.5	4
Library	2.5	-

D. TOPIC WISE DISTRIBUTION OF TIME & MARKS
FITTER TRADE
CRAFT INSTRUCTOR TRAINING SCHEME
SEMESTER-I

Note: During the discussion of any machine tools, related precautions and safety measures should be discussed.

Trade Theory				Trade Practical		
Sl. No.	Topics	Hours	Marks	Topics	Hours	Marks
1	Occupational safety & health	07	04	Sizing of material	95	40
2	Hand tools	15	10	Flatness, squareness and parallelism	75	40
3	Drilling	20	20	Drilling and its allied operation	75	40
4	Grinding	05	02	Threading	50	20
5	Precision measuring instrument	10	12	Checking flatness, squareness, parallelism up to accuracy of 0.02mm and 5 min	80	40
6	Metals and its properties	20	12	Finishing and assembly	65	20
7	Heat treatment	10	04			
8	Forging	07	04			
9	Soldering	07	08			
10	Lathe	10	08			
11	Welding	10	08			
12	Study of conventional machine	06	05			
13	CNC-Introduction	05	03			
	TOTAL	132	100	TOTAL	440	200
	THEORY 1 ---22 WEEKS X 06 HRS/WEEK=132hrs			PRACTICAL 1 ---22 WEEKS X 20 HRS/WEEK=440hrs		

E. DETAIL SYLLABUS FOR THE TRADE: FITTER
UNDER CRAFT INSTRUCTOR TRAINING SCHEME
SEMESTER-I

Note: During the discussion of any machine tools, related precautions and safety measures should be discussed.

Tentative Week No.	Theory.	Practical
1.	<p>Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Response to emergencies e.g.; power failure, fire, and system failure</p> <p>Soft Skills: its importance and Job area after completion of training. Introduction to 5S concept & its application. Importance of 5S implementation throughout CITS course-workplace cleaning, machine cleaning, signage, proper storage of equipment etc.</p> <p>Importance of Technical English terms used in industry –(in simple definition only) Technical forms, process charts, activity logs, in required formats of industry, estimation, cycle time, productivity reports, job cards.</p> <p>Basic Life support (BLS):-</p> <p>Basic Life Support (BLS) techniques for drowning, choking, electrocution, neck and spinal injury, including CPR (cardiopulmonary resuscitation).</p>	<p>Occupational Safety & Health Importance of housekeeping & good shop floor practices. Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipments(PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Use of Fire extinguishers.</p> <p>Technical English: Prepare different types of documentation as per industrial need by different methods of recording information.</p> <p>Basic Life support training: Be able to perform DRSABCD: D: Check for Danger R: Check for a Response S: Send for help A: Open the Airway</p>

		B: Check for normal Breathing C: Perform CPR (Cardio Pulmonary Resuscitation) D: Attach Defibrillator / Monitor as soon as available.
2	Types of work done under the trade. Importance of Craft Instructorship training Scheme towards transferring the skill & knowledge Duties & responsibilities of an instructor. Preparation of a training schedule, breakup of syllabus contents into unit/lesson/topic wise.	Designing the graded exercise covering the list of skills. Demonstrating on the concept of conservation of raw material.
3	Different types of tools like digital measuring instruments–Their construction and specifications conform to BIS. Files- elements, classification, material and types of file, their grades, cut etc and uses. Method of accurate filing, care and maintenance.	Exercise on scarping practice on cast iron surface plate to precision limits. Scraping of flat bearing surface and their fitting. Exercises on chipping a flat surface on mild steel and cast iron blocks with flat and cross cut chisel. Grinding the chisel.
4	Chisels & Hacksaw specification, types and kinds, construction and function.	Filing flat Surface to right angle Evaluation the job as per the marking Scheme. Writing the sequence of operation in the work book.
5	Appropriate cutting and clearance angle for cutting different materials. Method of chipping and sharpening of chisels. Precaution to be observed while chipping & sharpening of chisels.	Marking and evaluation of intricate profiles. Making a V block from C.I. and mild steel as per given drawing.
6	Types of drilling Machine-Pillar, Radial-their construction and specification.	Relocating a wrongly positional drilled hole. Checking Concentricity & dimension for true drilling. Practice on drilling through and blind holes on ferrous and non ferrous metals to a positional Accuracy of ± 0.1 mm.
7	Work holding and tool holding devices for different jobs. Different types of drills, drill nomenclature, cutting angle, size and method of holding drills both straight and taper shank and their applications.	Practical on grinding twist drill and without attachment and checking angle with the aid of gauges. Exercise on Taping through and blind holes to suit stud and bolt.
8	Definitions of cutting speed, feed, Depth of cut R.P.M and their Calculation. Method of drill grinding, common faults and their remedies. Description of drill chuck, key, drift, socket, sleeves and their proper uses in the drilling machine	Demonstration and exercise on Counter Bore, Counter sink, Spot facing Reaming holes- Three piece fitting with dowel pins.
9	Knowledge of Bench/ pedestal grinders. Definition of dressing, loading, Glazing, truing, mounting and dismantling of Grinding wheel from the machine	<u>REVISION & INTERNAL ASSESSMENT</u>

10	Introduction to tapping-Taps and Tapping: Taps- description, specification, Tapping Through and blind holes, lubricating for tapping. Cause for tap broken and remedies. Method of calculation of tap drill size for tapping. Specification of Dies. (ISO/BIS standard.)	Demonstration on removal of broken tabs or studs from a through hole and blind hole. External threading by using dies and lubricant. Care & maintenance.
11	Difference between tap wrench and die stock. Method of using dies. Lubricant used for treading. Checking with screw pitch gauge. Reamer (Hand, Machine) – Specification, types, parts and their uses Determining hole sizes for reaming procedure.	Measuring the thread Dimension by various methods- by Thread micrometer.
12	Lubricants & Coolants (in brief) types & their applications.	Exercise involving Preparation of one of the flat surfaces as master and two of the adjoining sides square by filing flat and square
13	Discussion on precision measuring instrument such as Vernier Caliper, height gauge, Micrometer (Various Types) Depth gauge, etc. Their working principal, construction, parts, graduation, reading, uses, care and maintenance.	Usage of digital height gauge, dialindicator, boregauge, combination set etc.
14	Discussion continued on Dial Test Indicator, Bore gauge, Bevel Protractor, Combination set etc. their construction, part, graduation, reading uses, care & maintenance. (Both English & Metric)	Advanced practice on Marking, Filing, Drilling, Countersinking, Tapping etc.
15	General Properties of metal, Difference between metals and non metals. Discussion about ferrous and non metal. Iron carbide diagram(Fe-Fe ₃ C) Discussion of physical, Mechanical and Chemical properties of metals.	Assembly of part and checking. Preparing a Parallel Clamp. Practice on square fitting step Fitting, sliding and Angle Fitting within an accuracy of +5 minutes and their evaluation.
16	Types of Cast Iron, their properties and uses. Carbon Steel Their classification, properties and uses.	Marking Dovetail Sliding, Fitting and assembly within an accuracy of +0.02mm.
17	Heat treatment of carbon steel;- Annealing, hardening, tempering, Normalizing etc. Case hardening, Carburizing, Induction hardening, Nitriding, Flame hardening and Cyaniding process. Change in properties of metals due to heat treatment.	Exercise on heat treatment of hand tools, such as chisels, screwdrivers, punches, coiled spring etc. Hardening of scriber points, the leg of calipers and dividers. Annealing of hardened steel components, case hardening of hammer heads, vice jaws and the end of spanners etc.

18	Introduction to forging methods and types of tool which are used for different forging operations.	Exercise on preparing sets of standard double ended spanner and screwdrivers blade by forging method. <u>REVISION & INTERNAL ASSESSMENT</u>
19	Study of different types of solders and their use, types of fluxes and their application, soft soldering and hard soldering	Practice on soft soldering, brazing and silver soldering.
20	Study of lathe operations-Taper turning, drilling, knurling and grinding.	Lathe operations-Taper turning, Drilling and Knurling.
21	Study of different types of welding machine and accessories-principle of Arc welding, Arc welding process, Different types of Arc welding. Introduction to gas welding-study of gas welding accessories, care and maintenance. Introduction to TIG.	Identification of parts of Arc welding transformer and its accessories. Practice on basic metal Arc welding process. TIG welding practice.
22	Study of basic parts of slotter, milling and Jig boring machines with the help of suitable audio visual aids. Introduction to CNC lathe.	Practice on setting the gas welding plant. Practice on flame setting-practice on welding of thin sheet and gas cutting metals.
23	Industrial visit & Submission of Report	
24 - 26	Revision & Trade Test	

F. List of Tools & Equipment

Trade – FITTER

Under CITS

For a batch of 20 Trainees

Semester-I

i) List of Trainee's Tool kit & other equipments:

SL. No.	Name of the tools and equipment	Qty per unit
1.	Try Square 10 cm blade	21 nos.
2.	Out side caliper 15 cm spring	05 nos.
3.	Inside caliper 15 cm spring	05 nos.
4.	Caliper 15 cm Hermaphrodite	05 nos.
5.	Divider 15 cm spring	05 nos.
6.	Straight scribe 15 cm	21 nos.
7.	Screw Driver 15 cm	05 nos.
8.	Cold Chisel Flat 12mm	05 nos.
9.	Ball pane Hammer 0.45 kg with handle.	10 nos.
10.	Ball pane Hammer bal0.22 kg with handle	10 nos.
11.	Flat File 25 cm lInd cut	21 nos.
12.	Flat File 25 cm lInd cut smooth.	21 nos.
13.	Half round File 15 cm lInd cut.	10 nos.
14.	Hacksaw frame fixed 30 cm.	21 nos.
15.	Safety goggles.	21 nos.
16.	Dot punch 10 cm	10 nos.
17.	Warding File 15 cm smooth	04 nos.
18.	Knife edge File 15 cm smooth	04 nos.
19.	File cant saw 15 cm smooth	04 nos.
20.	File feather edge 15 cm smooth	04 nos.
21.	File triangular 15 cm smooth	02 nos.
22.	File round 20 cm 2 nd cut	08 nos.
23.	File square 15 cm 2 nd cut	04 nos.
24.	File square 25 cm 2 nd cut	04 nos.
25.	Feeler gauge 10 blades	01 set
26.	File triangular 20 cm 2 nd cut	06 nos.
27.	File Swiss type needle set of 12	02 set
28.	File half round 25 cm lInd cut	06 nos.
29.	File round 30 cm bastard	04 nos.
30.	File Card	06 nos.
31.	Stone oil 15 cm x5 cm x2.5 cm	04 nos.
32.	Stone carborandum 15 cm x 5 cm x 5 cm x 4	02 nos.
33.	Oil Can 0.25 liters	02 nos.

34.	Pliers combination 15 cm	02 nos.
35.	Spanner Metric—worth D.E. set of 10 pcs.	06 nos.
36.	Spanner adjustable 15 cm	02 set
37.	Interchangeable ratchet socket set with a 12 mm driver,	01 set
38.	Box spanner se 6-25 mm set of 8 with Tommy bar.	01 set
39.	Clamp toolmaker 5cm and 7.5 cm set of 2	02 nos.
40.	Clamp "c"5 cm	02 nos.
41.	Clamp "c"10 cm	02 nos.
42.	Hand reamer adjustable cover max 9,12,18mm-set of 3	01 set
43.	Hand reamer taper 4-9mm set of 6 or 4-7mm set of 4	01 set
44.	Reamer parallel 12-16mm set of 5	01 no.
45.	Scraper flat 15cm	06 nos.
46.	Scraper 3 corner 15 cm	06 nos.
47.	Scraper half round 15 cm	06 nos.
48.	Chisel cold 9mm cross cut 9 mm diamond	06 each
49.	Chisel cold 19mm flat	06 nos.
50.	Chisel cold 9 mm round nose	06 nos.
51.	Extractor stud EZY-out	02 nos.
52.	Set combination 30 cm	02 nos.
53.	Micrometer 0-25mm out side	03 nos.
54.	Micrometer 25-50mm out side with 25 mm test piece	03 nos.
55.	Micrometer 50-75mm out side with 50mm test piece	02 nos.
56.	Micrometer in side 25-50mm	01 no.
57.	Vernier caliper 20 cm	03 nos.
58.	Vernier height gauges 30 cm	01 no.
59.	Vernier bevel protractor	01 no.
60.	Screw pitch gauge	01 no.
61.	Wire gauge, metric standard	01 no.
62.	Drill twist T/S 6mm to 25 mm x 1.5	01 set
63.	Drill chuck 12mm	01 no.
64.	Wheel dresser (1 for 4 units)	01 no.
65.	Machine vice 10cm	01 no.
66.	Machine vice 15cm	01 no.
67.	Sleeve drill Morse 0-1,1-2,2-3	01 set
68.	Bench Vice 12cm jaws	20 nos.
69.	Leg Vice 10cm jaw	02 nos.
70.	Fire Extinguisher	02 nos.
71.	Fire Buckets	02 nos.
72.	Wing Compass 25.4cm or 30cm	02 nos.
73.	Hand Hammer 01KG with handle	02 nos.
74.	Radius Gauges (Assorted)	10 nos.

75.	Dial Test Indicator .01 mm with magnetic stand	01no.
76.	Lathe Tools HSS Tipped set	02 no.
77.	Lathe Tools Bit HSS 6mm,8mm,10mm x 100mm	10 each
78.	Counter Boring and Counter sinking Tool	02 nos.
79.	Arm strong type bit holder RH	02 nos.
80.	Arm strong type bit holder LH	02 nos.
81.	Arm strong type bit holder Straight	02 nos.
82.	Engineers Try Square (Knife wedge) 150mm Blade.	01no.

ii) Tools, Instrument & General Shop Out fit

SL. No.	Name of the tools and equipment	Quantity
1.	Rule steel 30 cm to read metric	04 nos.
2.	Rule steel 60 cm	04 nos.
3.	Straight edge 45 cm steel	02 nos.
4.	Surface Plate 45x45 cm Cl/granite	02 nos.
5.	Marking table 91x91x122 cm	01 no.
6.	Universal scribing block 22 cm	02 nos.
7.	V- block pair 7 cm and 15 cm with clamps	02 nos.
8.	Square adjustable 15 cm blade	02 nos.
9.	Angle plate 10x20 cm	02 nos.
10.	Spirit Level 15cm metal	01 no.
11.	Letter Punch 3mm set	01 no.
12.	Number Punch set 3mm	01 no.
13.	Portable hand drill (electric) Oto 6 mm	02 nos.
14.	Twist Drill s/s 1.5 to 12 mm by 1/2 mm	01set
15.	Twist Drill s/s 8 mm to 15 mm by 1/2 mm	01 set
16.	Taps and dies complete set in box B. A	01 no.
17.	Taps and dies complete set in box width-worth	01 no.
18.	Taps and dies complete set in box 3-18 mm set of 10	01 no.

iii) LIST OF MACHINES, EQUIPMENTS & FURNITURE FOR THE TRADE FITTER

Sl No.	Description of Equipments	Qty in Nos.
1.	SS and SC centre lathe (all geared) with having minimum specification as: centre height 150 mm and centre distance 1000 mm along with 4 jaw and 3 jaw chucks, auto feed system, safety guard, motorized coolant system and lighting arrangement.	02 nos.
2.	Drilling Machine pillar type 0 - 20mm capacity with drill chuck & key	02 nos.
3.	Pedestal Grinder Double End type. Wheel 300x40x50.8mm Whell centre distance 650 mm approx Power of motor 1HP	02 nos.
4.	Power Saw Machine Stroke length 160 mm No of speed stroke 3 Range of speed stroke 80-100-125 Blade size 525x45x2.25 Power of motor 1.5 kw	01no.
5.	Fly Press 4T capacity	01no.
6.	Steel cupboard with 8 pigeon lockers	03 nos.
7.	Chair with arm	02 nos.
8.	Table for trainer	01 no.
9.	Work bench 240 x 120 x 90 cm	05 nos.
10.	Steel cupboard 180x90x45cm	02 nos.
11.	Steel cupboard 120x60x45cm	02 nos.
12.	White board with magnetic duster 6'x4'	01 no.
13.	First aid box	01 no.
14.	Metal rack 182x182x45cm	01 no.
15.	Flat tongs 300mm	04 nos.
16.	Round tongs 300mm	02 nos.
17.	Straight snips 250/300mm	06 nos.
18.	Bend snips 250/300mm	06 nos.
19.	Solder bit/soldering iron hatchet type 250g	04 nos.
20.	Anvil 50kg	02 nos.
21.	Swage block	01 no.
22.	Trammel	02 nos.
23.	Hand groover 4mm, 5mm	02 each
24.	Portable forge with hand blower 450mm	01 no.
25.	Leather gloves	04 pair
26.	Leather apron	04 nos.
27.	Asbestos gloves	04 pair

28.	Arc welding transformer-single phase, 200 Amps. (with cable, electrode holder and all other accessories)	02 nos.
29.	Oxy-acetylene gas welding plant with all accessories	01 set
30.	Gas cutting torch with different noses	01 no.
31.	Arc welding table with positioner-100cmx75cmx70cm height	02 nos.
32.	Gas welding table with fire bricks	01 no.
33.	Safety charts and posters	As required
34.	Grinding attachment for Lathe	1Set
35.	TIG Welding Machine 200 AC/DC, Rated input voltage 220 v Input frequency 50 Rated power 6.2 KVA Duty cycle 60 %	1 Set
36.	Equipment for conducting BLS (Basic Life Support) training. (Optional)	1 set

Syllabus for the subject

of

**TRADE THEORY-II
&
TRADE PRACTICAL-II**

Under

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

Trade: Fitter

Re-Designed in

- 2014 -

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G. GENERAL INFORMATION

- 1. Name of the Course** : Craft Instructor Training
- 2. Duration of Instructor Training** : 1 Year (Two semesters each of six months duration).
- 3. Subjects covered in the Semesters** : Detailed in Section - C
- 4. Name of the Subject** : **TRADE THEORY –II & TRADE PRACTICAL-II**
- 5. Applicability** : **FITTER TRADE**
- 6. Examination** : AITT to be held at the end of each semester.
- 7. Space Norms** :
 - (a) One class room of minimum 30sq.m. area having Minimum width of 5 m. and with 6000 lumen
 - (b) Workshop : 120 sq. meter having minimum width of 8 m. and with 30000 lumen
 - (c) Computer lab: 30 sq. m area***The electrical equipments of Class room should conform to minimum 3 star Building energy rating as per Bureau of Energy Efficiency (B.E.E.)**
- 8. Power Norms** :
 - (a) 1 KW for Class room
 - (b) 12 KW for Workshop.
- 9. Unit strength(Batch Size)** : 20
- 10. Entry qualification:** Candidate passed semester-I under CITS or completed Semester-I.
- 11. Trainers' Qualification** : Diploma or Degree in Mechanical / Production Engineering from AICTE recognized Board / University with five / two year's experience respectively.
- 12. Desirable** : Passed National Craft Instructor Training course in Fitter trade.
In case of two units, one trainer must be Degree in Engineering.

Note: *Not required if existing computer lab is available.

I. DETAIL SYLLABUS FOR THE TRADE: FITTER
UNDER CRAFT INSTRUCTOR TRAINING SCHEME
SEMESTER-II

Note: During the discussion of any machine tools, related precautions and safety measures should be discussed.

Tentative Week No.	Theory	Practical
01	Concept of Interchangeability. Limit Fits, Tolerance and Allowance- their definition and practical application in Industry. Preparation of lesson Plan, Information sheet, and Assignment Sheet etc.	Project work on fitting exercise. Like stiff joint/Rivet joint etc.
02	Types of rivets and their uses. Method and riveting, specification of riveted. System of Tolerance and Limits i.e. BIS System. Selection of Limits for different types of Fits. 1-Geometrical tolerance (Shape & Form). 2- Position Tolerances (Location	Preparation of Demonstration plan, job sheet, Operation Sheet. Shop Floor demonstration Practice.
03	Gauge: Introduction, necessity, Different types, description and uses of Radius, Wire, Snap, plug, Ring, Telescopic Gauge etc. Explain the difference between workshop gauge, inspection and master gauge. Care and Maintenance. Introduction to Inspection and quality control	Exercise on preparing different gauge by using Radius, Wire, Snap, Plug, Ring and Telescopic Gauges with in an accuracy of + 0.02mm Shop Floor demonstration Practice.
04	Discuss about various types of locking devices, different nuts (i.e. castle nut, slotted nuts etc.) different types of washers (spring washers, fiber washers, tab washers etc.)	Continued on preparing Gauge and their heat treatment practice and hardness testing by different method.
05	Rivets and Riveting, the object of rivets and the thickness of the plates, pitch of rivets. Types of rivet and their uses. Method of riveting, specification of riveted joint. Merit and demerits of riveting. Failures of riveted joints and remedies.	Exercise on drilling and tapping (Both through and blind hones) To very close limits, fitting studs, Counter / Sunk head screw etc. Drilling on cylindrical surface and angular surface. Exercise on marking out and location of holes for riveting, lap and but joint, uses of dolly and snap forming the riveted head.
06	Different methods of drives, power transmission by belts, gears, chains, clutches and coupling etc.	Making of keys and method of filling and removing keys from pulley & shaft. BIS specification for keys and key Ways

07	Broaching machine constructions, different types, parts, broaching process, broaching method etc. Broaching Tools and classification of broaching tools.	Demonstration on broaching machine operation by audio visual aids. <u>REVISION & INTERNAL ASSESSMENT</u>
08-10	Definition of jigs, fixtures and templates. Differentiate between jigs and fixtures, different types & Elements of Jigs and Fixtures. Introduction to presses, their types, main part of a power press. Different types of press tool operations. Die & Punch details and accessories. Clearance between die & punch and related angle, strip layout, calculation of cutting forces & perimeter. Blanking & piercing operations.	Exercise on preparing a simple drilling jig, checking assembly of parts and their accuracy. Exercise on preparation of welding, turning, milling fixture and template & try out of components. Exercise on preparation of simple press tool & try out of component.
11&12	Lapping and Honing: Explain about application of lapping and honing. Lapping and honing tools, shapes, grades and abrasive used tumbling, Frosting, its aim and methods of performing.	Exercise on male and female Fitting. Practice on simple hand Lapping, honing operation.
13	Method of protecting finished surfaces. Discuss about surface finish necessity, degree of finish, finishing symbol and its value. Methods of measuring surface finish. CLA roughness	Preparation of different joints related to the power transmission system (Universal, slip etc).Surface finishing measurement.
14	Construction & working principle of Sine bar & Dial Test Indicator along with the application of Slip Gauge.	Demonstration on Sine bar, dial test Indicator, slip gauge and comparator, and their applications.
15	Comparators- measurement of quality of the cylindrical bores.	Industrial visit to Mechanical Industries.
16	Checking tapers using ball& Roller gauge. Care and Maintenance. Measurement of angle using angle gauge block.	Demonstration on digital caliper and digital micrometer. Application of checking tapers using ball& Roller gauge. Usage of angle gauge block. <u>REVISION & INTERNAL ASSESSMENT</u>
17	Material handling system: Types of Material handing, equipment & accessories and their application & uses.	Practicing and inspection of dismantling & assembly of different valves, stop cocks bearing, pullers etc. and checking for leakage.
18	Application of hydraulic and pneumatic system in Modern machines.	Practice on pipe cutting, pipe fitting, pipe bending pipe threading and pipe replacing and repairs of various pipe works. Use of tool such as thread cutting dies for pipe, pipe bending machine etc. Shop Floor Demonstrating.

19	Bearing: Introduction, classification, type & Uses. Different materials of bearing, bearing types & uses.	Filling and scraping bearing surface and practice on removing worn out bearing from shaft & replacing with a new one.
20	Lubricants & Coolants (in brief) types & their applications.	Scraping and fitting of a direct control bearing on a shaft, preparation of oil grooves on shaft and bearing and checking their alignment. Shop Floor Demonstration.
21	Introduction to CAD, its importance. Different software available in the market. Concept of 2D & 3D application in preparation of drawing.	Practice on CAD software for making 2D drawing for mechanical component.
22	Introduction to co-ordinate measuring machine, its application & uses. Different types of probes and its application. Inspection and types of inspections. Quality control and its concept.	Demonstration on selection of probes, operation on co-ordinate measuring machine, setting of probe, measuring for different components with audio-visual aids.
23	Industrial visit & Submission of Report	
24 - 26	Revision & Trade Test	

J. List of Tools & Equipment

Trade – FITTER

Under CITS

For a batch of 20 Trainees

Semester-II

Sl. No.	Name of the hand tools	Qty per unit
1.	Try_Square 10 cm blade	05 nos.
2.	Caliper 15 cm Hermaphrodite	06 nos.
3.	Divider 15 cm spring	06 nos.
4.	Straight scribe 15 cm	05 nos.
5.	Screw Driver 15 cm	05 nos.
6.	Chisel cold Flat 12mm	06 nos.
7.	Hammer ball pane 0.45 kg with handle.	05 nos.
8.	Hammer bal pane0.22 kg with handle	05 nos.
9.	File Flat 25 cm lInd cut	21 nos.
10.	File Flat 25 cm lInd cut smooth.	21 nos.
11.	File half round 15 cm lInd cut.	21 nos.
12.	Hacksaw frame fixed 30 cm.	21 nos.
13.	Safety goggles.	21 nos.
14.	Dot punch 10 cm	10 nos.

Tools Instrument & General Shop Out fit

Sl. No.	Name of the tools and equipment	Quantity
1.	Rule steel 30 cm to read metric	04 nos.
2.	Rule steel 60 cm	04 nos.
3.	Straight edge 45 cm steel	02 nos.
4.	Surface Plate 45x45 cm Cl/granite	02 nos.
5.	Table for surface plate	02 nos.
6.	Universal scribing block 22 cm	02 nos.
7.	V- block pair 7 cm and 15 cm with clamps	02 nos.
8.	Square adjustable 15 cm blade	02 nos.
9.	Angle plate 10x20 cm	02 nos.
10.	Level spirit 15cm metal	01 no.
11.	Punch letter 3mm set	01 no.
12.	Punch number set 3mm	01 no.
13.	Punch hollow 6 mm to 19 set of 5	02 nos.
14.	Punch round 3 mm x 4 mm set of 2	02 nos.
15.	Portable hand drill (electric) Oto 6 mm	02 nos.
16.	Drill twist s/s 1.5 to 12 nun by .5 mm_	01 Set
17.	Drill twist s/s 8 mm to 15 mm by 1/2 mm	01set
18.	Taps and dies complete set in box B. A	01 no.
19.	Taps and dies complete set in box width-worth	01 no.
20.	Taps and dies complete set in box 3-18 mm set of 10	01 no.
21.	Warding File 15 cm smooth	04 nos.
22.	Knife edge File 15 cm smooth	04 nos.
23.	File cant saw 15 cm smooth	04 nos.
24.	File feather edge 15 cm smooth	04 nos.
25.	File triangular 15 cm smooth	02 nos.
26.	File round 20 cm 2 nd cut	08 nos.
27.	File square 15 cm 2 nd cut	04 nos.
28.	File square 25 cm 2 nd cut	04 nos.
29.	Feeler gauge 10 blades	01set
30.	File triangular 20 cm 2 nd cut	06 nos.
31.	File flat 30 cm 2 nd cut	06 nos.
32.	File flat 30 cm bastard	06 nos.
33.	File Swiss type needle set of 12	02set
34.	File half round 25 cm bastard	04 nos.
35.	File round 30 cm bastar	04 nos.
36.	File Card	06 nos.
37.	Stone oil 15 cm x5 cm x2.5 cm	04 nos.
38.	Stone carborandum 15 cm x 5 cm x 5 cm x 4	02 nos.
39.	Oil Can 0.25 liters	02 nos.
40.	Pliers combination 15 cm	02 nos.
41.	Vice grip pliers	02 nos.
42.	Blow lamp 0.55 liters	02 nos.
43.	Spanner Metric—D.E.set of 10 pcs	06 nos.

44.	Spanner adjustable 15 cm	02 set
45.	Interchangeable ratchet socket set with a 12 mm driver, sized 10-32 mm set of 18 socket and attachments	01 set
46.	Box spanner se 6-25 mm set of 8 with Tommy bar.	01 set
47.	Clamp toolmaker 5cm and 7.5 cm set of 2	02 nos.
48.	Clamp "c" 5 cm	02 nos.
49.	Clamp "c" 10 cm	02 nos.
50.	Hand reamer adjustable cover max 9,12,18mm-set of 3	01 set
51.	Hand reamer taper 4-9mm set of 6 or 4-7mm set of 4	01 set
52.	Reamer parallel 12-16mm set of 5	01 no.
53.	Scraper flat 15cm	06 nos.
54.	Scraper 3 corner 15 cm	06 nos.
55.	Scraper half round 15 cm	06 nos.
56.	Chisel cold 9mm cross cut 9 mm diamond	06 each
57.	Chisel cold 19mm flat	06 nos.
58.	Chisel cold 9 mm round nose	06 nos.
59.	Extractor stud EZY-out	02 nos.
60.	Set combination 30 cm	02 nos.
61.	Micrometer 0-25mm out side	03 nos.
62.	Micrometer 25-50mm out side with 25mm test piece	03. nos.
63.	Micrometer 50-75mm out side with 50mm test piece	02 nos.
64.	Micrometer in side 25-50mm	01 no.
65.	Vernier caliper 20 cm	03 nos.
66.	Vernier height gauges 30 cm	01 no.
67.	Vernier bevel protractor	01 no.
68.	Screw pitch gauge	01 no.
69.	Wire gauge, metric standard	01 no.
70.	Drill twist T/S 6mm to 25 mm x 1.5	01 set
71.	Drill chuck 12mm	01 no.
72.	Pipe wrench 40cm	01 no.
73.	Pipe wrench 30 cm	01 no.
74.	Pipe vice 100mm	02 nos.
75.	Adjustable pipe tape set BSP with die set cover pipe size 15,20,25,32,38,50mm	01 no.
76.	Wheel dresser (1 for 4 units)	01 no.
77.	Machine vice 10cm	01 no.
78.	Machine vice 15cm	01 no.
79.	Sleeve drill morse 0-1,1-2,2-3	01 set
80.	Bench Vice 12cm jaws	20 nos.
81.	Leg Vice 10cm jaw	02 nos.
82.	Fire Extinguisher	02 nos.
83.	Fire Buckets	02 nos.
84.	Wing Compass 25.4cm or 30cm	02 nos.
85.	Hand Hammer 01KG with handle	02 nos.
86.	Gauge slip as Johnson metric set	01 set

87.	Carbide wear block 0 lmm-02mm	02 each
88.	Gauge snaps Go and No Go 25 to 50mm by5mm set of 06pcs.	01set
89.	Gauge pluge single ended 05 to 55 by 5mm set of 1 pcs.	01set
90.	Gauge Telescopic up to 150mm	01 no.
91.	Radius Gauges(Asorted)	10 nos.
92.	Dial Test Indicator .0 l mm with magnetic stand	01no.
93.	Sine bar 125mm	01no.
94.	Sine bar 250mm	01no.
95.	Lathe Tools HSS Tiped set	02 nos.
96.	Lathe Tools Bit 6mm,8mm,10mmx100mm	10 each
97.	Counter Boring and Counter sinking Tool	02 nos.
98.	Arm strong type bit holder RH	02 nos.
99.	Arm strong type bit holder LH	02 nos.
100.	Arm strong type bit holder Straight	02 nos.
101.	Pipe cutter 6 mm to 50 mm wheel type	01no.
102.	Adjustable Spanner 38 cm long	01 no.
103.	Dial Vernier Caliper 0-200mm LC00.05MM (Universal type)	01 no.
104.	Vernier Micrometer 0-50 mm	01 no.
105.	Depth Micrometer 0-100mm,0.01mm	01 no.
106.	Vernier Caliper 150mm LC 0.02MM	01 no.
107.	Comparators Stand With Dial Indicator LC0.01mm	01 no.
108.	Engineers Try Square (Knife wedge) 150mm Blade.	01set
109.	Surface Roughness comparison plates N1-N12Grade	01 no.
110.	Digital Vernier Caliper 20cm	01 no.
111.	Digital Outside Micrometer 0-25mm	01 no.
112.	Digital Dial Test Indicator	01 no.
113.	Brinell Hardness Tester	01 no.

LIST OF MACHINES, EQUIPMENTS & FURNITURES FOR THE TRADE - FITTER

Sl. No.	Description of Equipments	Qty in Nos.
1.	SS and SC centre lathe (all geared) with having minimum specification as: centre height 150 mm and centre distance 1000 mm along with 4 jaw and 3 jaw chucks, auto feed system, safety guard, motorized coolant system and lighting arrangement.	02 nos.
2.	Drilling Machine pillar type 0 - 20mm capacity with drill chuck & key	02 nos.
3.	Pedestal Grinder Double End type. Wheel 300x40x50.8mm Wheel centre distance 650 mm approx Power of motor 1HP	01no
4.	Hydraulic Power Saw Machine suitable for minimum 375mm length blade.	01no
5.	Steel Cupboard with 8 pigeon lockers 78"x36"x19" (20g)	3 nos.
6.	Chair with arm for trainer	02 nos.
7.	Table for trainer	01 no
8.	Work Bench 240x120x90 cm	05 nos.
9.	Steel cupboard 180x90x45cm (20g)	02nos.
10.	Steel cupboard 120x60x45cm (20g)	02nos.
11.	White Board with magnetic duster 6'x4'	02 nos.
12.	First aid box.	01no
13.	Metal rack 182x182x45cm	01 no
14.	Brinell hardness testing machine having diamond indenter	01no
15.	Co-ordinate Measuring Machine having accuracy of 5 micron suitable to measure minimum 300mm distance. (Optional)	01 no
16.	Surface roughness tester	01 no
17.	CAD software(latest version)	11 users
18.	Desktop computers with latest configuration to run CAD software with UPS.	11nos.
19.	Computer Table & chair	11 nos. & 20 nos.

Note: Institutes having computer lab need not to procure item 18 & 19.

**K. FURNITURE, ACCESSORIES AND AUDIO VISUAL AIDS FOR
THE SEMESTER-I & II (COMMON FOR ALL ENGG. TRADES)**

Sl. No.	Item	Qty
1.	Class Room Chairs (armless) / Dual desk may also be allowed	20 /10nos.
2.	Class Room Tables (3ft X 2ft) / Dual desk may also be allowed	20 /10nos.
3.	Chair for Trainer (armed) movable	01 no.
4.	Table for Trainer (4 ½ ft X 2 ½ ft) with Drawer and cupboard	01 no.
5.	LCD / LED Projector	01 no.
6.	Multimedia Computer System with all accessories with UPS (.5 KVA)	01 set
7.	White Board (6ft X 4 ft.)	01 no.
8.	LCD Projector Screen	01 no.
9.	Air Conditioner 1.5Ton for computer room	02 nos.
10.	Wall charts, Transparencies and DVDs related to the trade	As required
11.	Laser Printer with scanner	01
12.	Steel Cupboard with 8 pigeon lockers	3 nos.
13.	Work bench for fitters with two vices of 100mm	2 nos.
14.	Steel cupboard 180x90x45cm	2 nos.
15.	Steel cupboard 120x60x45cm	2 nos.
16.	Multi drawer tool rack trolley with minimum 4 drawers and 20 tool capacity	04 nos.
17.	First aid box.	01 no.

L. LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation Shri/Mr./Ms.	Organization	Mentor Council Designation
Members of Sector Mentor council			
1.	A. D. Shahane, Vice-President, (Corporate Trg.)	Larsen & Tourbo Ltd., Mumbai:400001	Chairman
2.	Dr. P.K.Jain, Professor	IIT, Roorkee, Roorkee-247667, Uttarakhand	Member
3.	N. Ramakrishnan, Professor	IIT Gandhinagar, Gujarat-382424	Member
4.	Dr. P.V.Rao, Professor	IIT Delhi, New Delhi-110016	Member
5.	Dr. Debdas Roy, Asstt. Professor	NIFFT, Hatia, Ranchi-834003, Jharkhand	Member
6.	Dr. Anil Kumar Singh, Professor	NIFFT, Hatia, Ranchi-834003, Jharkhand	Member
7.	Dr. P.P.Bandyopadhyay Professor	IIT Kharagpur, Kharagpur- 721302, West Bengal	Member
8.	Dr. P.K.Ray, Professor	IIT Kharagpur, Kharagpur- 721302, West Bengal	Member
9.	S. S. Maity, MD	Central Tool Room & Training Centre (CTTC), Bhubaneswar	Member
10.	Dr. Ramesh Babu N, Professor	IIT Madras, Chennai	Member
11.	R.K. Sridharan, Manager/HRDC	Bharat Heavy Electricals Ltd, Ranipet, Tamil Nadu	Member
12.	N. Krishna Murthy Principal Scientific Officer	CQA(Heavy Vehicles), DGQA, Chennai, Tamil Nadu	Member
13.	Sunil Khodke Training Manager	Bobst India Pvt. Ltd., Pune	Member
14.	Ajay Dhuri	TATA Motors, Pune	Member
15.	Uday Apte	TATA Motors, Pune	Member
16.	H B Jagadeesh, Sr. Manager	HMT, Bengaluru	Member
17.	K Venugopal Director & COO	NTTF, Peenya, Bengaluru	Member
18.	B.A.Damahe, Principal L&T Institute of Technology	L&T Institute of Technology, Mumbai	Member
19.	Lakshmanan. R Senior Manager	BOSCH Ltd., Bengaluru	Member
20.	R C Agnihotri Principal	Indo- Swiss Training Centre Chandigarh, 160030	Member
Mentor			
21.	Sunil Kumar Gupta (Director)	DGET HQ, New Delhi.	Mentor

Members of Core Group			
22.	N. Nath. (ADT)	CSTARI, Kolkata	Co-ordinator
23.	H.Charles (TO)	NIMI, Chennai.	Member
24.	Sukhdev Singh (JDT)	ATI Kanpur	Team Leader
25.	Ravi Pandey (V.I)	ATI Kanpur	Member
26.	A.K. Nasakar (T.O)	ATI Kolkata	Member
27.	Samir Sarkar (T.O)	ATI Kolkata	Member
28.	J. Ram Eswara Rao (T.O)	RDAT Hyderabad	Member
29.	T.G. Kadam (T.O)	ATI Mumbai	Member
30.	K. Mahendar (DDT)	ATI Chennai	Member
31.	Shrikant S Sonnavane (T.O)	ATI Mumbai	Member
32.	K. Nagasrinivas (DDT)	ATI Hyderabad	Member
33.	G.N. Eswarappa (DDT)	FTI Bangalore	Member
34.	G. Govindan, Sr. Draughtsman	ATI Chennai	Member
35.	M.N.Renukaradhya, Dy.Director/Principal Grade I.,	Govt. ITI, Tumkur Road, Banglore, Karnataka	Member
36.	B.V.Venkatesh Reddy. JTO	Govt. ITI, Tumkur Road, Banglore, Karnataka	Member
37.	N.M.Kajale, Principal,	Govt. ITI Velhe, Distt: Pune, Maharashtra	Member
38.	Subrata Polley, Instructor	ITI Howrah Homes, West Bengal	Member
39.	VINOD KUMAR.R Sr.Instructor	Govt.ITI Dhanuvachapuram Trivendrum, Dist., Kerala	Member
40.	M. Anbalagan. Assistant Training Officer	Govt. ITI Coimbatore, Tamil Nadu	Member
41.	K. Lakshmi Narayanan, T.O.	DET, Tamil Nadu	Member
Other industry representatives			
42.	Venugopal Parvatikar	Skill Sonics, Bangalore	Member
43.	Venkata Dasari	Skill Sonics, Bangalore	Member
44.	Srihari, D	CADEM Tech. Pvt. Ltd., Bengaluru	Member
45.	Dasarathi.G.V.	CADEM Tech. Pvt. Ltd., Bengaluru	Member
46.	L.R.S.Mani	Ohm Shakti Industries, Bengaluru	Member