FITTER

NSQF LEVEL – 5

SECTOR- CAPITAL GOODS & MANUFACTURING

COMPETENCY BASED CURRICULUM

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

GOVERNMENT OF INDIA
Ministry of Skill Development & Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City, Kolkata – 700091

FITTER

(Engineering Trade)

SECTOR – CAPITAL GOODS AND MANUFACTURING

(Revised in 2023)

Version 2.0

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Developed By

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1. COURSE OVERVIEW

The Craft Instructor Training Scheme is operational since inception of the Craftsmen Training Scheme. The first Craft Instructors' Training Institute was established in 1948. Subsequently, 6 more institutes namely, Central Training Institute for Instructors (now called as National Skill Training Institute (NSTI)), NSTI at Ludhiana, Kanpur, Howrah, Mumbai, Chennai and Hyderabad were established in 1960's by DGT. Since then the CITS course is successfully running in all the NSTIs across India as well as in DGT affiliated institutes viz. Institutes for Training of Trainers (IToT). This is a competency based course of one year duration. "Fitter" CITS trade is applicable for Instructors of "Fitter" trade.

The main objective of Craft Instructor training programme is to enable Instructors explore different aspects of the techniques in pedagogy and transferring of hands-on skills so as to develop a pool of skilled manpower for industries, also leading to their career growth & benefiting society at large. Thus promoting a holistic learning experience where trainee acquires specialized knowledge, skills & develops attitude towards learning & contributing in vocational training ecosystem.

This course also enables the instructors to develop instructional skills for mentoring the trainees, engaging all trainees in learning process and managing effective utilization of resources. It emphasizes on the importance of collaborative learning & innovative ways of doing things. All trainees will be able to understand and interpret the course content in right perspective, so that they are engaged in & empowered by their learning experiences and above all, ensure quality delivery.

2. TRAINING SYSTEM

2.1 GENERAL

CITS courses are delivered in National Skill Training Institutes (NSTIs) & DGT affiliated institutes viz., Institutes for Training of Trainers (IToT). For detailed guidelines regarding admission on CITS, instructions issued by DGT from time to time are to be observed. Further complete admission details are made available on NIMI web portal http://www.nimionlineadmission.in. The course is of one-year duration. It consists of Trade Technology (Professionalskills and Professional knowledge), Training Methodology and Engineering Technology/ Soft skills. After successful completion of the training programme, the trainees appear in All India Trade Test for Craft Instructor. The successful trainee is awarded NCIC certificate by DGT.

2.2 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year:

S No.	Course Element	Notional Training Hours
1.	**Trade Technology**	
	Professional Skill (Trade Practical)	480
	Professional Knowledge (Trade Theory)	270
2.	**Training Methodology**	
	TM Practical	270
	TM Theory	180
	Total	**1200**

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

3	On the Job Training (OJT)/ Group Project	150
4	Optional Course	240

Trainees can also opt for optional courses of 240 hours duration.

2.3 PROGRESSION PATHWAYS

- Can join as an Instructor in a Vocational Training Institute / technical Institute.
- Can join as a supervisor in Industries.

2.4 ASSESSMENT & CERTIFICATION

The CITS trainee will be assessed for his/her Instructional skills, knowledge and attitude towards learning throughout the course span and also at the end of the training program.

a) The Continuous Assessment (Internal) during the period of training will be done by **Formative Assessment Method** to test competency of instructor with respect to assessment criteria set against each learning outcomes. The training institute has to maintain an individual trainee portfolio in line with assessment guidelines. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The **Final Assessment** will be in the form of **Summative Assessment Method**. The All India Trade Test for awarding National Craft Instructor Certificate will be conducted by DGT at the end of the year as per the guidelines of DGT. The learning outcome and assessment criteria will be the basis for setting question papers for final assessment**.** The external examiner during final examination will also check the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS CRITERIA

Allotment of Marks among the subjects for Examination:
The minimum pass percent for Trade Practical, TM practical Examinations and Formative assessment is 60% & for all other subjects is 40%.There will be no Grace marks.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. While assessing, the major factors to be considered are approaches to generate solutions to specific problems by involving standard/non-standard practices.

Due consideration should also be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising of the following:

- Demonstration of Instructional Skills (Lesson Plan, Demonstration Plan)
- Record book/daily diary
- Assessment Sheet
- Progress chart
- Video Recording
- Attendance and punctuality

- Viva-voce
- Practical work done/Models
- Assignments
- Project work

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming yearly examination for audit and verification by examining body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60%-75% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of an ***acceptable standard*** of crafts instructorship with ***occasional*** **guidance** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***fairly good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Average engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A fairly good level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Occasional support in imparting effective training.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of a ***reasonable standard*** of crafts instructorship with ***little*** **guidance** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Above average in engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A***good*** level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Little support in imparting effective training.
(c) Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional	• Demonstration of ***high*** skill level to establish a rapport with audience,

design, implement learning programme and assess learners which demonstrates attainment of a ***high standard*** of crafts instructorship with ***minimal or no support*** and engage students by demonstrating good attributes of a trainer.	presentation in orderly manner and establish as an expert in the field. • Good engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A ***high*** level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Minimal or no support in imparting effective training.

3. GENERAL INFORMATION

Name of the Trade	**FITTER-CITS**
Trade Code	DGT/4003
NCO – 2015	7233.0100, 7233.0200, 2356.0100
NOS Covered	CSC/N9489,CSC/N9490,CSC/N9491,CSC/N9411, CSC/N9433, CSC/N9496, CSC/N9497,CSC/N9498,CSC/N9499, CSC/N9431, ASC/N9410, ASC/N9411
NSQF Level	Level-5
Duration of Craft Instructor Training	One Year
Unit Strength (No. Of Student)	25
Entry Qualification	Degree in Mechanical/Production Engineering from AICTE/ UGC recognized Engineering College/ University OR 03 years Diploma in Mechanical/Production Engineering after class 10th from AICTE/ recognized board of technical education. OR Ex-serviceman from Indian Armed forces with 15 years of service in related field as per equivalency through DGR OR 10th Class with 02 year NTC/NAC passed in the trade of "Fitter" + 1 year of related experience.
Minimum Age	18 years as on first day of academic session.
Space Norms	120 Sq. m
Power Norms	10KW
Instructors Qualification for	
1. FITTER -CITS Trade	B.Voc./Degree in Mechanical/Production Engineering from AICTE/UGC recognized University with two years' experience in relevant field. OR 03 years Diploma in Mechanical/ Production Engineering from AICTE/ recognized Board/ University or relevant Advanced Diploma (Vocational) from DGT with five years' experience in relevant field. OR Ex-serviceman from Indian Armed forces with 15 years of service in related field as per equivalency through DGR. Candidate should undergone methods of instruction course or minimum 02 years of experience in technical training institute of Indian Armed forces OR NTC/ NAC passed in the Fitter trade with seven years' experience in relevant field. **<u>Essential Qualification:</u>**

	National Craft Instructor Certificate (NCIC) in Fitter trade,in any of the variants under DGT.
2. Workshop Calculation & Science	B.Voc./Degree in any Engineering from AICTE/ UGC recognized Engineering College/ university with two years' experience in relevant field. **OR** 03 years Diploma in any Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with five years' experience in relevant field. **OR** NTC/ NAC in any Engineering trade with seven years' experience in relevant field. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade. **OR** NCIC in RoDA or any of its variants under DGT.
3. Engineering Drawing	B.Voc./Degree in Engineering from AICTE/ UGC recognized Engineering College/ university with two years' experience in relevant field. OR 03 years Diploma in Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with five years' experience in relevant field. OR NTC/ NAC in any one of the 'Mechanical group (Gr-I) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with seven years experience. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade. **OR** NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT.
4. Training Methodology	B.Voc./Degree in any discipline from AICTE/ UGC recognized College/ university with two years' experience in training/ teaching field. OR Diploma in any discipline from recognized board / University with five years' experience in training/teaching field. OR NTC/ NAC passed in any trade with seven years' experience in training/ teaching field. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in any of the variants under DGT / B.Ed /ToT from NITTTR or equivalent.
5. Minimum Age for Instructor	21 years

4. JOB ROLE

Brief description of job roles:

Manual Training Teacher/Craft Instructor; instructs students in ITIs/Vocational Training Institutes in respective trades as per defined job role. Imparts theoretical instructions for the use of tools & equipment's of related trades and related subjects. Demonstrate process and operations related to the trade in the workshop; supervises, assesses and evaluates students in their practical work. Ensures availability & proper functioning of equipment and tools in stores.

Fitter General; sizes metal parts to close tolerances and fits and assembles them using hand tools for production or repairs of machines, or other metal products. Studies drawings to understand specification of different parts, fittings or assembles to be made and their functions. Cuts and shapes required parts dimensions and specifications by processes of sawing, clipping, filing, grinding, drilling holes, screw cutting, scrapping etc., Assembles parts by riveting, screwing, pinning etc. So as to make complete unit according to drawing. Dismantles or removes worn out, broken or defective parts using hand tools and replaces them by repaired or new ones. Tests completed article to ensure correct performance. May do simple turning, planning and shaping of parts on machines and perform welding, brazing, annealing, hardening, tempering and, like operations. May specialize in particular type of machine or product and be designated accordingly.

Fitter, Bench: Viceman sizes metal accurately to required dimension by sawing, chipping, filing, etc. using hand tools for making specimens or finished components. Studies drawing or measures sample to record dimensions of part to be made. Holds specified material in vice and sizes it by processes of sawing, chipping and filing. Measures object while working using foot rule, callipers, gauges etc. and checks for correct filing with square. Gets half-finished objects marked or marks it using face plate, marking block, scriber, Vernier height gauges, vice-blocks, angle plate, sine plate, slip gauges, combination set, etc. depending on accuracies required, to indicate guide lines for finished sizes, holes to be drilled and pitch centres, threads to be cut and other working details as specified in drawing or sample. Clamps object securely in correct position in vice and files it to required dimensions according to punch marks and guide lines frequently measuring it with calipers, micrometre, Vernier calipers, gauges etc. Drills holes with hand drill, cuts threads with taps and dies ensuring that they are square or at required angle to base. Measure finished article with dial indicator, micrometre, Vernier calipers, height gauges, screw gauges, plug gauges, sine plate slip gauge, etc. according to prescribed accuracies. May make parts separately and assemble them with screws, rivets, pins, etc. as specified. May check dimension with shadow graph. May be designated as FITTER TOOL ROOM or Filer according to nature of work done.

Reference NCO 2015:

a) 2356.0100-Manual Training Teacher/ Craft Instructor
b) 7233.0100 -Fitter General

c) 7233.0200 - Fitter, Bench

Reference NOS:

(i) CSC/N9489
(ii) CSC/N9490
(iii) CSC/N9491
(iv) CSC/N9411
(v) CSC/N9433
(vi) CSC/N9496
(vii) CSC/N9497
(viii) CSC/N9498
(ix) CSC/N9499
(x) CSC/N9431
(xi) ASC/N9410
(xii) ASC/N9411

5. LEARNING OUTCOME

Learning *outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.*

5.1TRADE TECHNOLOGY

1. Monitor implementation of safe working practices, environment regulation, housekeeping and demonstrate identification and application of different tools and operations using chisels, hacksaw to make true surfaces. (NOS: CSC/N9489)
2. Ensure marking dimensions, drill & tap blind holes, check the drill hole size using counter bore to remove broken taps. (NOS: CSC/N9490)
3. Plan to use various thread measuring instruments & explain to operate measuring instruments of digital system in advanced manner. (NOS: CSC/N9491)
4. Evaluate various welding practices. (NOS: CSC/N9411)
5. Check various CNC turning practices. (CSC/N9433)
6. Monitor identification of different riveted joints with project on fitting & usages of different types of gauges and heat treatment on gauges. (NOS: CSC/N9496)
7. Appraise Choice of doing tapping on blind holes at specified depth & identification of the drill jig with its function and simple press and its constructional parts. (NOS: CSC/N9497)
8. Evaluate broaching operations on broaching machine, lapping honing operations & different power transmissions joints. (NOS: CSC/N9498)
9. Check use and application of different types of comparators, sine bar, dial test indicator, different digital measuring instruments & demonstrate operation on co-ordinate measuring machine. (NOS: CSC/N9499)
10. Plan assembling and dismantling of different valves and pipe joints, hydraulic and pneumatic systems & monitor maintenance of bearings on machine parts. (NOS: CSC/N9501)
11. Check drawings through Auto CAD 2D& 3D modeling. (CSC/N9431)
12. Read and apply engineering drawing for different application in the field of work. (NOS: ASC/N9410)
13. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: ASC/N9411)

6. COURSE CONTENT

SYLLABUS FOR FITTER –CITSTRADE			
TRADE TECHNOLOGY			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Practical 80Hrs Theory 30Hrs	Monitor implementation of safe working practices, environment regulation, housekeeping and demonstrate identification and application of different tools and operations using chisels, hacksaw to make true surfaces.	1. Introduction of occupational safety & Health. 2. Importance of housekeeping & good shop floor practices. 3. Introduction of healthy, safety and environment guidelines legislation & regulations as applicable. 4. Introduction of disposal procedure of waste materials take cotton waste, metal chips/burrs etc. 5. Introduction of basic safety introduction, personal protective equipments (PPE). 6. Importance of basic injury prevention, basic first aid, hazard identification and avoidance, basic safety signs for danger. 7. Importance of warning, caution & personal safety message. 8. Introduction of preventive measures for electrical accidents & steps to be taken in such accident. 9. To use of fire extinguishers. 10. Importance of technical English. 11. Prepare different types of documentation as per Industries need by different methods of recording information. 12. Introduction of basic life support training and be able to perform DRSABCD. (D: check for danger, R: check for response, S: send for	Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Response to emergencies e.g.; power failure, fire, and system failure 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. 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. Basic Life support (BLS):- Basic Life Support (BLS) techniques for drowning, choking, electrocution, neck and spinal injury, including CPR(cardiopulmonary resuscitation).

		help, A: open the air way.)	
		13. Importance of skill grading chart. 14. Designing the grade exercise covering the list of skills. 15. Introduction of concept of conservation of Raw material. 16. Demonstration on the concept of conservation of raw materials.	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/lesion/topic wise.
		17. Exercise on chipping a flat surface on mild steel & cast Iron blocks, with a flat & cross cut chisel. 18. Exercise to make the flat chisel by grinding. 19. Exercise on filing flat surface to right angle. 20. Exercise on scraping practice on cast iron surface plate. 21. Scraping of flat bearing surface and their fitting. 22. Evaluation scheme & procedure how to check the job/exercise as per the marking scheme with tolerance ±0.02mm. 23. Write the sequence operations of the job/exercise with procedure to complete the job alongwith safety precautions.	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 filling, care and maintenance Chisels &Hacksaw specification, types and kinds, construction and function.
Practical 65Hrs Theory 24Hrs	Ensure marking dimensions, drill & tap blind holes, check the drill hole size using counter bore to remove broken taps.	24. Making scheme and evaluation of intricate profiles of exercise. 25. Making a V-block from cast iron as per drawing. 26. Making a V-block from mild steel as per drawing. 27. Relocating a wrongly positional drilled hole & checking concentricity &dimension for true drilling. 28. Practice on drilling through and blind holes on ferrous & non-ferrous metals to a	Appropriate cutting and clearance angel for cutting different materials. Method of chipping and sharpening of chisels. Precaution to be observed while chipping & sharpening of chisels. Types of drilling Machine-Pillar, Radial-their construction and specification. Work holding and tool holding devices for different jobs. Different types of drills, drill nomenclature, cutting angle,

		positional accuracy of ±0.10mm. 29. Practical/exercise on grinding twist drill and without attachment and checking angle with gauge. 30. Exercise on tapping through and blind holes to suit stud & bolt.	size and method of holding drills both straight and taper shank and their applications.
		31. Demonstration and exercise on counter bore, counter sink, spot facing reaming holes – three pices fitting with dowel pins. 32. Revision & Internal Assessment. 33. Demonstration on removal of broken taps or studs from a through hole and blind hole. 34. Exercise on external threading by using dies & lubricant. 35. Care & maintenance while using taps & dies.	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. Knowledge of Bench/ pedestal grinders. Definition of dressing loading, Glazing, truing, mounting and dismantling of Grinding wheel from the machine. Introduction to tapping-Taps and Tapping: Taps- description, specification, Tapping Through and blind holes, lubricating for taping. Cause for tap broken and remedies. Method of calculation of tap drill size for tapping. Specification of Dies. (ISO/BIS standard.)
Practical 52Hrs Theory 20Hrs	Plan to use various thread measuring instruments & explain to operate measuring instruments of digital system in advanced manner.	36. Measuring the thread dimension by various methods by thread micrometer. 37. Demo on thread micrometer and its applications. 38. Exercise involving preparation of one of the flat surface as master and two of the adjoining sides square by filing flat and square. 39. Demo on application of various types of lubricants & coolants. 40. Practice on filing to make sides square and the surface flat with minimum basic practical skills involvement.	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. Lubricants & Coolants (in brief) types & their applications.

		41. Demo on usage of digital height gauge and applications. 42. Demo on digital indicator & bore gauge and their applications. 43. Demo on combination set and parts and its functions. 44. Exercise on advanced practice on making, filing etc. 45. Exercise on advance practice on drilling, counter sinking, tapping etc. 46. Assemble of parts and checking and preparation a parallel clamp. 47. Practice on square fitting, step fitting etc. as per given drawing. 48. Practice on sliding and angle fitting, within accuracy of ±5 minutes and their evaluation.	Discussion on precision measuring instrument such as Venire Caliper, height gauge, Micrometer (Various Types) Depth gauge, etc. Their working principal, construction, parts, graduation reading, uses, care and maintenance. Discussion continued on Dial Test Indicator, Bore gauge, Bevel Protractor, Combination set etc. their construction, part, graduation, reading uses, care & maintenance. (Both English &Metric) General Properties of metal, Difference between metals and non Metals Discussion about ferrous and non metal. Iron carbide diagram(Fe- Fe3c) Discussion of physical, Mechanical and Chemical properties of metals.
Practical 22 Hrs Theory 10Hrs	Evaluate various welding practices.	49. Importance of arc welding in industry & uses. 50. Identification of parts of ARC welding transformer and its accessories. 51. Practice on basic metal ARC welding process. 52. TIG welding practice. 53. Practice on setting the gas welding plant & applications. 54. Practice on flame setting – practice on welding of thin sheet and gas cutting metals.	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. Study of basic parts of slotter, milling and Jig boring machines with the help of suitable audio visual aids.
Practical 22 Hrs Theory 10 Hrs	Check various CNC turning practices.	55. Introduction to CNC technology. 56. Practice on Direct Numerical Control (DNC) machine and Key & switches of operator console. 57. Practice on CNC lathe machine and coordinate systems of concerned machine.	Introduction to CNC lathe/turning. Advantages of CNC system/machine. Classification of CNC system. Designation of Axes. Part programming CNC (turning).

Practical 38Hrs Theory 14Hrs	Monitor identification of different riveted joints with project on fitting & usages of different types of gauges and heat treatment on gauges.	58. Project work on fitting exercise. Like stiff joint/Rivet joint etc.	Concept of Interchange- ability. Limit Fits, Tolerance and Allowance- their definition and practical application in Industry. Preparation of lesson Plan, Information sheet, and Assignment Sheet etc.
		59. Exercise on preparing different gauges by using radius, wire, snap, plug, ring and telescoping gauges with an accuracy of ± 0.02mm. 60. Shop floor demonstration practice as many as possible. 61. Exercise on preparation different gauges by using radius, wire, snap, plug, ring etc. with an accuracy of ± 0.02mm and their heat treatment practice and hardness testing by different methods.	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 Discuss about various types of locking devices, different nuts(i.e. castle nut, slotted nuts etc.) different types of washers(spring washers, fibre washers, tab washers etc.)
Practical 46Hrs Theory 18Hrs	Appraise Choice of doing tapping on blind holes at specified depth & identification of the drill jig with its function and simple press and its constructional parts.	62. Exercise on drilling and tapping (both through and blind holes) to very close limits, fitting studs, counter sunk head screw etc. 63. Drilling on cylindrical surface and angular surface. 64. Exercise on marking out and location of holes for riveting, lap and butt joint, uses of dolly and snap forming the riveting head. 65. Making of keys and method of filing and removing keys from pulley & shaft. BIS specification for keys & keys ways.	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. Different methods of drives, power transmission by belts gears, chains, clutches and coupling etc.
		66. Exercise on preparing on a simple drilling Jig, checking assembly of parts and their accuracy. 67. Exercise on preparation of welding, tuning, milling, fixture and template & try out of components.	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

		68. Exercise on preparation of simple press tool & try out of component.	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.
Practical 46Hrs Theory 18Hrs	Evaluate broaching operations on broaching machine, lapping honing operations &different power transmissions joints.	69. Demonstration on broaching machine operation by audio &visual aids. 70. Revision and internal assessment.	Broaching machine constructions, different types, parts, broaching process, broaching method etc. Broaching Tools and classification of broaching tools.
		71. Exercise on male & female fitting. 72. Practice on simple hand lapping, honing operation. 73. Preparation of different joints related to the power transmission system (universal, slip, etc.) 74. Demo on surface finishing measurement.	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. 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.
Practical 42Hrs Theory 18Hrs	Check use and application of different types of comparators, sine bar, dial test indicator, different digital measuring instruments & Coordinate Measuring Machine.	75. Demonstration on Sine bar and Its Applications. 76. Demonstration on Dial Test Indicator and Its Uses. 77. Demonstration on Slip gauges and Comparators and their Applications.	Construction & working principle of Sine bar & Dial Test Indicator along with the application of Slip Gauge.
		78. Demonstration on digital calliper and its Application. 79. Demonstration on Digitial Micrometer and its Applications 80. Application of checking Tapers Using Ball &Roller gauge 81. Demonstration on Usage of Angle gauge block 82. Revision & Internal Assessment.	Checking tapers using ball& Roller gauge. Care and Maintenance. Measurement of angle using angle gauge block.
		83. Demonstration on selection of probes, operation on co-ordinate measuring machine	Introduction to co-ordinate measuring machine, its application& uses. Different

		and its details. 84. Demonstration on setting of probe of co-ordinating measuring machine & measuring for different components with Audio-visual aids.	types of probes and its application Inspection and types of inspections. Quality control and its concept.
Practical 45Hrs Theory 18Hrs	Plan assembling and dismantling of different valves and pipe joints, hydraulic and pneumatic systems & monitor maintenance of bearings on machine parts.	85. Practicing and Inspection of dismantling &assembly of different Valves, stop cocks, bearing, pullers, etc., and checking for Leakage. 86. Practice on Pipe cutting, Pipe fitting, pipe bending, Pipe Threading, etc., 87. Practice on pipe replacing and repairs of various Pipe works 88. Shop floor demonstration on use of tools such as thread cutting dies for pipes, pipe bending machines, etc. 89. Practice and demonstration on basic parts/ tools of hydraulic and pneumatic system in detail. 90. Practice and demonstration on hydraulic and pneumatic system in modern machines and practice on hydraulic and pneumatic systems.	Material handling system: Types of Material handing equipment & accessories and their application & uses Application of hydraulic and pneumatic system in Modern machines. Introduction to hydraulic and pneumatic, compressed air, hydraulic power pack. Air compressor. Actuators, valves, accumulator and complings. Graphical symbols of hydraulic and pneumatic components.
		91. Filing and scraping various surfaces on various metals. 92. Practice on removing worn out bearing form shaft & replacing with a new one. 93. Shop floor demonstration on scraping and fitting of a direct control bearing on a shaft. 94. Shop floor demonstration on preparation of oil grooves on shaft and bearing and checking their alignment.	Bearing: Introduction, classification, type & Uses Different materials of bearing, bearing types & uses. Lubricants & Coolants (in brief) types & their applications.
Practical 22Hrs Theory 10Hrs	Check drawings through Auto CAD 2D& 3D modeling.	95. Practice on CAD software for making 2Ddrawings for mechanical components. 96. Assembly drawing practice on 2D& 3D modelling on various mechanical parts	Introduction to CAD, its importance. Different software available in the market. Concept of 2D & 3D application in preparation of drawing.

		using AUTO CAD software. 97. Practice of annotation and dimensioning on 3D model.	
Engineering Drawing: 40 Hrs.			
Professional Knowledge ED- 40 Hrs.	Read and apply engineering drawing for different application in the field of work.	**CIRCLES, TANGENTS AND ELLIPSE:** Practical applications procedure for constructing tangent to given circle-lines- loop pattern--tangential circles- external tangents- internal tangents ellipse **PARABOLIC CURVES, HYPERBOLA:** Involutes - Properties and their application. Procedure for constructing parabolic curve-hyperbolic curve-in volute curve. epicycloids, hypocycloid, Involutes, spiral & Archimedes spiral **TECHNICAL DRAWING/ SKETCHING OF COMPONENTS' PARTS:** Views of object Importance of technical sketching-types of sketches-Isometric drawing sketching- Oblique drawing sketching. **PROJECTIONS**: Theory of projections (Elaborate theoretical instructions), Reference planes, orthographic projections concept 1st Angle and 3rd Angle, Projections of points, Projections of Lines– determination of true lengths & inclinations. Projections of plane, determination of true shape. Exercises on missing surfaces and views. Orthographic drawing or interpretation of views. Introduction to first angle projections of solids. **ISOMETRIC VIEWS**: Fundamentals of isometric projections (Theoretical Projections) Isometric views from 2 to 3 given orthographic views. Preparation of simple working drawing of Furniture items like table, stool and any job prepared in the workshop. **SECTIONAL VIEWS:** Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventional in sectioning. Drawing of full section, half section, partial or broken out sections, offset sections, revolved sections and removed sections. Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, Rectangular, square angle, channel, rolled sections. Exercises on sectional views of different objects. - **DEVELOPMENT AND INTERSECTIONS:** Development of surfaces-Types of surface- Methods of development-Intersection- Methods of drawing intersection lines-critical point or key point. **FASTENERS**: Sketches of elements of screw threads, Sketches of studs, cap screws machine screws, set screws, Locking devices, bolts, Hexagonal & square nuts & nut bolt & washer assembly. Sketches of plain spring lock, toothed lock, washers, cap nut, check nut, slotted nut, cassel nut, sawn nut, wing nut, eye blot, tee bolt & foundation bolt. Sketches of various types of rivet heads (snap–	

		pan–conical– countersunk) Sketches of keys (sunk, flat, saddle, gib head, woodruff) Sketches of hole & shaft assembly. **DETAIL DRAWING AND ASSEMBLY DRAWING:** Details of machine drawing- Assembly drawing- surface quality-surface finish standard-Method of indicating surface roughness for general engineering drawing-symbols used for indication of surface roughness-symbols for direction of lay. Geometrical tolerance. Detail drawing of the following with complete dimensioning, tolerances, material and Surface finish specifications 1. Universal couplings 2. Ball bearing and roller bearing. 3. Fast and loose pulley. 4. Stepped and V belt pulley. 5. Flanged Pipe joints, right angle bend. 6. Tool Post of Lathe Machine. 7. Tail Stock of Lathe Machine 8. Stepped and V belt pulley. 9. Flanged Pipe joints, right angle bend. 10. Tool Post of Lathe Machine. 11. Tail Stock of Lathe Machine Practice of blue print reading on limit, size, fits, tolerance, machining symbols, and reading out of assembly drawing etc., ISO Standards. **READING OF ENGINEERING DRAWING:** Blue print and machine drawing reading exercises. **GRAPHS & CHARTS**: Types (Bar, Pie, Percentage bar, Logarithmic), Preparation & interpretation of the graphs and charts. **AUTO CAD:** Familiarization with AutoCAD application in engineering drawing. Practice on AutoCAD using Draw & Modify commands. Practice on AutoCAD with Rectangular snap using Draw, Modify, Inquiry commands. Practice on AutoCAD using text dimensioning& dimensioning styles Practice on AutoCAD to draw nuts, bolts & washers. Isometric views-isometric views with square, taper and radial surface-simple & complex views. Perspective views. Practice on AutoCAD using isometric snap to make isometric drawings Practice on AutoCAD using Hatch command and application. Practice on AutoCAD using 3D primitives with UCS (User Co-ordinate system).
WORKSHOP CALCULATION & SCIENCE: 40 Hrs.		

Professional Knowledge WCS- 40 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**WORKSHOP CALCULATION:** **Fraction:** Concept of Fraction, Numbers, Variable, Constant, **Ratio & Proportion**: - Trade related problems **Percentage:** Definition, changing percentage to decimal and fraction and vice versa. Applied problems related to trade. Estimation and cost of product. **Algebra:** Fundamental Algebraic formulae for multiplication and factorization. Algebraic equations, simple & simultaneous equations, quadratic equations and their applications. **Mensuration 2D:** Concept on basic geometrical definitions, basic geometrical theorems. Determination of areas, perimeters of triangles, quadrilaterals, polygons, circle, sector etc. **Mensuration 3D:** Determination of volumes, surface areas of cube, cuboids cylinders, hollow cylinder, sphere prisms, pyramids cone spheres, frustums etc. Mass, Weight, Volume, Density, Viscosity, Specific gravity and related problems. **Trigonometry:** Concept of angles, measurement of angles in degrees, grades and radians and their conversions. Trigonometrically ratios and their relations. Review of ratios of some standard angles (0, 30,45,60,90 degrees), Height & Distances, Simple problems. **Graphs:** basic concept, importance. Plotting of graphs of simple linear equation. Related problems on ohm's law, series-parallel combination. **Statistics:** Frequency tables, normal distribution, measure of central tendency – Mean, Median & Mode. Concept of probability. Charts like pie chart, bar chart, line diagram, Histogram and frequency polygon. **WORKSHOP SCIENCE:** **Units and Dimensions:** Conversions between British & Metric system of Units. Fundamental and derived units in SI System, Dimensions of Physical Quantities (MLT)-Fundamental & Derived. **Engineering Materials:** Classification properties and uses of ferrous metals, non-ferrous metals, alloys etc. Properties and uses of non-metals such as wood, plastic, rubber, ceramics industrial adhesives. **Heat & Temperature:** Concepts, differences, effects of heat, different units, relation, specific heat, thermal capacity, latent heat, water equivalent, mechanical equivalent of heat. Different Temperature measuring scales and their relation. Transference of heat, conduction, convection and radiation. Thermal Expansion related calculations. **Force and Motion**: Newton's laws of motion, displacement, velocity, acceleration, retardation, rest & motion such as linear, angular.

		Force – units, different laws for composition and resolution of forces. Concept on centre of gravity and equilibrium of forces in plane. Concept of moment of inertia and torque. **Work, power & energy**: Definitions, units, calculation & application. Concept of HP, IHP, BHP and FHP – related calculations with mechanical efficiency. S.I. unit of power and their relations. **Friction:** Concept of friction, laws of friction, limiting friction, coefficient of friction and angle of friction. Rolling friction & sliding friction with examples. Friction on inclined surfaces **Stress & Strain:** Concepts of stress, strain, modulus of elasticity. Stress- strain curve. Hook's law, different module of elasticity like Young's modulus, modulus of rigidity, bulk modulus and their relations. Poisson's ratio. **Simple machines:** Concept of Mechanical Advantage, Velocity Ratio, Efficiency and their relations. Working principles of inclined plane, lever, screw jack, wheel and axle, differential wheel and axle, worm and worm wheel, rack and pinion. Gear train. **Electricity:** Basic definitions like emf, current, resistance, potential difference, etc. Uses of electricity. Difference between ac and dc. Safety devices. Difference between conductors and semiconductors and resistors, Materials used for conductors, semiconductors and resistors. Ohm's Law. Series, parallel and series-parallel combination of resistances. Concept, definitions and units of electrical work, power and energy with related problems. **Fluid Mechanics:** Properties of fluid (density, viscosity, specific weight, specific volume, specific gravity) with their units. Concept of atmospheric pressure, gauge pressure, absolute pressure, vacuum and differential pressure.

SYLLABUS FOR CORE SKILLS
1. Training Methodology (Common for all CITS trades) (270Hrs + 180Hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for all the CITS trades, provided separately in www.bharatskills.gov.in./ dgt.gov.in

7. ASSESSMENT CRITERIA

LEARNING OUTCOME	ASSESSMENT CRITERIA
TRADE TECHNOLOGY	
1. Monitor implementation of safe working practices, environment regulation, housekeeping and demonstrate identification and application of different tools and operations using chisels, hacksaw to make true surfaces. (NOS: CSC/N9489)	Identify the lesson plane, demonstration plan, job plan, practice evaluation etc. for training for use in timely manner.
	Select raw materials and visual inspects for defects.
	Explain technical English with broad details.
	Identify basic life support training to perform DRSABCD.
	Check skill of grinding for dimension accuracy.
	Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner.
	Select raw materials and visual inspect for defects.
	Identify tools & instruments and equipment for makeup and other equipment.
	Prepare the job for hacksawing, fitting, chiseling etc.
	Observe safety procedure as per standard norms.
	Measure all dimensions in accordance with standard specification.
2. Ensure marking dimensions, drill & tap blind holes, check the drill hole size using counter bore to remove broken taps. (NOS: CSC/N9490)	Plan work in compliance with standard safety norms.
	Produce components by observing standard procedure.
	Observe V-Block dimensions as per set standard norms.
	Evaluate the standard dimensions for blind holes.
	Identify different works and tool holding devices for functional application.
	Check the size of drill hole as per drawing.
	Remove broken taps.
	Check functionality of components.
	Recognize general concepts of limits, fits and tolerance.
	Observe safety norms.
3. Plan to use various thread measuring instruments & explain to operate measuring instruments of digital system in advanced manner. (NOS: CSC/N9491)	Ascertain and select tools and material.
	Collect information related to standard procedure methods and tools.
	Mark the components as per drawing.
	Check dimensions by digital instruments.
	Demonstrate possible solutions in case of defect and standard tolerance limits.
	Set up work piece for operational set up.

	Mark the components as per drawing.
	Check the dimensions within tolerance limits of ±0.02mm.
	Use gauge by observing appropriate method and as per specification of drawing.
	Identify different tools for drilling, tapping, counter sinking and use these tools.
4. Evaluate various welding practices. (NOS: CSC/N9411)	Identify tools for arc welding.
	Observe safety norms for arc welding.
	Identify tools for TIG welding.
	Set the gas plant for gas welding.
	Perform the job as per set standard limits & tolerance.
5. Check various CNC turning practices. (NOS: CSC/N9433)	Identify tools for CNC lathe.
	Explain advantages of CNC system.
	Brief about classification of CNC system.
	Brief about part programming of CNC turning.
	Explain about DNC.
6. Monitor identification of different riveted joints with project on fitting & usages of different types of gauges and heat treatment on gauges. (NOS: CSC/N9496)	Identify rivets, hand tools for rivets.
	Identify raw materials for project as per plan to perform the job as per standard tolerance.
	Mark according to drawing.
	Rivet the job as per marking and assemble it.
	Observe safety norms while working with project.
	Identify the tools for measurement by different gauges.
	Choose proper gauge for proper size of job.
	Apply safety measures as per standard for measuring by gauges.
	Identify the gauges for heat treatment.
	Demonstrate heat treatment like hardening, tempering etc. for the requisite gauges.
7. Appraise Choice of doing tapping on blind holes at specified depth & identification of the drill jig with its function and simple press and its constructional parts. (NOS: CSC/N9497)	Select the tools for blind holes.
	Arrange the tools for blind holes on drilling machine.
	Observe safety precautions while working on drilling machine.
	Select the types of keys for different assembly.
	Identify function of the keys for different assembly work/ machine.
	Identify types of jigs and function of the jigs.
	Hold the job on drill jig.
	Apply safety measures while working with jigs.
	Identify functions of the press machines.

	Use different constructional parts of press.
8. Evaluate broaching operations on broaching machine, lapping honing operations & different power transmissions joints. (NOS: CSC/N9498)	Identify the holding tools for job required for broaching.
	Fix the broach tools as per requirement of the job.
	Follow safety norms on broaching machine.
	Carry out broaching teeth maintenance.
	Define lapping operations and safety.
	Identify different lap tools and abrasives.
	Explain power transmission by open belts.
	Elucidate power transmission by gears and chains.
	Ensure safety norms while working with gears for power transmission.
9. Check use and application of different types of comparators, sine bar, dial test indicator, different digital measuring instruments & demonstrate operation on co-ordinate measuring machine. (NOS: CSC/N9499)	Explain about comparators and its functions.
	Check different types of comparators like mechanical, electrical etc.
	Explain application of sine bar.
	Perform functions of dial test indicator.
	Explain safety precautions while using sine bar.
	Identify the parts of the digital micrometer.
	Explain function of the digital micrometer.
	Elucidate brief advantages of digital calliper.
	Explain parts of digital height gauge.
	Brief details of uses of digital height gauge.
	Explain about coordinate measuring machine.
	Brief details of parts of coordinate measuring machine.
	Apply coordinate measuring machine in industry and training.
	Explain advantages of coordinate measuring machine.
	Take safety precautions while working with coordinate measuring machine.
10. Plan assembling and dismantling of different valves and pipe joints, hydraulic and pneumatic systems & monitor maintenance of bearings on machine parts. (NOS: CSC/N9501)	Identify tools and equipment for assemble and dismantling.
	Explain types of valves and their functions.
	Brief about types of pipe joints.
	Plan small project work on different pipe joints.
	Explain safety measures during assembly and dismantling.
	Identify worn out bearings in the machine.
	Dismantle the worn out bearings by bearing puller.
	Assemble the new bearing in the machines.
	Monitor maintenance of bearings while working the machine.
	Take Safety precautions during assembling and dismantling.

11. Check drawings through Auto CAD 2D& 3D modelling. (NOS: CSC/N9431)	Explain brief details of Auto CAD 2D.
	Draw simple 2D drawings through Auto CAD.
	Explain brief details of Auto CAD 3Dmodelling.
	Draw simple 3D drawings through Auto CAD.
	Draw assembly of machine parts through 3D modelling.
12. Read and apply engineering drawing for different application in the field of work. (NOS: ASC/N9410)	
	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
13. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: ASC/N9411)	Solve different mathematical problems
	Explain concept of basic science related to the field of study

8. INFRASTRUCTURE

LIST OF TOOLS AND EQUIPMENT FOR FITTER- CITS TRADE			
(for batch of 25 candidates)			
S no.	**Name of the Tool &Equipment**	**Specification**	**Quantity**
A. List of Trainee's Tool kit & other equipment			
1.	Try Square	10 cm blade	25+1 nos.
2.	Straight scriber	15 cm	25+1 nos.
3.	Flat File	25 cm 2nd cut	25+1 nos.
4.	Flat File	25 cm 2nd cut smooth	25+1 nos.
5.	Hacksaw frame fixed	30 cm.	25+1 nos.
6.	Safety goggles.		25+1 nos.
B. Tools, Instrument & General Shop Outfit			
7.	Outside caliper	15 cm spring	05 nos.
8.	Inside caliper	15 cm spring	05 nos.
9.	Caliper	15 cm Hermaphrodite	05 nos.
10.	Divider	15 cm spring	05 nos.
11.	Screw Driver	15 cm	05 nos.
12.	Cold Chisel Flat	12mm	05 nos.
13.	Ball pane Hammer	0.45 kg with handle.	13 nos.
14.	Ball pane Hammer bal	0.22 kg with handle	13 nos.
15.	Half round File	15 cm llnd cut.	13 nos.
16.	Dot punch	10 cm	13 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 2nd cut	08 nos.
23.	File square	15 cm 2nd cut	04 nos.
24.	File square	25 cm 2nd cut	04 nos.
25.	Feeler gauge	10 blades	01 set
26.	File triangular	20 cm 2nd cut	06 nos.
27.	File Swiss type needle	set of 12	02 set
28.	File half round	25 cm IInd 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	12 mm driver	01 set
38.	Box spanner	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,I8mm-set of 3	01 set
43.	Hand reamer taper	4-9mm set of 6or 4-7mmset 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	50-75mmout 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 Taper Shank	6mm to 25 mmx1.5	01set
63.	Drill chuck	12mm	01 no.
64.	Wheel dresser (1 for 4 units)		01 no.
65.	Machine vice	10cm	01 no.
66.	Machine vice	15 cm	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)		13 nos.
75.	Dial Test Indicator	.0 l mm with magnetic stand	01no.
76.	Lathe Tools HSS Tipped set		02 no.
77.	Lathe Tools Bit HSS	6mm,8mm,10mm x 100mm	13 nos.
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.
83.	Rule steel	30 cm to read metric	04 nos.
84.	Rule steel	60 cm	04 nos.
85.	Straight edge	45 cm steel	02 nos.
86.	Surface Plate	45x45 cm Cl/granite	02 nos.
87.	Marking table	91x91x122 cm	01 no.
88.	Universal scribing block	22 cm	02 nos.
89.	V- block pair	7 cm and 15 cm with clamps	02 nos.
90.	Square adjustable	15 cm blade	02 nos.
91.	Angle plate	10x20 cm	02 nos.
92.	Spirit Level	15cm metal	01 no.
93.	Letter Punch	3mm set	01 no.
94.	Number Punch set	3mm	01 no.
95.	Portable hand drill (electric)	0 to 6 mm	02 nos.
96.	Twist Drill straight shank	1.5 to 12 mm by 1/2 mm	01set
97.	Twist Drill straight shank	8 mm to 15 mm by 1/2 mm	01 set
98.	Taps and dies complete set in box B. A		01 no.
99.	Taps and dies complete set in box width-worth		01 no.
100.	Taps and dies complete set in box	3-18 mm set of 10	01 no.
101.	Pipe wrench	40cm	01 no.
102.	Pipe wrench	30 cm	01 no.
103.	Pipe vice	100mm	02 nos.
104.	Adjustable pipe tap set BSP with die set cover pipe size	15,20,25,32,38,50mm	01 no.
105.	Wheel dresser (1 for 4 units)		01 no.
106.	Machine vice	10cm	01 no.
107.	Machine vice	15 cm	01 no.
108.	Sleeve drill morse	0-1,1-2,2-3	01 set

109.	Bench Vice	12cm jaws	25 nos.
110.	Leg Vice	10cm jaw	02 nos.
111.	Fire Extinguisher		02 nos.
112.	Fire Buckets		02 nos.
113.	Wing Compass	25.4cm or 30cm	02 nos.
114.	Hand Hammer	01KG with handle	02 nos.
115.	Gauge slip as Johnson metric set		01 set
116.	Carbide wear block	0 lmm-02mm	02 each
117.	Gauge snaps	Go and No Go 25 to 50mm by5mm set of 06pcs.	01set
118.	Gauge pluge single ended	05 to 55 by 5mm set of 1 1pcs.	01set
119.	Gauge Telescopic	up to 150mm	01 no.
120.	Dial Vernier Caliper	0-200mm LC00.05MM (Universal type)	01 no.
121.	Vernier Micrometer	0-50 mm	01 no.
122.	Depth Micrometer	0-100mm,0.01mm	01 no.
123.	Vernier Caliper	150mm LC 0.02MM	01 no.
124.	Comparators Stand With Dial Indicator	LC0.01mm	01 no.
125.	Engineers Try Square (Knife wedge)	150mm Blade.	01set
126.	Surface Roughness comparison plates	N1-N12Grade	01 no.
127.	Digital Vernier Caliper	20cm	01 no.
128.	Digital Outside Micrometer	0-25mm	01 no.
129.	Digital Dial Test Indicator		01 no.
130.	Brinell Hardness Tester		01 no.
131.	Flat tongs	300mm	04 nos.
132.	Round tongs	300mm	02 nos.
133.	Straight snips	250/300mm	06 nos.
134.	Bend snips	250/300mm	06 nos.
135.	Solder bit/soldering iron hatchet type	250g	04 nos.
136.	Anvil	50kg	02 nos.
137.	Swage block		01 no.
138.	Trammel		02 nos.
139.	Hand groover	4mm, 5mm	02 each
140.	Portable forge with hand blower	450mm	01 no.
141.	Leather gloves		04 pair
142.	Leather apron		04 nos.
143.	Asbestos gloves		04 pair
144.	Gas cutting torch with different noses		01 no.
145.	Arc welding table with positioner	100cmx75cmx70cm height	02 nos.
146.	Gas welding table with fire bricks		01 no.

147.	Safety charts and posters		As required
148.	Grinding attachment for Lathe		1Set
149.	Radius Gauges(Assorted)		13 nos.
150.	Dial Test Indicator	.0 l mm with magnetic stand	01no.
151.	Sine bar	125mm	01no.
152.	Sine bar	250mm	01no.
153.	Micron suitable to measure minimum 300mm distance. (Optional)		01 no.
154.	Surface roughness tester		01 no.
155.	CAD software(latest version)		13 users
156.	Desktop computer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. Cache Memory: - Minimum 3 MB or better. RAM:-8 GB DDR-III or Higher. Hard Disk Drive: 500GB or Higher, 7200 rpm (minimum) or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet (10/100/1000) - Wi-Fi, USB Mouse, USB Keyboard and Monitor (Min. 17 Inch), Standard Ports and connectors. DVD Writer, Speakers And Mic. Licensed Windows Operating System / OEM Pack(Preloaded), Antivirus / Total Security	13 nos.
157.	UPS		As required
158.	Air conditioner		As required
C. LIST OF MACHINERIES AND EQUIPMENT			
159.	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.
160.	Drilling Machine pillar type 0 - 20mm capacity with drill chuck & key		02 nos.
161.	Pedestal Grinder Double End type. Wheel 300x40x50.8mm		02 nos.

	Wheel centre distance 650 mm approx Power of motor 1 HP		
162.	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.
163.	Fly Press 4T capacity		01no.
164.	Arc welding transformer-single phase, 200 Amps. (with cable, electrode holder and all other accessories)		02 nos.
165.	Oxy-acetylene gas welding plant with all accessories		01 set
166.	TIG Welding Machine	200 AC/DC,Rated input voltage 220 v Input frequency 50 Rated power 6.2 KVA Duty cycle 60%	1 Set
167.	Equipment for conducting BLS (Basic Life Support) training. (Optional)		1 set
168.	Equipment for conducting BLS (Basic Life Support) training. (Optional)		1 set
169.	Hydraulic Power Saw Machine suitable	for minimum375mm length blade	01no.
170.	Brinell hardness testing machine having diamond indenter Co-ordinate Measuring Machine having accuracy of 5		01no.
E. FURNITURE			
171.	Steel cupboard with 8 pigeon lockers		03 nos.
172.	Chair with arm		02 nos.
173.	Table for trainer		01 no.
174.	Work bench	240 x 120 x 90 cm	06 nos.
175.	Steel cupboard	180x90x45cm	02 nos.
176.	Steel cupboard	120x60x45cm	02 nos.
177.	White board with magnetic duster	6'x4'	01 no.
178.	First aid box		01 no.
179.	Metal rack	182x182x45cm	01 no.
180.	Computer Table		13 nos.
181.	Computer chair		25 nos.


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