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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

MACHINIST GRINDER

(Duration: Two years)
Revised in July 2022

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4

SECTOR – CAPITAL GOODS AND MANUFACTURING

कौशलं बलम्
Directorate General of Training

MACHINIST GRINDER

(Engineering Trade)

(Revised in July 2022)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 4

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

EN-81, Sector-V, Salt Lake City,

Kolkata – 700 091

www.cstaricalcutta.gov.in

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1. COURSE INFORMATION

During the two-year duration, a candidate of Machinist Grinder trade is trained on subjects Professional Skill, Professional Knowledge and Employability Skills related to job role. In addition to this, a candidate is entrusted to make/do project work and Extra Curricular Activities to build up confidence. The practical skills are imparted in simple to complex manner & simultaneously theory subject is taught in the same fashion to apply cognitive knowledge while executing task. The course covers the detail aspect of Machinist (Grinder). The broad components covered under Professional Skill subject are as below:

FIRST YEAR: The practical part starts with basic fitting covering components like filing, sawing, drilling, tapping, chipping, grinding and different fits. The accuracy proposed is of ±0.2mm and angular accuracy of 1°. Different turning operations on lathe viz., plain, facing, boring, grooving, step turning, parting, chamfering, knurling and different thread cutting by setting the different parameter, are covered in the practical part. In addition, mounting, balancing, dressing and truing of grinding wheel are to be performed. In assignment part production of plain and cylindrical surfaces, viz. parallel block, plain mandrel, socket, Morse taper, sleeve, etc. within accuracy of ±0.1mm are involved. Different milling operations (plain, stepped, angular, dovetail, T-slot, contour, gear) along with surface & cylindrical grinding to an accuracy of ±0.02mm are covered. Setting up of cylindrical grinder for automatic movement, grinding long parallel mandrel, alignment of table for taper grinding, eccentric grinding, etc. are the part of practical. This year includes making of bush, square block, V-block, angle plate, re-sharpening of side & face milling cutter.

SECOND YEAR: Working on cylindrical and surface grinder is part of practical training and produce components with an accuracy of ±0.01mm using the same. Grinding shoulder of h7 and slot of H7, snap gauge, ring gauge of H6 and machine centre of h6 are taught in the practical part. Practical on cylindrical bore grinding within accuracy of ±0.01mm, grinding long cylinder close to h6 and grinding jobs using different accessories. Developed skills on cylindrical grinding and honing, finishing angular form, steps, shoulder, compound or double taper, steep taper, lathe centre, plug, Morse taper, Metric taper within accuracy of ±0.008mm and surface finish of N5/N4. Use of centerless grinding process, lapping on flat surface, lapping on cylindrical surface and buffing to limit of h5 are included. Practical part includes CNC machine operation like jog, reference edits, MDI, auto-mode program, call & entry, simulation, tool offset and changing and developed skill on operating CNC turning centre as per drawing by preparing Part-program.

In addition, components like Employability Skills develop basic fundamental with regard to the trade are extensively covered. This skill is essential skill which is necessary to perform the job in any given situation.

2. TRAINING SYSTEM

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of Labour market. The vocational training programmes are running under aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer programmes under DGT for propagating vocational training.

Machinist Grinder trade under CTS is one of the popular courses delivered nationwide through a network of ITIs. The course is of two years duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Employability Skills) imparts requisite core skill & knowledge and life skills. After passing out of the training programme, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the job and maintenance work.
- Check the task/job for functioning, identify and rectify errors in task/job.
- Document the technical parameters related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can appear in 10+2 examination through National Institute of Open Schooling (NIOS) for acquiring higher secondary certificate and can go further for General/ Technical education.
- Can take admission in diploma course in notified branches of Engineering by lateral entry.

- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of two years: -

S No.	Course Element	Notional Training Hours	
		1st Year	2nd Year
1	Professional Skill (Trade Practical)	840	840
2	Professional Knowledge (Trade Theory)	240	300
3	Employability Skills	120	60
	Total	**1200**	**1200**

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

4	On the Job Training (OJT)/ Group Project	150	150

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses.

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment (Internal)** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in

assessment guideline. 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. The All India Trade Test for awarding NTC will be conducted by Controller of examinations, DGT as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%.

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 assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitive to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude to be considered while assessing competency.

Assessment will be evidence based comprising some of the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work
- Computer based multiple choice question examination
- Practical Examination

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

Performance Level	Evidence
(a) Marks in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Marks in the range of 75% - 90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices.	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Marks in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Grinder, General; grinds and smoothens metal surfaces to specified accuracy using one or more type of grinding machine. Examines drawings and other specifications of part to be ground. Selects grinding wheel of appropriate size, shape and abrasive quality and fastens it on spindle of machine. Mounts metal part accurately in position on machine using chucks, jigs, fixtures or between centres of head and tail stock of machine as required and sets it accurately either parallel or at angle in relation to grinding wheel as specified using appropriate devices and instruments necessary. Adjusts machine table, guides, stops and other controls to determine direction and limit of metal and grinding wheel movements. Selects grinding wheel speed and starts machine for grinding. Manipulates hand wheel or sets and starts automatic controls to bring grinding wheel in contact with work. Checks progress of grinding with measuring instruments and gauges for accuracy. May balance dress or change grinding wheel, stone or abrasive. May oil and clean machine.

Surface Grinder; grinds flat surfaces of machined metal objects to required finish and thickness by surface grinding machine. Studies drawings and other specifications for nature of grinding operations required. Selects appropriate grinding wheel and fits it on machine spindle. Places work in position on magnetic chuck on the machine. Sets required speed of grinding wheel and feed of machine and adjust guides and stops to control to and fro travel of machine table. Starts machine and brings grinding wheel into contact with work. Applies cut and observes progress of operation. Stops machine and measure work as necessary to ensure required accuracy. Removes work from machine when grinding completed. May operate horizontal or vertical spindle surface grinding machine. May oil and clean machine.

Roll Grinder; grinds shafts, rollers, commutator etc., to accurate finish for various mechanical purposes by centreless, cylindrical or universal grinding machine. Studies drawing and other specifications of parts to be ground. Selects and mounts appropriate abrasive wheels on machine. Turns hand wheel to adjust gap between rims of wheels according to diameter of part to be ground. Moves levers to select appropriate speeds for each wheel. Sets feed guide to guide work into position between two wheel rims and clamps coil guide properly to receive work from between wheel rims. Starts machine and feeds work on to feed guide or keeps hopper filled with objects that are automatically fed between wheels. Observes progress of work and checks periodically ground parts with micrometer or gauge to ensure that they conform to prescribed specifications. May do cylindrical grinding of parallel, step and taper shafts and internal bores set between centers or otherwise by processes of traverse plunge or angular grinding and be designated as CYLINDRICAL GRINDER or INTERNAL GRINDER as appropriate. May set or adjust grinding wheel distance for different operations. May clean and oil machine.

Honer/Honing Machine Operator; Honer grinds internal surface of bores and cylinders to accurate mirror like finish with honing machine. Mounts ground cylinder accurately in position on machine, using clamps, jigs and other fixtures. Selects appropriate honing stick (abrasive tool) and clamps it on spindle of machine. Aligns cylinder accurately so that honing tool goes smoothly inside cylinder bore. Sets machine to feed and rotate hone at appropriate speed and starts machine. Expands tool to required diameter and manipulates hand wheel to feed tool into cylinder. Engages automatic feed that oscillates hone within cylinder and regulates supply of cutting lubricant over honing tool. Checks progress of honing as required with measuring instruments and makes necessary adjustments to ensure accuracy. Removes work when honing is completed. May do internal grinding of cylinders and bores. May oil and clean machine.

Lapper; smoothens hardened flat, cylindrical, spherical or other metal surfaces mechanically or manually to glossy finish by rubbing surfaces with fine abrasives. Examines drawings and other specifications of part to be lapped and selects appropriate abrasive dust. Fits lapping wheel and sets object to be lapped on machine. Applies abrasive dust on metal surface and wheel and starts machine. Brings metal objects in contact with lapping wheel or holds work by hand over lapping wheel and polishes surface to required finish. Applies abrasive compound where necessary to attain high degree of finish. Smoothens or polishes surface for set period. Removes metal and cleans it in special liquids. May do hand lapping by enclosing object in container and vigorously rubbing by hand top plate of container with abrasive compound on metal surface to attain high degree of polish and accurate finish.

Grinder, Tool and Cutter; grinds machine tools and cutter to correct specifications by special grinding machines and wheel. Studies drawings and other specifications to understand nature of grinding operation required. Fastens appropriate abrasive wheel to spindle of machine. Mounts cutting tool to be ground on machine using dividing head, jig or fixture as required. Manipulates swivel tables, wheel head and work holding device, guide finger, etc. as necessary to set machine to appropriate angle for grinding desired level on cutting edges of tool selects and sets speed and feed to machine according to nature of work and wheel used. Starts machine, brings rotating grinding wheel in contact with edge of tool and grinds proper angles, clearance, flutes etc. as required on tool or cutter set, frequently checking it with gauge or measuring instrument while grinding to ensure accuracy. Rotates work through proper angle by dividing head or otherwise to set next flute or teeth of tool or cutter for grinding and continues operation. Uses cutting fluid or coolant as found necessary and ensures that no part of work gets burnt or damaged while grinding. Stops machine and removes tool when grinding is completed. Changes grinding wheel and position of tool as and when required. May give final finish to cutting edge by hand using hones. May oil and clean machine. May specialize in grinding a particular type of tool and be designated accordingly. May check ground tool or cutter by shadow projector to ensure accurate finish.

Plan and organize assigned work and detect & resolve issues during execution. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

May be designated as Mechanic Machine Tool Maintenance according to nature of work done

Reference NCO-2015:

(i) 7224.0100 – Grinder, General
(ii) 7224.0400 – Surface Grinder
(iii) 7224.0300 – Roll Grinder
(iv) 7224.0600 – Honer/Honing Machine Operator
(v) 7224.0700 – Lapper
(vi) 7223.2200 – Grinder, Tool and Cutter

Reference NOS:

i) CSC/N0304
ii) CSC/N0110
iii) CSC/N0109
iv) CSC/N9409
v) CSC/NO115
vi) CSC/N9401
vii) CSC/N9402

4. GENERAL INFORMATION

Name of the Trade	**MACHINIST GRINDER**
Trade Code	DGT/1033
NCO – 2015	7224.0100, 7224.0400,7224.0300, 7224.0600, 7224.0700, 7223.2200
NOS Covered	CSC/N0304, CSC/N0110, CSC/N0109, CSC/N9409, CSC/NO115, CSC/N9401, CSC/N9402
NSQF Level	Level – 4
Duration of Craftsmen Training	Two Years (2400 hours + 300 hours OJT/Group Project)
Entry Qualification	Passed 10th class examination with Science and Mathematics or with vocational subject in same sector or its equivalent.
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, LV, DEAF
Unit Strength (No. Of Student)	20 (There is no separate provision of supernumerary seats)
Space Norms	102 Sq.m
Power Norms	23.4 KW
Instructors Qualification for	
(i) Machinist Grinder Trade	B.Voc/Degree in Mechanical Engineering from AICTE/UGC recognized college /university with one year experience in the relevant field. **OR** 03 years Diploma in Mechanical Engineering from AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/NAC passed in the Trade of "Machinist Grinder" With three years' experience in the relevant field. **Essential Qualification:** Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT. ***Note: - Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them***

	must possess NCIC in any of its variants.
(ii) Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering trades with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants NCIC in RoDA or any of its variants under DGT
(iii) Engineering Drawing	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the 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 three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants of NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT.
(iv) Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) **OR**

	Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills.
(v) Minimum Age for Instructor	21 Years

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.

5.1 LEARNING OUTCOMES (TRADE SPECIFIC)

FIRST YEAR:

1. Plan and organize the work to make job as per specification applying different types of basic fitting operation and check for dimensional accuracy by using steel rule, caliper etc. [Basic Fitting operation- marking, hack sawing, chiseling, filing,, drilling, reaming, taping, off-hand grinding etc. accuracy±0.25mm] following safety precautions. (NOS: CSC/N0304)
2. Produce simple components by setting different machine parameters and performing different lathe operation [Different machine parameters: - Cutting, speed, feed, depth of cut; Different lathe operation – Facing, plain turning, taper turning, boring and simple thread cutting.] (NOS: CSC/N0110)
3. Perform grinding wheel mounting, balancing, dressing, truing and set surface grinder to make job by rough & finish grinding and check accuracy with precision measuring instrument [Accuracy limit:- ±0.25mm.] (NOS: CSC/N0109)
4. Set cylindrical grinder to produce job/ components by performing external and internal cylindrical operation and check accuracy [Accuracy limit:- ±0.25mm.] (NOS: CSC/N0109)
5. Set up cylindrical grinder for automatic movement to perform different cylindrical grinding operation using different machine accessories and check accuracy [Different cylindrical grinding:- straight parallel, taper, bush eccentric; Different machine accessories: - steady rest, chuck face plate, angle plate and check accuracy limit ±0.02 mm] (NOS: CSC/N0109)
6. Perform dry & wet grinding to make different shaped job of various metals and check accuracy. [Different shaped job: - square block angle plate, angular block; various metal: - cast iron, steel & accuracy limit ±0.02 mm.] (NOS: CSC/N0109)
7. Make a component by performing bore grinding and check accuracy by telescopic gauge. [Accuracy limit ±0.02 mm.] (NOS: CSC/N0109)

8. Perform operations on tools & cutter grinder and re-sharpening different tools on pedestal grinder. [Different tools: - lathe tools, drill, tool bit] (NOS: CSC/N0109)
9. Make components having angular and straight surface and check accuracy with different gauges and instruments. [Different components: - V' block, parallel bar, drill point angle; Different gauges: - sine bar, slip gauge & DTI (dial test indicator) and accuracy limit ±0.02 mm.] (NOS: CSC/N0109)
10. Perform preventive maintenance of grinding machines. [Grinding machines: - surface and cylindrical] (NOS: CSC/N0109)
11. Make job of different material by cylindrical parallel grinding with appropriate accuracy. [Different material: - soft & hard metals; Accuracy limit±0.01mm] (NOS: CSC/N0109)
12. Read and apply engineering drawing for different application in the field of work. (CSC/N9401)
13. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (CSC/N9402)

SECOND YEAR:

14. Perform re-sharpening of different milling cutters [Different milling cutters: -plain, slitting saw] (NOS: CSC/N0109)
15. Make different components having straight & angular surface with close tolerance limit and check different fault. [Different components: - V' block, plain cylindrical bar, cube; tolerance limit - ±0.01mm; different faults - cracks, blow-holes, chatters] (NOS: CSC/N0109)
16. Make different gauges with close tolerance limit and check accuracy with different gauges. [Different gauges: - snap gauge, ring gauge; tolerance limit- (H7/h7); Checking gauges- ring, plug] (NOS: CSC/N0109)
17. Produce different components of non-ferrous metal within appropriate accuracy. [Different components - taper pin, rectangular bar; accuracy limit- ±0.01mm.] (NOS: CSC/N0109)
18. Produce different components involving cylindrical angular grinding operation to close limit accuracy. [Different components- lathe centre, milling machine arbor; accuracy:- h6 or H6] (NOS: CSC/N0109)
19. Prepare surface of a component by honing operation & Check accuracy. [Accuracy limit: ±0.001mm] (NOS: CSC/N9409)
20. Produce components by different taper grinding operation and check accuracy. [Different taper grinding: - compound or double taper, steep taper, morse taper; accuracy limit- ±0.008mm.] (NOS: CSC/N0109)

21. Produce male and female components by different grinding to close tolerance limit. [Different grinding: - step and slot grinding; tolerance limit- H6/h5] (NOS: CSC/N0109)
22. Prepare surface of a job by performing lapping & buffing to close limit h5. (NOS: CSC/N9409)
23. Make components by different grinding to close tolerance limit and check accuracy. [Different grinding: - cylindrical taper, surface grinding & shoulder grinding; tolerance limit- h6] (NOS: CSC/N0109)
24. Identify different components of CNC lathe to understand working and prepare part programme by using simulation software. (NOS: CSC/NO115)
25. Read and apply engineering drawing for different application in the field of work. (CSC/N9401)
26. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (CSC/N9402)

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
FIRST YEAR	
1. Plan and organize the work to make job as per specification applying different types of basic fitting operation and check for dimensional accuracy by using steel rule, caliper etc. *[Basic Fitting operation- marking, hack sawing, chiseling, filing, drilling, reaming, taping, off-hand grinding etc. accuracy±0.25mm]* following safety precautions. (NOS: CSC/N0304)	Plan & identify tools, instruments and equipment for marking and make this available for use in a timely manner.
	Select raw material and visual inspection for defects.
	Mark as per specification applying desired mathematical calculation and observing standard procedure.
	Measure all dimensions in accordance with standard specifications and tolerances.
	Identify hand tools for different fitting operations and make these available for use in a timely manner.
	Prepare the job for Hacksawing, chiselling, filing, drilling, tapping, grinding.
	Perform basic fitting operations viz., Hacksawing, filing, drilling, tapping and grinding to close tolerance as per specification to make the job.
	Observe safety procedure during above operation as per standard norms and company guidelines.
	Check for dimensional accuracy as per standard procedure.
	Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate

	manner and prepare for disposal.
2. Produce simple components by setting different machine parameters and performing different lathe operation [Different machine parameters: - Cutting, speed, feed, depth of cut; Different lathe operation – Facing, plain turning, taper turning, boring and simple thread cutting.] (NOS: CSC/N0110)	Identify and acquaint with lathe machine operation with its components.
	Identify different work holding devices and acquaint with functional application of each device.
	Mount the appropriate work holding device and check for its functional usage to perform turning operations.
	Set the job on chuck as per shape.
	Set the lathe on appropriate speed & feed.
	Operate the lathe to demonstrate lathe operation, observing standard operating practice.
	Perform lathe operation viz., facing, plain turning, taper turning, boring and simple thread cutting to make components as per specification.
	Check accuracy/ correctness of job using appropriate gauge and measuring instruments for their functional requirement.
	Observe safety procedure during above operation as per standard norms and company guidelines.
3. Perform grinding wheel mounting, balancing, dressing, truing and set surface grinder to make job by rough & finish grinding and check accuracy with precision measuring instrument [Accuracy limit:- ±0.25mm.] (NOS: CSC/N0109)	Acquaintance of basic working principles and safety aspect of grinding wheel mounting, balancing, dressing and truing of grinding wheel.
	Explain functional application of different levers, stoppers, adjustment etc. for surface grinder.
	Identify different lubrication points of surface grinder.
	Identify lubricants and their usage for application in surface grinder as for machine manual.
	Identify different grinding wheel mounting devices and acquaint with functional application of each device.
	Mount the grinding wheel with required alignment and check for its functional usage to perform surface grinding operations.
	Solve problem by applying basic methods and information during setting.
	Observe safety procedure during mounting as per standard norms

	Plan & select appropriate method to produce different operation rough & finish.
	Check accuracy of job using appropriate measuring instrument.
4. Set cylindrical grinder to produce job/ components by performing external and internal cylindrical operation and check accuracy [Accuracy limit:- ±0.25mm.] (NOS: CSC/N0109)	Explain the constructional features, working principles and safety aspect of cylindrical grinder.
	Explain functional application of different levers, stoppers, adjustment etc.
	Identify different lubrication points of cylindrical grinder.
	Identify lubricants and their usage for application in cylindrical grinder as per machine manual.
	Identify different work and tool holding devices and acquaint with functional application of each device.
	Mount the work and tool holding devices with required alignment and check for its functional usage to perform cylindrical grinding operations.
	Solve problem by applying basic methods, tools, materials and information during setting.
	Observe safety procedure during mounting as per standard norms
	Plan & select appropriate method to grind external & internal operation
	Check accuracy set job using appropriate precision measuring instrument.
5. Set up cylindrical grinder for automatic movement to perform different cylindrical grinding operation using different machine accessories and check accuracy [Different cylindrical grinding:- straight parallel, taper, bush eccentric; Different machine accessories: - steady rest, chuck face plate, angle plate	Plan & select appropriate machine parameters to set for automatic movements
	Plan & select appropriate method to perform straight, parallel, taper, lush, rentic grinding chuck, face plate, angle plate
	Carryout and apply standard method to make different components as required.
	Set up and produce component as per standard operating procedure for form grinding.
	Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate

and check accuracy limit ±0.02 mm] (NOS: CSC/N0109)	manner and prepare for disposal.
6. Perform dry & wet grinding to make different shaped job of various metals and check accuracy. [Different shaped job: - square block angle plate, angular block; various metal: - cast iron, steel & accuracy limit ±0.02 mm.] (NOS: CSC/N0109)	Identify different work material and select the grinding wheel.
	Observe heat generated in grinding for different types of metal.
	Select appropriate coolant for different types of metal grinding.
	Solve problem by applying desired mathematical skill, basic methods, select speed, feed, depth of cut and organize information during setting.
	Observe safety procedure during operation as per standard norms.
7. Make a component by performing bore grinding and check accuracy by telescopic gauge. [Accuracy limit ±0.02 mm.] (NOS: CSC/N0109)	Plan and select appropriate method to produce components.
	Demonstrate possible solutions using desired mathematical skills, knowledge of facts, principles, processes and general concept in the field of work and collect and organize information to determine use of specific machine
	Set up and produce component with bore as per standard Operating procedure of internal cylindrical grinding.
	Measure the dimensions with instruments/gauges as per drawing.
	Comply with safety rules when performing the above operations.
8. Perform operations on tools & cutter grinder and re-sharpening different tools on pedestal grinder. [Different tools: - lathe tools, drill, tool bit] (NOS: CSC/N0109)	Plan and select appropriate method to re-sharpen the lathe tools, drill bit.
	Dress the grinding wheel and set the tool.
	Work out and apply off-grinding parameters as per different components to be re sharpened.
	Set and re-sharpen the tools as per standard operating procedure
	Solve problems during operation by selecting and applying basic methods, tools, material, collect and organize information for quality output.

	Measure with instruments/gauges as per drawing and check functionality of tools.
	Comply with safety rules when performing the above operations.
9. Make components having angular and straight surface and check accuracy with different gauges and instruments. [Different components: - V' block, parallel bar, drill point angle; Different gauges: - sine bar, slip gauge & DTI (dial test indicator) and accuracy limit ±0.02 mm.](NOS: CSC/N0109)	Plan and select appropriate method to produce various components with the help of surface grinder.
	Select the appropriate grinding wheel and work holding devices.
	Apply desired mathematical skills, collect and organize information to work out the machining parameters.
	Produce components as per drawing.
	Check accuracy/ correctness of job using appropriate gauge and measuring instruments for their functional requirement.
	Comply with safety rules when performing the above operations.
10. Perform preventive maintenance of grinding machines. [Grinding machines: - surface and cylindrical] (NOS: CSC/N0109)	Identify tools & equipment and collect relevant information from appropriate source.
	Ascertain for the aligning / parallelism of grinding machines.
	Plan work for lubrication schedule, simple estimation.
	Observe mechanism, driving system of grinding machines and set properly if required.
	Observe safety procedure during operation as per standard norms.
11. Make job of different material by cylindrical parallel grinding with appropriate accuracy. [Different material: - soft & hard metals; Accuracy limit±0.01mm] (NOS: CSC/N0109)	Plan and select appropriate method to produce various components with the help of cylindrical grinder.
	Select the appropriate grinding wheel according to material to be ground and work holding devices.
	Apply desired mathematical skills, collect and organize information to work out the machining parameters.
	Produce components as per drawing.
	Check accuracy/ correctness of job using appropriate gauge and measuring instruments for their functional requirement.
	Observe safety procedure during operation as per standard norms.

12. Read and apply engineering drawing for different application in the field of work. (CSC/N9401)	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. (CSC/N9402)	Solve different mathematical problems
	Explain concept of basic science related to the field of study
SECOND YEAR	
14. Perform re-sharpening of different milling cutters [Different milling cutters: - plain, slitting saw] (NOS: CSC/N0109)	Plan and select appropriate method to re-sharpen the plain, side and face milling cutter.
	Set up milling cutter and re-sharpen the milling cutter as per standard operating procedure of the machine.
	Measure the dimensions with instruments/gauges.
	Comply with safety rules when performing the above operations.
15. Make different components having straight & angular surface with close tolerance limit and check different fault. [Different components: - V' block, plain cylindrical bar, cube; tolerance limit - ±0.01mm; different faults - cracks, blow-holes, chatters] (NOS: CSC/N0109)	Plan and select appropriate method to produce various components with the help of surface grinder and cylindrical grinder.
	Select the appropriate grinding wheel and work holding devices.
	Apply desired mathematical skills, collect and organize information to work out the machining parameters.
	Produce components as per drawing.
	Check accuracy/ correctness of job using appropriate gauge and measuring instruments for their functional requirement.

	Observe safety procedure during operation as per standard norms.
16. Make different gauges with close tolerance limit and check accuracy with different gauges. [Different gauges: - snap gauge, ring gauge; tolerance limit- (H7/h7); Checking gauges- ring, plug] (NOS: CSC/N0109)	Plan and select appropriate method to produce various components with the help of surface grinder and cylindrical grinder.
	Select the appropriate grinding wheel and work holding devices.
	Apply desired mathematical skills, collect and organize information to work out the machining parameters.
	Produce components as per drawing.
	Check accuracy/ correctness of job using appropriate gauge and measuring instruments for their functional requirement.
	Comply with safety rules when performing the above operations.
17. Produce different components of non-ferrous metal within appropriate accuracy. [Different components - taper pin, rectangular bar; accuracy limit- ±0.01mm.] (NOS: CSC/N0109)	Plan and select appropriate method to perform the precession components of non ferrous viz. dowel pin, rectangular bar.
	Set and produce the precession components as per drawing.
	Solve problems during operation by selecting and applying basic methods, tools, materials and information and using quality concept.
	Check for accuracy of the precession components.
	Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
	Observe safety/ precaution during machining.
18. Produce different components involving cylindrical angular grinding operation to close limit accuracy. [Different components- lathe centre, milling machine arbor; accuracy:- h6 or H6]	Plan and select appropriate method to perform lathe centre, milling machine arbor grinding.
	Set up and produce component as per standard operating procedure of lathe centre, milling machine arbor grinding.
	Solve problems during operation by selecting and applying basic methods, tools, materials and information and using quality concept.
	Apply mathematical skill, knowledge of facts, principles,

(NOS: CSC/N0109)	processes and general concepts in the field of lathe centre, milling machine arbor grinding.
	Measure with instruments/gauges as per drawing and check functionality of component.
	Comply with safety rules when performing the above operations.
19. Prepare surface of a component by honing operation & Check accuracy. [Accuracy limit: ±0.001mm] (NOS: CSC/N9409)	Plan and select appropriate method to finish the work piece by honing as per drawing.
	Select appropriate tools, equipment and machine to produce the work piece as per drawing and make these available for use in a timely manner.
	Honed the work piece as per standard operating practice.
	Check the dimension of job by precession instrument.
	Observe safety precautions during operation.
	Check for desired performance.
20. Produce components by different taper grinding operation and check accuracy. [Different taper grinding: - compound or double taper, steep taper, morse taper; accuracy limit- ±0.008mm.] (NOS: CSC/N0109)	Plan and select appropriate method to produce the various taper work piece as per drawing.
	Set up and produce component as per standard operating procedure of taper grinding.
	Solve problems during operation by selecting and applying basic methods, tools, materials and information and using quality concept.
	Apply mathematical skill, knowledge of facts, principles, processes and general concepts in the field of steep taper grinding.
	Measure with instruments/gauges as per drawing and check functionality of component.
	Comply with safety rules when performing the above operations.
21. Produce male and female components by different grinding to close tolerance limit. [Different grinding: - step and slot grinding;	Plan and select appropriate method to produce male female components as per drawing.
	Select appropriate grinding wheel, equipment and machine to produce the work pieces as per drawing and make these available for use in a timely manner.

tolerance limit- H6/h5] (NOS: CSC/N0109)	Set the job on grinding machine and grind the components as per specification/drawing following Standard operating practice.
	Check the dimension of components by precession instrument.
	Observe safety precautions during operation.
	Check for desired performance of assembled components.
22. Prepare surface of a job by performing lapping & buffing to close limit h5. (NOS: CSC/N9409)	Plan and select appropriate method to produce the work piece as per drawing.
	Select appropriate tools, equipment and machine to produce the work piece as per drawing and make these available for use in a timely manner.
	Lapping/buffing the product following standard operating practice.
	Set the job and finish the surfaces as per specification/drawing following standard operating practice.
	Check the dimension of job by precession instrument.
	Observe safety precautions during operation.
23. Make components by different grinding to close tolerance limit and check accuracy. [Different grinding: - cylindrical taper, surface grinding & shoulder grinding; tolerance limit- h6] (NOS: CSC/N0109)	Plan and select appropriate method to produce the work piece with close tolerance as per drawing.
	Set the job on grinding machine and grind the components as per specification/drawing following Standard operating practice.
	Solve problem by applying basic methods, tools, materials and information during machining.
	Check the dimension of components by precession instrument.
	Dispose waste as per procedure.
	Observe safety precautions during operation.
24. Identify different components of CNC lathe to understand working and prepare part programme by using simulation software. (NOS: CSC/NO115)	Identify different components of CNC.
	Plan and prepare part programme as per drawing.
	Simulate for its correctness with simulation software.
	Demonstrate possible solutions within the team.
	Solve problems during simulation by selecting and applying basic methods, information and using quality concept.
	Check accuracy/ correctness of part program.

	Observe safety/ precaution during simulation.
25. Read and apply engineering drawing for different application in the field of work. (CSC/N9401)	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.
26. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (CSC/N9402)	Solve different mathematical problems
	Explain concept of basic science related to the field of study

7. TRADE SYLLABUS

SYLLABUS FOR MACHINIST GRINDER TRADE			
FIRST YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**

Professional Skill 100 Hrs; Professional Knowledge 20 Hrs	Plan and organize the work to make job as per specification applying different types of basic fitting operation and check for dimensional accuracy by using steel rule, caliper etc. [Basic Fitting operation- marking, hack sawing, chiseling, filing, drilling, reaming, taping, off-hand grinding etc. accuracy±0.25mm] following safety precautions. (Mapped NOS: CSC/N0304)	1. Importance of trade training. (02 hrs) 2. List of tools & Machinery used in the trade. (02 hrs) 3. Health & Safety: Introduction to safety equipments and their uses. (02 hrs) 4. Introduction of First-aid. (01 hr) 5. Operation of Electrical mains. (02 hrs) 6. Occupational Safety. (02 hrs) 7. Health Importance of housekeeping & good shop floor practices. (02 hrs) 8. Safety and Environment guidelines. Legislations & regulations as applicable. (02 hrs) 9. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. (03 hrs) 10. Personal protective Equipment's (PPE):- Basic injury prevention. (03 hrs) 11. Hazard identification and avoidance. (03 hrs) 12. Safety signs for Danger, Warning, caution & personal safety message. (02 hrs) 13. Preventive measures for electrical accidents & steps to be taken in such accidents. Use of Fire extinguishers. (02 hrs)	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. **Soft Skills: its importance and Job area after completion of training.** Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies e.g.; power failure, fire, and system failure. Introduction to Grinding trade and machine safety precautions according to IS: 1991-1962. (06 hrs.)
		14. Identify of tools & equipment's as per desired	Description of hand tools, Safety precautions, care and

		specifications for marking & sawing (Hand tools, Fitting tools & Measuring tools) (05 hrs) 15. Select material as per application, Inspect visually of raw material for rusting, scaling, corrosion etc. (05 hrs) 16. Mark out lines on job, (04 hrs) 17. Grip suitably in vice, cut different types of metals of different sections to given dimensions by a Hacksaw. (6 hrs) 18. Mark, punch and grind on pedestal grinder. (03 hrs)	maintenance and material from which they are made. Ferrous and nonferrous metal and their identification by different methods. Heat treatment of metals, its importance, various methods of heat treatment such as hardening, tempering, normalizing, annealing etc. (05 hrs.)
		19. Measure different types of jobs by steel rule, caliper etc. and put dimension on freehand drawing (05 hrs) 20. Taper by angular protractor. (03 hrs)	Theory of Semi precision measuring instruments. General measuring tools (used in grinding shop) their description, use care and maintenance. (02 hrs.)
		21. Drill different sizes of holes by hand, Ream the holes, (05 hrs) 22. Make thread in drilled holes by tap. (02 hrs) 23. Prepare thread on a round bar (02 hrs) 24. Match an internal and external thread cutting with taps and dies using coolants. (03 hrs)	Relation between drill & tap sizes, care of taps and dies and their correct use. Types, properties and selection of coolants and lubricants. (03 hrs)
		25. Drill different sizes of holes by machine. (04 hrs)	Brief description of drilling machine use and care.

		26. Use of screw drivers, spanners, pliers etc. (03 hrs) 27. Make simple fitting job within accuracy ±0.4. (5 Hrs)	Knowledge of tool fixing and job holding device on drilling machine. (02 hrs.)
		28. File a MS flat as given dimension. (12 hrs) 29. Make simple fitting job within accuracy ±0.2. (5 Hrs)	Knowledge of different types of files according to cut and shape. Methods of filing operation. Knowledge of surface finish accuracy by filing. (02 hrs.)
Professional Skill 80 Hrs; Professional Knowledge 22 Hrs	Produce simple components by setting different machine parameters and performing different lathe operation [Different machine parameters: - Cutting, speed, feed, depth of cut; Different lathe operation – Facing, plain turning, taper turning, boring and simple thread cutting.] (Mapped NOS: CSC/N0110)	30. Identify Centre lathe and its parts, (04 hrs) 31. Set lathe machine and perform on lathe operation with idle or dry run. (10 hrs) 32. Grind Lathe Tools on Pedestal Grinder. (10 hrs)	Brief description of a Centre lathe, its use. Knowledge of transmission of speed from motor to spindle of a lathe. Knowledge of aligning a job on lathe. Lathe tools nomenclature. (07 hrs.)
		33. Perform facing and turning on lathe. (05 hrs) 34. Perform drilling operation on lathe. (05 hrs) 35. Perform taper turning using compound rest and taper turning attachment. (05 hrs) 36. Perform boring operation on lathe. (11 hrs)	Knowledge of controlling cutting speed, feed and depth of cut. Lathe tools and their uses. Selection of tools for different operation in lathe. Taper and its types and problems. Taper turning methods and calculations. i.e. Form tool, TT attachment, Compound rest etc. (08 hrs.)
		37. Perform simple external screw cutting. (15 hrs) 38. Perform simple internal screw cutting. (15 hrs)	Method of screw cutting and simple calculation. Knowledge of spindle speed mechanism related to lead screw of lathe. (07 hrs.)
Professional	Perform grinding	39. Set grinding wheel on wheel	Application and use of

Skill 100 Hrs; Professional Knowledge 20 Hrs	wheel mounting, balancing, dressing, truing and set surface grinder to make job by rough & finish grinding and check accuracy with precision measuring instrument [Accuracy limit:- ±0.25mm.] (Mapped NOS: CSC/N0109)	flange, truing and balancing of wheels. (20 hrs) 40. Dress grinding wheel. (05 hrs)	pedestal grinder. General dressing tools used in grinding section such as wheel, diamond dresser, steel type dresser, abrasive dresser and nonferrous dresser. (05 hrs.)
		41. Check and measure various types of jobs using micrometers, Vernier caliper, Height gauge etc. (10 hrs) 42. Identify different parts of surface grinding machine. (10 hrs) 43. Set surface grinding machine and perform operating with dry / idle run. (12 hrs)	Precision measuring instruments English and metric micrometer, vernier caliper, dial test indicator etc. their description and uses. Knowledge of digital measuring instruments and its uses. Pneumatic gauges – its accessories and control device and use for checking dimensions. (06 hrs.)
		44. Perform rough and finish grinding on surface work. (15 hrs) 45. Perform rough and finish grinding on cylindrical job. (20 hrs) 46. Include diamond and CBN grinding wheel. (08 hrs)	Different types of abrasive, manufacture of grinding wheels, their grades. (09 hrs.)
Professional Skill 90 Hrs; Professional Knowledge 20 Hrs	Set cylindrical grinder to produce job/ components by performing external and internal cylindrical operation and check accuracy [Accuracy limit: - ±0.25mm.] (Mapped NOS: CSC/N0109)	47. Perform grinding on surface grinding machine. (07 hrs) 48. Identify different parts of cylindrical grinding machine. (02 hrs) 49. Set cylindrical grinding machine and perform operation with dry / idle run. (07 hrs) 50. Perform grinding on Cylindrical grinding machine	Principle and value of grinding in finishing process, various types of grinding wheels their construction and characteristic glazed and loaded wheels. (03 hrs.)

		(Grinding should be performed both on soft and hardened materials). (07 hrs)	
		51. Grind parallel block within accuracy ±0.2mm. (06 hrs) 52. Perform Plain-mandrel grinding to size within accuracy ± 0.2. (06 hrs)	Knowledge how to square up a workpiece using an angle plate. Checking of squareness. Multiple clamping of parts to achieve concentricity & uniformity in size. (04 hrs.)
		53. Demonstrate selection of grinding wheels for grinding different metals. (03 hrs) 54. Select of suitable wheel to obtain rough and IS: 1249-1958. (03 hrs)	Factors effecting selection of wheels, identification of wheel, marking system of grinding wheels IS: 551- 1966. (03 hrs.)
		55. Grind different metals with suitable grinding wheels. (24 hrs)	Grit and different types of bonds, such as vitrified, resinoid, rubber etc. Different types of metals and electroplated bond. (05 hrs.)
		56. Perform externals cylindrical grinding operation within accuracy ± 0.1mm. (03 hrs) 57. Perform internal cylindrical grinding operation within accuracy ± 0.1mm. (03 hrs) 58. Change the recommended wheel speed and control depth of cut. (02 hrs) 59. Perform grinding of sockets both internal and external and check. (05 hrs) 60. Perform Morse taper grinding both internal and external and check. (05 hrs) 61. Perform grinding External	Grinding wheel speed, surface speed per minute conversion of peripheral speed to r.p.m. Depth of cut and range at usefulness. Depth micrometer and vernier caliper. Common types of surface grinding machine, plain surface, rotary surface, horizontal and vertical surface grinder etc. Method of grinding tapers. (05 hrs.)

		sleeve and check. (05 hrs) 62. Perform depth checking by depth gauge micrometer. (02 hrs)	
Professional Skill 200 Hrs; Professional Knowledge 30 Hrs	Set up cylindrical grinder for automatic movement to perform different cylindrical grinding operation using different machine accessories and check accuracy [Different cylindrical grinding:- straight parallel, taper, bush eccentric; Different machine accessories: - steady rest, chuck face plate, angle plate and check accuracy limit ±0.02 mm] (Mapped NOS: CSC/N0109)	63. Revise previous works. (05 hrs) 64. Perform machine setting for automatic movements. (10 hrs) 65. Perform parallel grinding on cylindrical grinder. (15 hrs)	Introduction Training-Revision of previous works. Common types of grinding machines. Plain cylindrical external and internal cylindrical grinder and universal grinder. (04 hrs.)
		66. Test and mount wheels, sleeves, check truing and rebalancing. (15 hrs) 67. Perform grinding parallel mandrel within ± 0.03mm. (10 hrs)	Test for alignment and checking, balancing at wheel, dressing different types of wheel, dressers, their description and uses. (04 hrs.)
		68. Perform wheel balance and dressing grinding long bar using steady rest. (25 hrs)	Test for alignment and checking, balancing of wheel, dressing different types of wheel, dressers their description and uses. (03 hrs.)
		69. Perform grinding different types of jobs using machine chuck, face angle plate collets. (25 hrs)	Holding devices such as Magnetic chuck, chucks and face plates collets their description and uses. Method of holding jobs on magnetic chuck, face plate and chucks. (03 hrs.)
		70. Align table with the help of test bar and dial test indicator. (05 hrs) 71. Perform parallel grinding within accuracy ±0.02mm. (05 hrs) 72. Perform cylindrical Taper grinding (by swiveling machine table) (10 hrs)	External grinding operational steps in external grinding of a job and precautions to be taken. (04 hrs.)

		73. Grind an eccentric job. (10 hrs) 74. Finish different types of jobs using jigs and fixtures, angle plates by grinding. (15 hrs)	Holding devices such as jig and fixture angle plates 'V' blocks etc. their description and uses. (04 hrs.)
		75. Perform grinding of job by using face plate angle plate etc. (25 hrs,)	Internal grinding operational steps in internal grinding of a job precautions to be taken. (03 hrs.)
		76. Finish surfaces of bushes on mandrel within ±0.02 mm by grinding. (25 hrs)	Rough and finish grinding limit fit and tolerances as per ISI: 919-1963. Basic size and its deviation, position of tolerances as per ISI: 919-1963. Basic size and its deviation, position of tolerance zones with respect of zero line. Fits different types clearance, interference and transition. Interchangeable system. Letter symbols for holes and shaft and fundamental deviation hole basis and shaft basis system. (05 hrs.)
Professional Skill 40 Hrs; Professional Knowledge 10 Hrs	Perform dry & wet grinding to make different shaped job of various metals and check accuracy. [Different shaped job: - square block angle plate, angular block; various metal: - cast iron, steel & accuracy limit ±0.02 mm.] (Mapped NOS: CSC/N0109)	77. Perform dry and wet grinding of different classes of metals such as cast iron, brazed carbide tip and different classes of steel. (22 hrs)	Heat generated in grinding dry and wet grinding use of coolant, their composition and selection. Characteristic of coolant. (05 hrs.)
		78. Grind square block within accuracy ±0.02mm. (06 hrs) 79. Grind angle plate within accuracy ±0.02mm (06 hrs) 80. Grind angular block within accuracy ±0.02mm. (06 hrs)	Grinding a square job grinding angular surface taker grinding by stane land taper and angle protractor. (05hrs.)

Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	Make a component by performing bore grinding and check accuracy by telescopic gauge. [Accuracy limit ±0.02 mm.] (Mapped NOS: CSC/N0109)	81. Perform bore grinding within accuracy ±0.02mm. (13 hrs) 82. Use of Telescopic gauge for checking of bore. (12 hrs)	Grinding defects vibration, chattering, glazing and loading their causes and remedies. (05 hrs.)
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	Perform operations on tools & cutter grinder and re-sharpening different tools on pedestal grinder. [Different tools: - lathe tools, drill, tool bit] (Mapped NOS: CSC/N0109)	83. Perform operation on tools and cutter grinding machine. (09 hrs) 84. Manipulate and control tools and cutter grinding machine (05 hrs) 85. Mount jobs on mandrel in tools and cutter grinding machine. (02 hrs) 86. Mount wheel and guards on pedestal grinder. (02 hrs) 87. Sharpen lathe tools on pedestal grinder. (02 hrs) 88. Sharpen drill, tool-bit on pedestal grinder. (05 hrs)	Tool and cutter grinding machine-parts and accessories, description use, care and maintenance, pedestal grinder and bench grinder-their description and uses. (05 hrs.)
Professional Skill 100 Hrs; Professional Knowledge 16 Hrs	Make components having angular and straight surface and check accuracy with different gauges and instruments. [Different components: - V' block, parallel bar, drill point angle; Different gauges: - sine bar, slip gauge & DTI (dial test indicator) and	89. Check tapered or angular jobs with help of sine bar, slip gauges and dial gauge. (23 hrs)	Use of snap gauges, sine bar and slip gauges their description and uses. Polishing, lapping powder and emery clothes lapping flat surface. (04 hrs.)
		90. Perform cylindrical and surfaces grinding operation (25 hrs)	Tools and cutter grinder their description, working principles, operations care and maintenance. (04 hrs.)
		91. Perform step grinding on cylindrical grinding machine. (25 hrs)	Special types of grinding machines and centreless grinders. Their description, working principles,

	accuracy limit ±0.02 mm.] (Mapped NOS: CSC/N0109)		operations, care and maintenance. (04 hrs.)
		92. Grind Parallel block on surface grinding machine (12 hrs) 93. Grind gauges within finish accuracy ±0.02mm. (Rough and finish grinding using disc and diamond wheels). (15 hrs)	Diamond Wheel and Applications of diamond wheel in grinding. (04hrs.)
Professional Skill 30 Hrs; Professional Knowledge 06 Hrs	Perform preventive maintenance of grinding machines. [Grinding machines: - surface and cylindrical] (Mapped NOS: CSC/N0109)	94. Make simple utility jobs such as V' block, Parallel bar, Drill point angle checking gauge with surface and cylindrical grinders. (12 hrs) 95. Perform preventive maintenance of grinding machines. (18 hrs)	Preventive maintenance and its necessity. Mode of frequency of lubrication. Preparation of Maintenance schedule, simple estimation, use of hand book and reference table. Total preventive Maintenance. (06 hrs.)
Professional Skill 50 Hrs; Professional Knowledge 12 Hrs	Make job of different material by cylindrical parallel grinding with appropriate accuracy. [Different material: - soft & hard metals; Accuracy limit±0.01mm] (Mapped NOS: CSC/N0109)	96. Finish cylindrical surfaces by grinding within accuracy ±0.01mm (Maintaining parallelism) on both soft and hard metals. (50 hrs)	Cylindrical grinding machine, its parts, use care and maintenance surface grinding machine-its parts use care and maintenance Universal cylindrical grinding machines parts description use, care and maintenance. Internal grinding machine and its parts their description, use care and maintenance. (12 hrs.)
Engineering Drawing: 40 Hrs.			
Professional Knowledge ED-40 Hrs	Read and apply engineering drawing for different application in the field of work. (CSC/N9401)	**ENGINEERING DRAWING:** Introduction to Engineering Drawing and Drawing Instruments – • Conventions • Sizes and layout of drawing sheets • Title Block, its position and content • Drawing Instrument	

		Lines- Types and applications in drawingFree hand drawing of – • Geometrical figures and blocks with dimension • Transferring measurement from the given object to the free hand sketches. • Free hand drawing of hand tools and measuring tools. Drawing of Geometrical figures: • Angle, Triangle, Circle, Rectangle, Square, Parallelogram. • Lettering & Numbering – Single Stroke. Dimensioning • Types of arrowhead • Leader line with text • Position of dimensioning (Unidirectional, Aligned) Symbolic representation – • Different symbols used in the related trades. Concept and reading of Drawing in • Concept of axes plane and quadrant • Concept of Orthographic and Isometric projections • Method of first angle and third angle projections (definition and difference) Reading of Job drawing of related trades.
Workshop Calculation Science: 34 hrs.		
Professional Knowledge WCS-34 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (CSC/N9402)	**<u>WORKSHOP CALCULATION & SCIENCE:</u>** **Unit, Fractions** Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, substraction, multiplication & division Decimal fractions - Addition, subtraction, multilipication & division Solving problems by using calculator **Square root, Ratio and Proportions, Percentage** Square and suare root Simple problems using calculator Applications of pythagoras theorem and related problems Ratio and proportion Percentage Precentage - Changing percentage to decimal and fraction **Material Science**

		Types metals, types of ferrous and non ferrous metals Physical and mechanical properties of metals Introduction of iron and cast iron Difference between iron & steel, alloy steel Properties and uses of insulating materials **Mass, Weight, Volume and Density** Mass, volume, density, weight and specific gravity Numerical related to L,C, O sections **Speed and Velocity, Work, Power and Energy** Work, power, energy, HP, IHP, BHP and efficiency **Heat & Temperature and Pressure** Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals- Concept of pressure - Units of pressure **Basic Electricity** Introduction and uses of electricity **Mensuration** Area and perimeter of square, rectangle and parallelogram Area and perimeter of Triangles Area and perimeter of circle, semi-circle, circular ring, sector of circle, hexagon and ellipse Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder Finding the lateral surface area, total surface area and capacity in litres of hexagonal, conical and cylindrical shaped vessels **Levers and Simple machines** Lever & Simple machines - Lever and its types **Trigonometry** Measurement of angles Trigonometrical ratios Trigonometrical tables
In-plant training / Project work: a) Drilling jig b) Parallel bar c) Taper mandrel		

SYLLABUS FOR MACHINIST GRINDER TRADE			
SECOND YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 45 Hrs; Professional Knowledge 10 Hrs	Perform re-sharpening of different milling cutters [Different milling cutters: - plain, slitting saw] (Mapped NOS: CSC/N0109)	97. Perform grinding of plain milling cutter. (20 hrs) 98. Perform grinding of slitting saw milling cutter. (25 hrs)	Milling cutters and its nomenclature. Grinding of bushes and cylinders steps and precautions to be taken. (10 hrs.)
Professional Skill 160 Hrs; Professional Knowledge 45 Hrs	Make different components having straight & angular surface with close tolerance limit and check different fault. [Different components: - V' block, plain cylindrical bar, cube; tolerance limit - ±0.01mm; different faults - cracks, blow-holes, chatters] (Mapped NOS: CSC/N0109)	99. Perform grinding on plain flat surface in surface grinding machine with close tolerances (±0.01mm.) (21 hrs)	Dial test indicators marking block, height gauge and surface plate their description. (06 hrs.)
		100. Perform grinding on angular surface like 'V' block. (21 hrs)	Principle of vernier caliper, protractors, micrometers (O/S, I/S and depth) and other instruments having vernier graduations. Combination sets-their use care and maintenance. (06 hrs.)
		101. Grind parallel block on surface grinding machine within close limits (±0.01mm.) (08 hrs) 102. Perform plane cylindrical grinding to close limit with accuracy of h7. (12 hrs).	Bonding materials their kinds description and uses. Grade and structure at grinding wheels. Brief about ISO- 9000. Importance of Quality. (07 hrs.)
		103. Perform cylindrical bore grinding within accuracy ±0.01mm. (15 hrs) 104. Set and grind jobs on chucks	Wheel marking system selection of wheels. Specification and types (shapes & size) of grinding wheels, diamond wheels and their uses. (07

		and face plates. (08 hrs)	hrs.)
		105. Balance grinding wheel (06 hrs) 106. Mount grinding wheel. (03 hrs) 107. Perform right angle grinding on surface grinding machine within accuracy ± 0.01mm. (16 hrs)	Mounting of grinding wheels, grinding wheels, collets and mandrels, balancing of grinding wheels by different methods. (06 hrs.)
		108. Perform wheel dressing for rough and finishing grinding. (01 hrs) 109. Grind a cube to close limit. (Tolerance within ±0.01mm.) (24 hrs)	Types of dresses-steel type, abrasive Diamond tool and rotary dresses abrasive bricks and sticks their description, use, care and maintenance. (07 hrs.)
		110. Perform shoulder grinding on cylinder-grinding machine to close limit h7. (08 hrs) 111. Perform slot grinding on surface grinding machines to close limits H7. (09 hrs) 112. Find different faults while grinding. viz., Cracks, blow holes, chatters. (08 hrs)	Dressing and truing of grinding wheels advantage of balancing, inspections and care of grinding wheels. Wheel storage. Heat generated in grinding dry and wet grinding, use of coolants their composition and selection, limit, fit and tolerances as per ISI: 919-1963. Basic size and its deviation position of tolerance zone with respect to zero lines. Fits different types clearance, interference and transition Interchangeable system Letter symbols for holes and shafts and fundamental deviation hole basis and shaft 9basis systems. (06 hrs.)
Professional Skill 86 Hrs; Professional Knowledge 25 Hrs	Make different gauges with close tolerance limit and check accuracy with different gauges. [Different	113. Grind Snap gauge in close limit to H6. (25 hrs)	Gauges-feeler, taper gauge radius, plug, ring snap (fixed and adjustable) and slip their description use care and maintenance. (06 hrs.)
		114. Perform grinding on cylindrical taper using	Inside micrometer depth gauge, special types of micrometers,

	gauges: - snap gauge, ring gauge; tolerance limit- (H7/h7); Checking gauges- ring, plug] (Mapped NOS: CSC/N0109)	standards ring gauges. (19 hrs)	universal dial test indicator their construction and function. (06 hrs.)
		115. Perform grinding of ring gauge using plug gauge. (20 hrs)	Special type of grinding machine centreless, thread crankshaft etc. their description, use care and maintenance. (06 hrs.)
		116. Grinding long cylindrical using steady rest to close limit of h6. (22 hrs)	Essential mechanism of grinding machines, wheel is guards to IS: 1991-1962 machine guards etc. Process of cleaning and oiling at grinding machines (care and Maintenance) types of steady rests their description and use (07 hrs.)
Professional Skill 65 Hrs; Professional Knowledge 17 Hrs	Produce different components of non-ferrous metal within appropriate accuracy. [Different components - taper pin, rectangular bar; accuracy limit- ±0.01mm.] (Mapped NOS: CSC/N0109)	117. Grind thin plates to close limits of h6 using coolants. (25hrs)	Principle types of grinding fluids importance of uniform temperature, selection and use at grinding fluids, method of supplying grinding fluids. (06 hrs.)
		118. Perform grinding on parallel and taper pins using chuck and collets-h6. (20hrs)	Types of holding devices methods of holding work, type of centres - holding work between centres types of chucks and holding process in chucks. (05 hrs.)
		119. Select grinding wheel and perform grinding on rectangular bar of non-ferrous metals within accuracy ±0.01mm. (20hrs)	Holding work on face plate, pneumatic chuck and magnetic chuck. Precautions to taken before grinding, peripheral of surface speed of grinding wheels, importance of constant wheel speeds, calculations at S.F.P.M. (06 hrs.)
Professional Skill 85 Hrs; Professional Knowledge 20 Hrs	Produce different components involving cylindrical angular grinding operation to close limit accuracy.	120. Perform grinding on machine centre to close limit h6 or H6. (20hrs)	Calculation at R.P.M. and S.F.P.M. of grinding wheels calculation of work speed for cylindrical grinding speed and feeds for cylindrical grinding speed and feeds for internal grinding. (05hrs.)
		121. Perform Facing and	Traverse and over run of traverse,

	[Different components- lathe centre, milling machine arbor; accuracy:- h6 or H6] (Mapped NOS: CSC/N0109)	Chamfering within accuracy ±0.01mm or ± 5 minutes. (20hrs)	width of wheel and depth of cut in different types of grinding achiness. Grinding allowance and time estimation. Rough and finish grinding process. (05 hrs.)
		122. Perform step grinding on surface grinding machine to close limit h6 or H6. (22hrs)	Surface grinding methods of surface grinding by using periphery of grinding wheel and ring edge of grinding wheel. Types of surface grinding machines. Work finish, wheel selection holding of work. (05 hrs.)
		123. Perform V-block grinding within accuracy ±0.01 mm, ± 5 minutes, surface finish N5. (23hrs)	Process of grinding angular surfaces. Grinding slots and grooves. Grinding "V" blocks. Recommended wheel speeds for surface grinding machines. (05 hrs.)
Professional Skill 18 Hrs; Professional Knowledge 06 Hrs	Prepare surface of a component by honing operation & Check accuracy. [Accuracy limit: ±0.001mm] (NOS: CSC/N9409)	124. Grind cylindrical stepsand perform honing (18hrs)	Hones and Honing, types of honing stones there description and use. Amount and rate of stock removal. Adjustment for elementary honing conditions, honing tolerances. (06 hrs.)
Professional Skill 135 Hrs; Professional Knowledge 30 Hrs	Produce components by different taper grinding operation and check accuracy. [Different taper grinding: - compound or double taper, steep taper, morse taper; accuracy	125. Finish surface of Angular form grinding within accuracy of ±0.01mm. (20hrs)	Cylindrical-types of cylindrical grinding operation traverse method, plunge cut method and form grinding method. Alignment of head stock and tail stock. (05 hrs.)
		126. Grind cylindrical steps with shoulder and chamfer within accuracy ±0.008mm. (20hrs)	Method of plain cylindrical surface grinding step-grinding and shoulder and face grinding. (05 hrs.)
		127. Perform compound or double taper grinding accuracy of ±0.008mm. and surface finish of N5 (22hrs)	Method of grinding external and angle (simple) taper and steep. Taper double compound taper. (05 hrs.)

	limit - ±0.008mm.] (Mapped NOS: CSC/N0109)	128. Perform steep taper grinding with in accuracy ±0.008mm. (12 hrs) 129. Grind lathe centre within accuracy ±0.008 mm. surface finish N4. (13 hrs)	Use of universal head for angular grinding. Measuring and checking of taper and angles. Use of taper plug and ring gauges. (05 hrs.)
		130. Make Morse taper within accuracy ±0.008 mm. surface finish N4. (08 hrs) 131. Perform Plug grinding within accuracy ±0.008 mm. surface finish N4. (08 hrs) 132. Finish Metric tapers by grinding within accuracy ±0.008 mm. surface finish N4. (09 hrs)	Taper and angle checking by using protractors, micrometer and rollers. (05 hrs.)
		133. Perform Taper grinding using sine bar, D.T.I. and gauge blocks to close limit h6. (23hrs)	Use of sine bar and gauge block-taper checking by sine bar gauge block D.T.I. micrometer and rollers. Other out of round surfaces. Holding work with fixed steady rest, in process gauges and pneumatic gauges. (05 hrs.)
Professional Skill 67 Hrs; Professional Knowledge 20 Hrs	Produce male and female components by different grinding to close tolerance limit. [Different grinding: - step and slot grinding; tolerance limit-H6/h5] (NOS: CSC/N0109)	134. Grind Taper up to close limit H6. (6hrs) 135. Grind lathe centre within h7. (8hrs)	Centreless grinding process of holding job, and types of operations. Effect of setting work above and below wheel centre. Jig and fixture holding work by fixture and vice non-electric and magnetic chuck. Use of three jaw and two jaw steady rest (05 hrs.)
		136. Perform internal step grinding to close limit H6, (13 hrs) 137. Grind ring gauge to close limit-H7. (8hrs)	Internal centreless grinding methods of holding jobs and processes of grinding. Selection of wheels. Internal grinding work movement and wheel movement. Rotation and reciprocation of job and wheel spindle, Internal grinding

			allowance, selection of wheels for internal grinding allowance, selection of wheels for internal grinding. Thread grinding method of holding jobs methods of grinding threads and thread calculation. (095hrs.)
		138. Perform slot grinding to close limit h5. (16hrs)	Thread grinding method of holding jobs method of grinding threads and thread calculation. (05 hrs.)
		139. Perform cylindrical step grinding (16hrs)	Various types of thread grinding wheels and their selection. Types of dressers and process of process of dressing selection of coolants and their use. (05 hrs.)
Professional Skill 19 Hrs; Professional Knowledge 06 Hrs	Prepare surface of a job by performing lapping & buffing to close limit h5. (NOS: CSC/N9409)	140. Perform Lapping on flat surface. (05hrs) 141. Perform Lapping on cylindrical surface (06hrs) 142. Perform Buffing to close limits . (8hrs)	Laps and lapping material, types of laps lapping abrasives rotary diamond lap lapping lubricants lapping pressures wet and dry lapping. Hand lapping and machine lapping. Lapping flat surface lapping cylindrical surface polishing wheels polishing operations abrasive buffing wheels (06 hrs.)
Professional Skill 70 Hrs; Professional Knowledge 20 Hrs	Make components by different grinding to close tolerance limit and check accuracy. [Different grinding: - cylindrical taper, surface grinding & shoulder grinding; tolerance limit- h6] (Mapped NOS: CSC/N0109)	143. Perform cylindrical Taper grinding. (10hrs)	-Do- (05 hrs.)
		144. Perform surface grinding within accuracy ±0.01mm. (20hrs)	Grinding defects and their corrections, inaccurate work out of round, out of parallel taper on and irregular marks spiral scratches, discoloured burnt surface etc. (05 hrs.)
		145. Perform Multi-step cylindrical grinding. (20hrs)	Grinding defects and their correction. Waviness marks of surface, chatters-short close evenly spaced long and regularly spaced, marks in phase with vibration of floor, random marks, random waves

			etc. Glazing of wheel and loading of wheel. (05 hrs.)
		146. Perform shoulder grinding on cylinder-grinding machine to close limit h7. (20hrs)	Dressing and truing of grinding wheels advantage of balancing, inspections and care of grinding wheels. Wheel storage. (05 hrs.)
Professional Skill 90 Hrs; Professional Knowledge 23 Hrs	Identify different components of CNC lathe to understand working and prepare part programme by using simulation software. (NOS: CSC/NO115)	147. Prepare different types of documentation as per industrial need by different methods of recording information. (12 hrs)	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. (05 hrs.)
		148. Identify CNC machine (04 hrs) 149. CNC machine operation like Jog, Reference Edit, MDI, Auto Mode Program. Call & Entry, Simulation, Tool off-set Tool changing /Orientation. (12 hrs)	Introduction to CNC Technology CNC M/c. principle advantages classification, drives, controls. Basic information on CNC machine & maintenance of CNC M/c. computer aided CNC Language. Introduction to CNC grinding. (05 hrs.)
		150. Know rules of personal and CNC machine safety, safe handling of tools, safety switches and material handling equipment using CNC didactic/ simulation software and equipment. (10 hrs) 151. Identify CNC lathe machine elements and their functions, on the machine. (10 hrs)	Personal safety, safe material handling, and safe machine operation on CNC turning centers. CNC technology basics, Comparison between CNC and conventional lathes. Concepts of positioning accuracy, repeatability. (06 hrs.)

		152. Understand the working of parts of CNC lathe, explained using CNC didactic/ simulation software. (15 hrs) 153. Identify machine over travel limits and emergency stop, on the machine. (05 hrs) 154. Decide tool path for turning, facing, grooving, threading, drilling. (15 hrs) 155. Identify safety switches and interlocking of DIH modes. (05 hrs)	CNC lathe machine elements and their functions - bed, chuck, tailstock, turret, ball screws, guide ways, LM guides, coolant system, hydraulic system, chip conveyor, steady rest, console, spindle motor and drive, axes motors, tail stock, encoders, control switches. Feedback, CNC interpolation, open and close loop control systems. Machining operations and the tool paths in them – stock removal in turning and facing, grooving, face grooving, threading, drilling. (07 hrs.)
Engineering Drawing: 40 hrs.			
Professional Knowledge ED-40 Hrs	Read and apply engineering drawing for different application in the field of work. (CSC/N9401)	**ENGINEERING DRAWING:** Reading of drawing of nuts, bolt, screw thread, different types oflocking devices e.g., Double nut, Castle nut, Pin, etc. Reading of foundation drawing. Reading of Rivets and rivetted joints, welded joints. Reading of drawing of pipes and pipe joints. Reading of Job Drawing, Sectional View & Assembly view.	
Workshop Calculation Science: 38 Hrs.			
Professional Knowledge WCS-38 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (CSC/N9402)	**WORKSHOP CALCULATION & SCIENCE:** **Friction** Friction - Advantages and disadvantages, Laws of friction, co-efficient of friction, angle of friction, simple problems related to friction Friction - Lubrication Friction - Co- efficient of friction, application and effects of friction in workshop practice **Centre of Gravity** Centre of gravity - Centre of gravity and its practical application **Area of cut out regular surfaces and area of irregular surfaces** Area of cut out regular surfaces - circle, segment and sector of circle Related problems of area of cut out regular surfaces - circle, segment and sector of circle	

		Area of irregular surfaces and application related to shop problems **Elasticity** Elasticity - Elastic, plastic materials, stress, strain and their units and young's modulus Elasticity - Ultimate stress and working stress **Heat Treatment** Heat treatment and advantages **Estimation and Costing** Estimation and costing - Simple estimation of the requirement of material etc., as applicable to the trade Estimation and costing - Problems on estimation and costing
In-plant training / Project work a) Morse taper b) Lathe centre close to h6 c) Stepped taper ring close to H7		

SYLLABUS FOR CORE SKILLS
1. Employability Skills (Common for all CTS trades) (120 Hrs + 60 Hrs.)

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

ANNEXURE-I

LIST OF TOOLS AND EQUIPMENT			
MACHINIST GRINDER (For batch of 20 candidates)			
S No	**Name of the Tool &Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Steel Rule	150mm (graduated both English and Metric).	21 (20+1) Nos.
2.	Try Square Engineer	150mm	21 (20+1) Nos.
3.	Outside Calipers (spring)	250mm	21 (20+1) Nos.
4.	Inside Calipers (spring)	150 mm	21 (20+1) Nos.
5.	Hammer Ball Peen	With handle 0.50 kg.	21 (20+1) Nos.
6.	Odd leg Caliper	150 mm	21 (20+1) Nos.
7.	Scriber	150 x 3 mm	21 (20+1) Nos.
8.	Plier	150 mm	21 (20+1) Nos.
9.	Goggles	(fiber plastic cup) safety glasses (interchangeable glasses)	21 (20+1) Nos.
B. TOOLS, MEASURING INSTRUMENTS AND GENERAL SHOP OUTFIT			
10.	Hammer Engineers	Ball Peen 0.50 kg.	3 Nos.
11.	Scribing Block	with adjustable Vertical spindle 225 mm 4 Angle Plate, adjustable (graduated in degrees) 150 x 150 x 150 mm	3 Nos.
12.	Blocks Vee	150 x 100 x 100 mm (fitted with clamps, hardened and ground)	3 Pairs.
13.	Calipers, Vernier(Digital)	200 mm, inside and outside (graduated in inches and millimeters	1 Each
14.	C-clamps	50 mm, 100 mm and 150 mm	3 Each
15.	Oil can	Pressure delivery 1/4 pint	4 Nos.
16.	Height Gauge	(Metric and English graduated)	1 No.
17.	Combination set	(consisting of 300 mm rule centre)	2 Nos.
18.	Chuck, Drill	12 mm cap. (Taper shank)	1 No.
19.	Dial Test Indicator complete	with stand (universal type with magnetic base 1/100 mm)	2 Nos.
20.	Diamond, Wheel Dressing	(single stone mounted)	4 Nos.

21.	Files, Hand Flat,	200 mm smooth	10 Nos.
22.	Files, Hand Flat,	250 mm smooth	10 Nos.
23.	Files, Half round	150 mm smooth	10 Nos.
24.	Files, round	Dead smooth 200 mm	4 Nos.
25.	Files, Triangular,	Dead smooth 200 mm	2 Each
26.	Files, Triangular	Dead smooth 150 mm	4 Nos.
27.	File Flat Rough	300 mm	4 Nos.
28.	File Flat	250 mm Second Cut	4 Nos.
29.	Feeler Gauge Metric Set		1 set
30.	Gauge Radius (Inside and Outside) (Metric)		2 Nos.
31.	Gauge, Telescopic	12 to 150 mm	2 Sets
32.	Gauge, Morse Taper,	Plug Nos. 1,2,3,4	1 Each
33.	Gauge, Morse Taper,	Ring Nos. 1,2,3,4	1 Each
34.	Hacksaw frame	200 to 300 mm adjustable	2 Nos.
35.	Keys, Allen	1 mm to 14 mm by 1 mm	4 sets
36.	Keys, Allen	3 to 12 mm, by 1.5 mm	1 Set
37.	Spirit Level, Engineers	25 mm precision	1 No.
38.	Micrometer outside (Digital)	0 to 25 mm	3 nos.
39.	Micrometer outside (Digital)	25 to 50 mm	2 nos.
40.	Micrometer outside (Digital)	50 to 75 mm	1 no.
41.	Micrometer outside (Digital)	75 to 100 mm	1 no.
42.	Micrometer outside (Digital)	25 to 150 mm with extension Rods.	1 no.
43.	Oil Stone Carborandum,	Coarse on one side and fine on the other 200 x 50 x 25 mm	2 Nos.
44.	Oil Stone Carborandum,	Coarse on one side and fine on other slip 100 x 12 mm triangular.	2 Nos.
45.	Oil Stone Carborandum,	Coarse on one side and fine on other slip 100 x 18 mm triangular	2 Nos.
46.	Try Square, Engineer's	100 mm blade	2 Nos.
47.	Straight Edge Engineer's	300 x 50 x 12 mm beveled edge.	1 No.
48.	Screw Driver	200 mm blade	2 Nos.
49.	Screw Driver	300 mm blade	2 Nos.
50.	Spanner D.E. open jaw	3 to 18 mm by 3 mm	2 Sets
51.	Techometer(Digital)	with male and female rubber attachments (upto10,000 RPM)	1 No.
52.	Vices, Machine, Swiveling Base	150 mm x 100 mm	2 Nos.
53.	Universal Machine Vice	100 mm for Grinding	2 Nos.
54.	Angle Truing Attachment for surface grinding machine.		1 No.

55.	Demagnetizer Chuck		1 No.
56.	Centre Punch	150 x 6 mm dia.	4 Nos.
57.	Surface Plate	60 x 60 cms.	1 No.
58.	Marking Table 90 x 60 x 90 cms	90 x 60x 90 cms.	1 No.
59.	Portable Hand Drill (Electric)	6 mm	1 No.
60.	Taps and Dies complete set in box (Metric)		1 Set
61.	Drill Twist (Straight Shank)	1/8" to 1/2" by 1/64"	1 Set
62.	Drill Twist (Metric)	3 mm to 12 mm, in step of 1 mm	1 Set
63.	Set of Sockets Morse taper	(0-1, 1-2 and 2-3)	1 Set
64.	Drill Chuck	0 to 12 mm Morse Taper	1 No.
65.	Screw Pitch Gauge		1 No.
66.	Working Benches	340 x 120 x 75 cms with 4 bench vices, 125 mm jaw	1 No.
67.	Fire Extinguisher		1 No.
68.	Fire Buckets with stand		4 Nos.
69.	Steel lockers	with 6 drawers	2 Nos.
70.	Metal Rack	180 x 150 x 45 cms.	1 No.
71.	Black Board with Easel		1 No.
72.	Adjustable Wrench	250 mm size	1 No.
73.	Hammer (Nylon face)	30 mm	4 Nos.
74.	Magnetic V-Block with push button switch (All magnetic)	75 x 75 x 100 mm	1 Set
75.	Magnetic V-Block base (All magnetic)	for Dial Indicator 75 x 75 x 100 mm	2 Nos.
76.	Static balancing stand for grinding wheel		1 No.
77.	Dial Test Indicator(Digital)		2 Nos.
C : GENERAL MACHINERY			
78.	SS and SC centre lathe (all geared)	with minimum specification as: centre height 150 mm and centre distance 750 mm along with 4 jaw chuck, self centering chuck, auto feed system, safety guard, motorized coolant system and lighting arrangement, set of lathe tools, lathe carriers.	3 Nos.
79.	Pillar Drill machine (All geared)	0-25mm drill holding capacity with drill chuck & keys.	1 No.
80.	Cylindrical External Grinding Machine	fully motorized with dressing arrangement and supplied with face plates and driving dogs, 3-jaw	2 Nos.

		self centering chuck, 4- jaw independent chuck, tail stock assorted centres pump with tank and pipe fittings spanners and grease gun (each machine to be supplied with assorted grinding wheels and tool grinding machine for general purpose work with internal grinding attachment) with minimum specification as: To accommodate 750mm job with centre height 150mm. Wheel diameter x Width = 300 x 25mm.	
81.	Grinding machine plain surface	wheel dia. 175 mm (or near) with reciprocating table having longitudinal table traverse 200 mm (or near) fully automatic and fitted with adjustable traverse stops, machine to be fully motorized and fitted with ace guards and pumps, tank and pump fittings and also to be supplied with magnetic chuck 250 x 112 mm. Diamond tool holder, set of spanners, grease gun, oil-can and spare grinding wheel for general purpose grinding.	2 Nos.
82.	Grinding machine plain surface	With horizontal and vertical spindle, reciprocating table having longitudinal table traverse fully motorized and supplied with set of spanners, necessary equipment, diamond tool holders for wheel sized 175 x 30 x 18 mm suitable cup wheels for vertical spindle, spare wheel proper guards and coolant pump with fittings.	2 Nos.
83.	Tool and cutter grinding machine (With set of collets, indexing head pin type and) & Mandrels 25*27	250 x 375 mm fully motorized supplied with chuck, centers tool rest, height gauge, table clamps universal vice tooth rest. Diamond dressing tool and holding attachment equipment for tool grinding and assorted grinding	1 No.

		wheels for all tool room work (with twist drill grinding attachment).	

ABBREVIATIONS

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्