

CURRICULUM

FOR THE TRADE OF

MACHINIST (Dual Mode)

UNDER

DUAL TRAINING SYSTEM

BY



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

PROPOSED TIME DISTRIBUTION FOR MACHINIST TRADE UNDER
INDUSTRY INSTITUTE - TRAINING SCHEME

BLOCK WITH DURATION	THEORY	PRAC.	WSC/ CAL	ENGG. DRG.	EMP. SKILL	ECA, LIB. & OTHERS	REM.
BLOCK – I (12 months/52 Weeks duration) Institute level trg.	510 hrs.	830 hrs.	170 hrs.	250 hrs.	110 hrs.	50 hrs.	160 hrs. Revision & Test
BLOCK – II (09 months /39 weeks duration) Industry level trg.	---	1560 HRS.	---	---	---	---	---
BLOCK – III (3 months/ 13 Weeks duration) Institute level trg.	100 hrs.	210 hrs. (Practical practice and submission of report related to industry training)	50 hrs.	60 hrs.	---	20 hrs.	Last 2 weeks revision & exam.
GRAND TOTAL	610 HRS.	2600 HRS.	220 HRS.	310 HRS.	110 HRS.	70 HRS.	240 HRS.
Total duration of training inclusive of Industry & Institute is 2 years (4160 HRS.)							

GENERAL INFORMATION FOR INSTITUTE (ITI)

1. **Name of the Trade** : **MACHINIST (Dual mode)**
2. **N.C.O. Code No.** : 835.10
3. **Duration of Craftsmen Training** : Two years (Three Blocks).
4. **Power norms** : 20 KW
5. **Space norms** : 130 Sq.mt
6. **Entry Qualification** : Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
7. **Trainees per unit** : 12 (Supernumeraries/Ex-Trainee allowed: 4)
- 8a. **Qualification for Instructors** : Degree in Mechanical Engineering from recognized university with one year post qualification experience in the relevant field
OR
Diploma in Mechanical Engineering from recognized Board of Technical Education with two years post qualification experience in the relevant field
OR
NTC/NAC in the Trade of “Machinist” with 3 years post qualification experience in the relevant field.
- 8b. **Desirable qualification** : Preference will be given to a candidate with Craft Instructor Certificate (CIC) in Machinist/ Operator Advance Machine Tool Trades.

Note:

- (i) Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.
- (ii) Instructor qualification for WCS and E.D, as per the training manual.

Distribution of training on Hourly basis:

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra curricular activity
40 Hours	25 Hours	6 Hours	2 Hours	3 Hours	2 Hours	2 Hours

SYLLABUS CONTENT WITH TIME STRUCTURE FOR MACHINIST TRADE

Block – I

Duration- 12 Months (52 weeks)

Institute Level Training: -

Sl. No.	Practical Duration:- 830 hrs.	Theory Duration:- 510 hrs.
1.	<p>Importance of trade training, List of tools & Machinery used in the trade. Health & Safety: Introduction to safety equipments and their uses. Introduction of first aid, operation of Electrical mains.</p> <p>Occupational Safety & Health Importance of housekeeping & good shop floor practices. Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipments(PPE):-Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Use of Fire extinguishers.</p>	<p>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 eg; power failure, fire, and system failure.</p>
2.	<p>Identification of tools & equipments as per desired specifications for marking & sawing(Hand tools , Fitting tools & Measuring tools) Selection of material as per application Visual inspection of raw material for rusting, scaling, corrosion etc., Marking out lines, gripping suitably in vice jaws, hack sawing to given dimensions, sawing different types of metals of different sections.</p>	<p>Hand tools and its importance, steel rule, Try square, chisel, surface gauge and care & maintenance, Hacksaw frame, blades.</p>
3.	<p>Chipping flat surfaces and grinding various angles to chisels, filing flat surface. Grooving with Hammer and chisel.</p>	<p>Classification and types of chisels, files & uses, vices - its uses. Hammers and its types. Related safety.</p>
4.	<p>Hack sawing & Filing Flat surfaces, Uses of marking tools, Punch, Try square & basic measuring tools, caliper, steel rule.</p>	<p>Marking block, Steel rule, and calipers-different types and uses. Combination set-its components and uses.</p>
5.	<p>Marking and Drilling holes on flat pieces. Tapping as per simple drawing.</p>	<p>Hacksaw blade, Hacksaw frame and its types. Drill bits- parts, Types & uses.</p>

6.	Fitting male and female square piece to close limit. Application of vernier caliper in making job.	Introduction to Hand Taps & Dies and their types, applications, care and maintenance. Familiar with tap and drill size, Thread Terminology.
7.	Demonstration to Shaping machine and its construction. Setting of strokes, tools, job on table machining of Rectangular block, steps, with the use of Basic tools. Safety points to be observed while working on a shaper. Setting of vice, setting of block on vice checking accuracy. Shaping angular surfaces. Cutting of external keyway and Tee slots on shaper.	Introduction of shaper, types classification, Shaping parts, construction use of parts, quick return mechanism ratio etc. Various tools of shaping machine and their angles and importance of angles. Various methods of holding jobs, use of clamps, nuts & bolts V- blocks, angle plates shaping operations, their importance. Tool head - its parts and application, function of each part of tool head. Shaping tools and types. Speed, feed, depth of cut.
8.	General introduction to slotting. Safety points to be observed while working on a slotter. Slotting a square & hexagon internal job, checking and measuring with gauges & precision measuring instruments.	Slotter-principle, construction, details, driving mechanism, quick return motion and speed ratio. Safety precaution comparative study with a shaping machine. Classification of slotting machine. Job holding devices-vice, clamps, V-block, parallel block etc. Slotting tools different types of work tool angles comparison of tool shape with that of shaper. Use of tool with holder for internal operations. Precautions to be observed during slotting internal operations. Outside micrometer, its types and construction, parts, reading use, care and maintenance. Study about Depth gauge, micrometers and dial test indicator - their parts and use. Heat treatment process Annealing, Normalizing, and Tempering, Hardening, case hardening and its importance. Use of vernier caliper and its parts, principle & reading, use & care. Surface finish as per ISI system. Introduction to coolant & lubricant-difference between them, types and uses of each.
9.	Demonstration to lathe. Holding of round job in an independent chuck and truing it. Holding the tool in a tool post, centering the job with the tool. Facing & drilling.	Introduction to Planning M/c. parts, types, constructions, details of Driving mechanism of planer, quick return motion etc.
10.	Parallel turning between centers, parting off, chamfering using roughing, finishing and parting off tools.	Introduction to lathe. Its types, engine lathe construction, detail function of parts size and specification. Safety points to be observed while working on a lathe.
11.	Holding the job in jaw chuck truing, centering facing. Step turning undercutting, knurling drilling and boring.	Lathe tools their angles & uses. Driving mechanism, speed and feed mechanism & lathe accessories.
12.	Taper turning by offset method checking of the	Chucks-different types of job holding devices

	taper with precision instruments. Taper turning by swiveling compound rest, setting the compound rest to correct degree, checking the tool height, clamping the saddle for no longitudinal movement, checking up with precision instruments.	on lathe and advantages of each type. Mounting and dismounting of chucks.
13.	Cutting V thread external and internal in a lathe. Checking up with screw pitch gauge. Cutting square thread external & internal on a lathe.	Taper introduction, types and uses. Calculations of tapers. Measurement of taper by sine bar and slip gauges.
14.	Introduction to milling machine, demonstration on working principle, setting of job, setting of cutter in arbor, setting of vice on table. Safety points to be observed while working on a milling machine.	
15.	Sequence of milling six faces of a solid block. Checking the accuracy with the help of try-square scribing block and vernier height gauge.	Different thread forms their related dimensions and calculations screw cutting in a lathe. Measurement of threads by three wire methods.
16.	Step milling using side and face cutter checking with micrometer.	Milling machine importance of milling machine, types and specification of milling machine, driving and feed mechanism of milling machine.
17.	Straddle and gang milling operations including up-milling and down milling. Milling concave and convex surfaces.	Classification & different types of milling cutters & their use. Parts and nomenclature.
18.	Demonstration to indexing head types, setting and aligning of indexing head with reference to job on milling machine.	Vernier height gauge parts, graduations vernier setting & reading, Vernier bevel protractor, parts, graduation setting and reading. Care and maintenance of precision measuring instruments.
19.	Milling square and hexagonal job by simple indexing method.	Different milling operations plain-face, angular, form, slot, gang and straddle milling etc. Up and down milling. Different types of milling attachments and their uses.
20.	Milling dovetail and 'T' slots both male and female matching each other.	Indexing-introduction & types. Indexing head-constructural details, function of indexing plates and the sector arms. Calculation for various types of indexing.
21.	Milling of spur gear having even and odd number of teeth.	Gear introduction, use and type. Elements of a spur gear. Gear tooth of each forms types, merits and demerits of each. Spur gear calculations, curves and their uses. Selection of gear cutter type and form & various methods of checking gear and its parts.

22.	Demonstration to grinding machine surface grinder, cylindrical grinder. Driving and feed mechanism, job holding devices mounting of wheels. Wheel balancing & truing. Grinding of parallel and stepped jobs. Dressing of grinding wheels.	Grinding machine introduction types, specification, their parts and functions & uses. Safety points to be observed while working on a Grinding machine. Types of Abrasives and their uses, Glazing and loading of wheels. Explain the importance and necessity of quality.
23.	Checking of alignment of lathe centers and their adjustments. Center drilling, step turning between centers recessing and chamfering & measurement with vernier caliper. Taper turning by taper turning attachment.	Turning of taper by taper turning attachment advantages and dis-advantages taper calculations. Face plate- its use safety precaution in holding jobs on face plate.
24.	Exercise on use of pillar drill in drilling, counter sinking, counter boring. Spot facing and use of spot facing tools.	Screw cutting on a lathe. Terms relating screw thread major/ minor diameter pitch and lead of the screw, depth of thread simple gear train and compound gear train change gears for fractional pitches.
25.	Boring on a vertical milling machine, measurement of bore size.	Difference between single and multi-start threads-their uses merits and demerits. Broach - its types and uses.
26.	Demonstration of marking system of Grinding wheels. Different Tool and Cutter grinding practices on Tool & Cutter grinding m/c.	Square thread its form and calculation of depth, core dia, pitch dia. Acme thread its forms use and calculations.

<p>27.</p>	<p>Milling tongue and groove on a mating job. Checking with precision instruments and gauges.</p>	<p>Pillar drill machine, functions of parts. Application of pillar drill. Radial drills function parts etc. Reamer- parts, types, uses. Special tools – use and precautions to be observed for shaping internal keyways dovetails & ‘T’ slots. Various material for single point cutting tools, tipped tools, their brazing and grinding process. Tool angles and their effect on cutting various materials. Cutting speed, feed, depth of cut for slotting, shaping and time calculation. Checking of dovetail grooves with vernier caliper and roller. Their calculations and use of sine bar, slip gauge and dial test indicator. Properties of metals general idea of physical, mechanical properties of metals, colour, weight, hardness toughness, malleability, ductility their effect on Machinability. Use of radius gauges and template. Introduction to jigs and fixtures. Types and uses. Interchangeability - Limit, Fit, Tolerances and allowances. Introduction and their indexing process on a slotter by its rotary table graduations. Form tool for slotting machines. Calculation for spur gear in relation to graduation of circular table. Vertical milling machine its parts, method of boring in a vertical milling. Difference between horizontal and vertical milling machine. Elements of milling cutter Rake angle, primary, secondary and clearance angles, lead etc. Selection procedure of grinding wheels. Abrasives its types Bonds, Grade Grit, structure, different shape of wheels and their uses. Inside micrometer, Principle, construction graduation reading both in English and metric system gauge types and uses.</p>
<p>28.</p>	<p>Demo of parts of CNC machining center - control switches, console buttons and machines specifications (spindle power, axes traverse, etc.). Demonstration of machine parts - bed, spindle motor and drive, tool changer, axes motors and ball screws, guideways, LM guides, console, electrical, coolant system, hydraulic system, chip conveyor. Working of parts explained using multimedia based CNC</p>	<p>CNC technology basics: Difference between CNC and conventional lathes. Advantages and disadvantages of CNC machines over conventional machines. Schematic diagram of CNC system. Axes convention. Working of parts explained using multimedia CNC teach ware. Parts shown on machine.</p>

	simulator.	
29.	CNC part programming with simple exercises and various programming codes. Practice on CNC machine simulator.	Programming - sequence, formats, different codes, canned cycles. Absolute and incremental programming. Tool nose radius compensation (G41/42). Cutting tool materials, cutting tool geometry - insert types, holder types, insert cutting edge geometry. Cutting parameters - cutting speed, feed rate, depth of cut. Process planning, tool selection and cutting parameters selection. Explained using multimedia CNC teachware and CNC machine simulator.
30.	CNC machining center operation in various modes: jog, single block, auto, MDI, edit, etc. Program entry. Setting of tool offsets, entry of tool radius. Practice on CNC machine simulator.	Program execution in different modes like single block, manual and auto. Tool and work offsets setting. Prepare various programs as per drawing. Concepts taught using multimedia based CNC simulator.

31.	<p>Program and cut parts on CNC machining center with face milling, contour milling with tool radius compensation, pocket milling, drilling, peck drilling, countersinking, tapping operations using canned cycles for hole operations. The practice is on CNC machine simulator.</p>	<p>Importance of Technical English terms used in industry -(in simple definition only) Technical forms, process charts, activity logs, in required formats of industry, estimation, cycle time, productivity reports, job cards Spiral introduction, type and elements. Difference between helix & spiral. Difference between R.H. and L.H. helix Spiral-lead, helix angle and calculation. Cam Introduction development and use. Use of proper cutting speed and feed for various metals. Calculation for the machining time, machining allowances. Vernier gear tooth caliper, its application in checking gear tooth. Introduction to broaching methods of milling splines. Its calculations and selection of cutters. Spiral milling lead, pitch, helix angle R.H. and L.H. swiveling the table in relation to the helix angle, selection of cutter for spiral milling. Calculations for spiral milling. Cam-types, application in modern m/c. tools, its special advantages, Cam-lobe, lead setting of dividing head, Calculation, manufacturing process, calculation for milling a drum cam. Helical gear introduction elements and calculation. Introduction geometry and uses of bevel gears. Quality control types of variation, causes of variation, measurement of testing, gear & error. Introduction to rack, its use & application. Rack cutting attachment, calculation for linear pitch, circular pitch, Gear ratio, Indexing movement, etc Introduction, geometry and use of worm and worm wheel.</p>
REVISION & TEST		

NOTE: - Maximum uses of video demonstration and other IT based teaching aids may be adopted to deliver the theoretical knowledge.

Syllabus for

EMPLOYABILITY SKILLS

GENERAL INFORMATION
(Employability Skill)

1. **Name of the subject:** EMPLOYABILITY SKILLS
2. **Hours of Instruction:** 110 Hrs.
3. **Examination:** The examination will be held at the end of the training.
4. **Instructor Qualification:**

MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGET institutes

AND

Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above

OR

Existing Social Studies Instructors duly trained in Employability Skills from DGET institutes

5. **Instructor:**

One full time regular instructor shall be engaged on every 240 numbers of trainees for teaching the subject “Employability Skills”. One additional full time regular instructor would be required on increase in every 240 trainees. Wherever the trainees are less than 240 or part thereof, a part-time instructor may be engaged to teach the subject.

ALLOTMENT OF TIME AND MARKS AMONG THE TOPICS

Sl. No.	Topics	Allotted Hours	Marks Allotted	To be covered in
1.	English Literacy	20 hrs.	9	Block – I
2.	I.T. Literacy	20 hrs.	9	
3.	Communication Skills	15 hrs.	7	
4.	SUB TOTAL:	55	25	
5.	Entrepreneurship Skills	15 hrs.	6	
6.	Productivity	10 hrs.	5	
7.	Occupational safety , health and Environment Education	15 hrs.	6	
8.	Labour Welfare Legislation	05 hrs.	3	
9.	Quality Tools	10 hrs.	5	
	Sub Total:	55	25	
	TOTAL	110 hrs.	50	

Detail of Syllabus

1. English Literacy	
Hours of Instruction: 20 Hrs. Marks Allotted: 09	
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy	
Hours of Instruction: 20 Hrs. Marks Allotted: 09	
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets
Computer Networking and INTERNET	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills Hour of Instruction: 15 Hrs. Marks Allotted: 07	
Topic	Contents

Introduction to Communication Skills	Communication and its importance
	Principles of Effective communication
	Types of communication - verbal, non verbal, written, email, talking on phone.
	Non verbal communication -characteristics, components- Para-language
	Body - language
	Barriers to communication and dealing with barriers.
	Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.
	Triple- A Listening - Attitude, Attention & Adjustment.
	Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success
	The Power of Positive Attitude
	Self awareness
	Importance of Commitment
	Ethics and Values
	Ways to Motivate Oneself
Personal Goal setting and Employability Planning.	
Facing Interviews	Manners, Etiquettes, Dress code for an interview
	Do's & Don'ts for an interview
Behavioral Skills	Problem Solving
	Confidence Building
	Attitude
4. Entrepreneurship Skills Hour of Instruction: 15 Hrs. Marks Allotted: 06	
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available

	scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity	
Hour of Instruction: 10 Hrs. Marks Allotted: 05	
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard. Industry Nation.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
7. Occupational Safety, Health and Environment Education Hour of	
Instruction: 15 Hrs. Marks Allotted: 06	
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person
Basic Provisions	Idea of basic provision of safety, health, welfare under legislative of India.

Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water
Environment	Right attitude towards environment, Maintenance of in -house environment
7. Labour Welfare Legislation Hour of Instruction: 05 Hrs. Marks Allotted: 03	
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
Hour of Instruction: 10 Hrs.	
8. Quality Tools Marks Allotted: 05	
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples

Tools & Equipments for Employability Skills:

Sl. No.	Name of the Equipment	Quantity
1	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 nos.
2	UPS - 500Va	10 nos.
3	Scanner cum Printer	1 no.
4	Computer Tables	10 nos.
5	Computer Chairs	20 nos.
6	LCD Projector	1 no.
7	White Board 1200mm x 900mm	1 no.

* Note: Above Tools & Equipments not required, if Computer LAB is available in the institute.

Syllabus for

ENGINEERING DRAWING

GENERAL INFORMATION
(Engineering Drawing)

1. **Name of the Subject :** ENGINEERING DRAWING
2. **Hours of Instruction:** 310 hrs.
3. **Instructor Qualification:** Degree in Engineering with one year experience
OR
Diploma in Engineering with two years experience
OR
NCVT / NAC in the Draughtsman (Mechanical / Civil)
with three years experience.
4. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.
5. **Instructor:**
 - One full time instructor is required for 144Engineering seats sanctioned in the institute. Additional instructor will be required on increase in every 144 students.
 - For seats less than 144, the instructor may be out sourced/ hired on contract basis.

Details of syllabus

Sl. No.	Topics (Total duration – 310 hrs.)
1.	Engineering Drawing: Introduction and its importance <ul style="list-style-type: none"> - Relationship to other technical drawing types - Conventions - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003
2.	Drawing Instruments : their Standard and uses <ul style="list-style-type: none"> - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
3.	Lines : <ul style="list-style-type: none"> - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment
4.	Drawing of Geometrical Figures: Definition, nomenclature and practice of - Angle: Measurement and its types, method of bisecting. <ul style="list-style-type: none"> - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
5.	Lettering and Numbering as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.
6.	Dimensioning: <ul style="list-style-type: none"> - Definition, types and methods of dimensioning (functional, nonfunctional and auxiliary) - Types of arrowhead - Leader Line with text
7.	Free hand drawing of <ul style="list-style-type: none"> - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension - Transferring measurement from the given object to the free hand sketches.
8.	Sizes and Layout of Drawing Sheets <ul style="list-style-type: none"> - Basic principle of Sheet Size - Designation of sizes - Selection of sizes - Title Block, its position and content - Borders and Frames (Orientation marks and graduations) - Grid Reference - Item Reference on Drawing Sheet (Item List)
9.	Method of presentation of Engineering Drawing <ul style="list-style-type: none"> - Pictorial View - Orthogonal View - Isometric view
10.	Symbolic Representation (as per BIS SP:46-2003) of : Fastener (Rivets, Bolts and Nuts) - Bars and profile sections <ul style="list-style-type: none"> - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings

11.	Construction of Scales and diagonal scale
12.	Practice of Lettering and Title Block
13.	Dimensioning practice: <ul style="list-style-type: none"> - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance. - Text of dimension of repeated features, equidistance elements, circumferential objects.
14.	Construction of Geometrical Drawing Figures: <ul style="list-style-type: none"> - Different Polygons and their values of included angles. Inscribed and Circumscribed polygons. - Conic Sections (Ellipse & Parabola)
15.	Drawing of Solid figures (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions.
16.	Free Hand sketch of hand tools and measuring tools used in respective trades.
17.	Projections: <ul style="list-style-type: none"> - Concept of axes plane and quadrant. - Orthographic projections - Method of first angle and third angle projections (definition and difference) - Symbol of 1st angle and 3rd angle projection as per IS specification.
18.	Drawing of Orthographic projection from isometric/3D view of blocks
19.	Orthographic Drawing of simple fastener (Rivet, Bolts, Nuts & Screw)
20.	Drawing details of two simple mating blocks and assembled view.
21.	- Machined components; concept of fillet & chamfer; surface finish symbols.
22.	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
23.	- Free hand Sketches for bolts, nuts, screws and other screwed members.
24.	- Free hand Sketching of foundation bolts and types of washers.
25.	- Standard rivet forms as per BIS (Six types).
26.	- Riveted joints-Butt & Lap (Drawing one for each type).
27.	- Orthogonal views of keys of different types
28.	- Free hand Sketches for simple pipe, unions with simple pipe line drawings.
29.	- Concept of preparation of assembly drawing and detailing. Preparation of simple assemblies & their details of trade related tools/job/exercises with the dimensions from the given sample or models.
30.	-Free hand sketch of trade related components / parts (viz., single tool post for the lathe, etc.)
31.	- Study of assembled views of Vee-blocks with clamps.
32.	- Study of assembled views of shaft and pulley.
33.	- Study of assembled views of bush bearing.
34.	- Study of assembled views of a simple coupling.
35.	- Free hand Sketching of different gear wheels and nomenclature.
36.	- Free hand Details and assembly of simple bench vice.
37.	- Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.
38.	- Simple exercises relating missing symbols. <ul style="list-style-type: none"> - Missing views
39.	- Simple exercises related to missing section.
40.	-Free hand sketching of different types of bearings and its conventional representation.
41.	- Free hand sketching of different gear wheels and nomenclature/ Simple duct (for RAC). Free hand sketch of Reciprocating compressor - open type (for RAC)

42.	- Solution of NCVT test. - Simple exercises related to trade related symbols. - Basic electrical and electronic symbols
43.	- Study of drawing & Estimation of materials.
44.	- Solution of NCVT test papers.
45.	Revision
46.	Examination

LIST OF TOOLS & EQUIPMENTS

Sl. No.	NAME OF TOOLS / EQUIPMENTS	QUANTITY
1.	Drawing Board	20
2.	Models : Solid & cut section	as required
3.	Table for trainees	20
4.	Stool for trainees	20
5.	Cupboard (big)	01
6.	White Board (size: 8ft. x 4ft.)	01
7.	Trainer's Table	01
8.	Trainer's Chair	01

Syllabus for

Workshop Science & Calculation

GENERAL INFORMATION
(Workshop Science & Calculation)

1. **Name of the subject :** WORKSHOP CALCULATION & SCIENCE
2. **Hours of Instruction:** 220 hrs.
3. **Examination:** The examination for the subject will be held at the end of training.
4. **Instructor Qualification:** Degree in Engineering with two years experience OR
Diploma in Engineering with one year experience
5. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.
6. **Instructor:**

One full time instructor is required for 144Engineering seats sanctioned in the institute. Additional instructor will be required on increase in every 144 students.

For seats less than 144, the instructor may be out sourced/ hired on contract basis.

SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION
(Total duration – 220 hrs.)

Topic No	Workshop Calculation	Workshop Science
1.	Unit: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	Material Science : properties -Physical & Mechanical, Types -Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.
2.	Fractions : Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator.	Mass .Weight and Density : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.
3.	Square Root: Square and Square Root, method of finding out square roots, Simple problem using calculator.	Speed and Velocity: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.
4.	Ratio & Proportion : Simple calculation on related problems.	Work, Power and Energy: work, unit of work, power, unit of power, Horse power of engines,
5.	Percentage : Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.
6.	Algebra : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	Heat & Temperature: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.
7.	Mensuration : Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids - cube, cuboid, cylinder and Sphere. Surface area of solids -cube, cuboid, cylinder and Sphere.	Basic Electricity: Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections - series, parallel, electric power, Horse power, energy, unit of electrical energy.
8.	Trigonometry: Trigonometrical ratios, measurement of angles. Trigonometric tables	Levers and Simple Machines: levers and its types. Simple Machines, Effort and Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage.
9.	- Geometrical construction & theorem: division of line segment, parallel lines, similar angles, perpendicular lines, isosceles triangle and right angled triangle.	- Forces definition. - Compressive, tensile, shear forces and simple problems. -Stress, strain, ultimate strength, factor of safety. -Basic study of stress-strain curve for MS.
10.	- Area of cut-out regular surfaces: circle and	- Temperature measuring instruments.

	segment and sector of circle.	Specific heats of solids & liquids.
11.	- Area of irregular surfaces. - Application related to shop problems.	- Thermal Conductivity, Heat loss and heat gain.
12.	- Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple machine blocks.	- Average Velocity, Acceleration & Retardation. - Related problems.
13.	- Material weight and cost problems related to trade.	- Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force
14.	- Finding the value of unknown sides and angles of a triangle by Trigonometrical method.	
15.	- Finding height and distance by trigonometry.	
16.	- Application of trigonometry in shop problems. (viz. taper angle calculation).	
17.	Graph: - Read images, graphs, diagrams - bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	- Friction- co-efficient of friction, application and effects of friction in Workshop practice. Centre of gravity and its practical application.
18.	Simple problem on Statistics: - Frequency distribution table - Calculation of Mean value. - Examples on mass scale productions. - Cumulative frequency -Arithmetic mean	- Magnetic substances- natural and artificial magnets. - Method of magnetization. Use of magnets.
19.	Acceptance of lot by sampling method (within specified limit size) with simple examples (not more than 20 samples).	- Electrical insulating materials. - Basic concept of earthing.
20.		- Transmission of power by belt, pulleys & gear drive. - Calculation of Transmission of power by belt pulley and gear drive.
21.		- Heat treatment and advantages.
22.		Concept of pressure - units of pressure, atmospheric pressure, absolute pressure, gauge pressure -gauges used for measuring pressure
23.		Introduction to pneumatics & hydraulics systems.

BLOCK – II

DURATION: 09 MONTHS (39 weeks)

Industry level training

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR MACHINIST TRADE:

- 1. Safety and best practices /Basic Industrial Culture (5S, KAIZEN, etc.)**
- 2. Record keeping and documentation**
- 3. Different machining operations**
- 4. Preparing components (both in conventional and CNC) as per drg.**
- 5. Routine check for different machines**

DETAILS OF PRACTICAL SKILLS TO BE COVERED DURING INDUSTRY TRAINING FOR MACHINIST TRADE

Duration of training: - 09 Months

Actual training will depend on the existing facilities available in the establishments.

The candidate should be competent to execute following operation/ skills after completion of the industrial training: -

1. Safety precautions & best practices related to the shop floor.
2. Shaping open and blind key ways, concave, convex, dovetail (male & female), Tee slot, irregular surfaces.
3. Slotting key ways, splines (male and female), internal and external spur gear, irregular contour on casting and forgings.
4. Grinding of various cutting tools for shaper, slotter, lathe and Form Tools (both in Off hand and Tool & Cutter Grinder) .
5. Performing all the types of operations including different types of thread cutting viz., ‘V’, Square, ACME, Multi-start ‘V’ thread (internal and external) on lathe.
6. Milling of different gears (viz. Spur gear, Helical gear, Bevel gear, etc.), Rack, Sprocket wheel, Scroll plate, Worm and Worm wheel by different indexing methods.
7. Milling Plate, Drum and Face cam.
8. Milling Odd and Even tooth clutch.
9. Produce different components as per drawing or sample using different conventional machine.
10. Daily routine check list for all conventional and CNC machines.
11. Grinding wheel balancing & truing. Dressing of grinding wheels. Grinding of parallel and stepped jobs.

12. Prepare different types of documentation as per industrial need by different methods of recording information.
13. Produce different components as per drawing by setting, preparing part programme and operating CNC Vertical Machining Centre (3 – axes).

NOTE: -

1. In addition to the above mentioned skills/ operations industry may impart training on any other skills/ operations related to the trade.
2. All the operations/ skills indicated above related to milling machine may be executed both in conventional and CNC machine.
3. Utility jobs-such as actual machine parts-components, accessories etc. should be given to trainees for machining
4. Assignment should be planned so that the apprentices may spend 20% of the total time of production type of work (using gauges, templates, fixture etc.) for developing their skill and confidence about manufacturing which will help ever in self-employment, if found necessary in the future.

BLOCK – III

DURATION: 3 months (13 weeks)

Institute level training

For last three months candidates will be engaged in following works: -

1. Revision of theoretical components covered during Block – I.
2. Practical practice and report submission
3. Preparing candidate to face interview, preparation of bio-data, awareness about different jobs in the related field and grooming to be an entrepreneur.
4. Self study and final AITT examination

Note:-

1. The training may be conducted in Block mode i.e. few months in ITI & few in Industry.
2. The training may be conducted in flexible mode i.e. few days of a week in ITI & few days in Industry.
3. Nine months industrial training is mandatory.
4. Last three months of training in ITI is mandatory.
5. No admission of trainees without signing MOU with industry by the Institute (ITI).
6. To sign MOU with ITI, industry must ensure the training facility should be available to impart different skill sets as indicated in Block-II. At least 60% of total skill set in Block-II for Fitter and 75% of total skill set in Block-II for Turner, Machinist & TDM(Dies & Moulds) to be covered in industry.
7. If the industry ensures delivery of skill training as per Sl. 6 then 2nd MOU is not necessary.
8. However, Industry should ensure 100% skill training indicated in Block-II & necessary arrangement to be made to cover training on rest skill set (beyond the % indicated in sl.6) in collaboration with any other related industries. Extensive use of E-learning process may also be adopted.

TRADE: MACHINIST (Dual mode)

LIST OF TOOLS & EQUIPMENTS FOR 12 TRAINEES + 1

A : TRAINEES TOOL KIT:-

SI. No.	Description	Qty.
1.	Steel rule 30 cm graduated both in English & Metric units	16 nos.
2.	Outside spring caliper 150 mm	8 nos.
3.	Inside spring caliper 150 mm	8 nos.
4.	Hermaphrodite caliper 150 mm	8 nos.
5.	Divider spring 150 mm	8 nos.
6.	Centre Punch 100 mm	8 nos.
7.	Hammer B.P. 0.5 kg.	16 nos.
8.	Cold chisel flat 25 x 200 mm	16 nos.
9.	File flat bastard 300 mm	16 nos.
10.	File flat 2 nd cut 250 mm	16 nos.
11.	File flat smooth 200 mm	16 nos.
12.	Engineers screw driver	16 nos.
13.	Combination Plier 150 mm	16 nos.
14.	Safety glasses	16 nos.

B: Tools, Instruments and General Shop Out fits

SI. No.	Description	Quantity
1.	Surface plate 400 mm x 400mm grade	1 no.
2.	Table for surface plate 900 x 900 x 1200 mm	1 no.
3.	Marking off table 1200 x 1200 x 900 mm high	1 no.
4.	Scribing block universal 300 mm	2 nos.
5.	V- Block 100/7 - 80 - A	2 nos.
6.	Try square 300 mm	2 nos.
7.	Outside spring caliper 200 mm	2 nos.
8.	Divider spring 200 mm	2 nos.
9.	Inside spring caliper 200 mm	2 no.
10.	Straight edge steel 1 meter	1 no.
11.	Straight edge steel 500 mm	1 no.
12.	Steel tape 2 meter in case	1 no
13.	Steel rule 60 cm graduated both in English & Metric units	2 nos.
14.	Sprit level 2V 250, 05 meter	1no
15.	Hammer B.P. 800 gms. With handle	4 nos.
16.	Screw driver, heavy duty 300 mm with handle	4 nos.
17.	Hammer lead 1 kg.	2 nos.
18.	Spindle blade screw driver 100 mm	4 nos.
19.	Allen Hexagonal keys 2.5 to 12	2 sets
20.	Spanner D.E. series 2 (set of 7 pieces)	6 sets
21.	Adjustable spanner 300 mm	2 nos.
22.	Reduction sleeve Morse 1-1, 3-1, 4-1, 4-2, 5-1, 5-2, 6-1,	2 nos. each
23.	Angle plate size 200 x 100 x 200 mm	2 nos.
24.	Angle plate adjustable 250 x 150 x 175 mm	2 nos.
25.	Solid parallels in pairs (different sizes) in Metric	12 pairs (assorted)
26.	Oil Can pressure feed 500 mg.	6nos
27.	Oil stone 150 x 50 x 25 mm	2nos
28.	Number drills H.S.S. (parallel shank)	1set

29.	Twist drills 3 mm to 13 mm in step of 0.5 mm (parallel shank)	2set
30.	Drill Chuck 0.20 with taper shank	1no
31.	Centre drill A 1 to 5	2set
32.	Grinding wheel dresser (diamond)	1no
33.	Grinding wheel dresser Huntington type	2 nos.
34.	Clamps C 100 mm	2nos
35.	Clamps C 200 mm	2nos
36.	Tap and Die set in box metric pitch (6 mm to 12 mm)	1set
37.	Drill H.S.S. taper shank (6 mm to 12 mm in step of 0.5 mm)	2set
38.	File flat 2 nd cut 250 mm	4nos
39.	File flat smooth 200 mm	4nos
40.	File Half round 2 nd cut 250 mm	4nos
41.	File triangular smooth 200 mm	4nos
42.	Needle file set	1no.
43.	File square 2 nd cut 250 mm	4nos
44.	Reamer 6 mm to 25 mm by 1 mm	1set
45.	Reamer adjustable 10 mm to 15 mm by 75 mm	1set
46.	Tool bits H.S.S. 6 mm square	1 Dozen
47.	Tool bits H.S.S. 10 mm square	1 Dozen
48.	Tool bits holder (Armstrong) L.H	4nos
49.	Tool bits holder (Armstrong) R.H.	4nos
50.	Assorted tools and bit holders for lathe, shaper, slotter & planner in different shapes and sizes	As required
51.	Hacksaw frame adjustable 250-300 mm with blades	2nos
52.	Table chuck 75 mm jaw swivel base	1no
53.	Machine vice 200 mm swivel base	4nos
54.	Machine vice 160 mm swivel base	2nos
55.	Hand vice 50 mm jaw	2nos
56.	Radius turning attachment	1no
57.	Angle turning attachment	1no
58.	Compound angle vice (standard sine)	1no
59.	Universal vice 150 mm	1no
60.	Universal table angle plate	1no
61.	Shaper tool holder turret type	2nos
62.	Base chuck for slotter	1no
63.	shaper indexing center	1no
64.	Knurling tools (set of 3) straight and diamond	1each
65.	Plier cutting 200 mm	2nos
66.	Carbide tipped tools of different sizes and shapes (throw away tips)	2sets
67.	Hand hammer 1 kg. With handle	2nos

C : Milling Cutters

Sl. No.	Name & Description of Cutters	Quantity
1.	Cylindrical cutter 63 x 90 bore dia	3nos
2.	Cylindrical cutter 80 x 90 bore dia.	3 nos
3.	Side and face cutter dia 80 x 8	2 nos
4.	Side and face cutter dia 160 x 10	3 nos
5.	Side and face cutter dia 100 x 12	2 nos
6.	Side and face cutter dia 160 x 16	2 nos
7.	Side and face cutter dia 200 x 20	3 nos
8.	Side and face cutter dia 100 x 10	2 nos
9.	Equal angle cutter 45 ⁰ /100	2 nos
10.	Equal angle cutter 60 ⁰ /100	2 nos
11.	Equal angle cutter 90 ⁰ /100	2 nos
12.	Double angle unequal cutter 50 x 12 x 55 ⁰	2 nos
13.	Double angle unequal cutter 50 x 12 x 60 ⁰	2 nos
14.	Double angle unequal cutter 50 x 12 x 70 ⁰	2 nos

15.	Double angle unequal cutter 50 x 12 x 75 ⁰	1 no
16.	Single angle cutter 63 x 18 x 45 ⁰ RH	1 no
17.	Single angle cutter 63 x 18 x 45 ⁰ LH	1 no
18.	Single angle cutter 63 x 18 x 60 ⁰ RH	1 no
19.	Single angle cutter 63 x 18 x 60 ⁰ LH	1 no
20.	Slitting Saw cutter 0 75 x 3 X 0 27 mm	2 nos.
21.	Slitting Saw cutter 0 100 x 6 X 0 27 mm	2 nos.
22.	Shell End Mill 0 50 x 36 x 0 22 (preferably inserted tip type)	2 nos.
23.	Shell End Mill 0 75 mm x 50 x 0 22 (preferably inserted tip type)	2 nos.
24.	Parallel shank end mills 06, 010 and 0 16 are (double fluted), 0 20 mm & 0 25mm (four fluted)	4 nos. each
25.	"T" slot cutter with parallel shank- 0 17.5 x 8 mm width x dia. of shank 8 mm	2 nos.
26.	Concave Milling cutter 0 63 x 6 radius x 0 27 mm	1 nos.
27.	Convex Milling cutter 0 63 x 6 radius x 0 27 mm	1 nos.
28.	Disc type form milling cutter (involute form -2 module, 20° pressure angle)	1 set

D : MEASURING INSTRUMENTS

Sl. No.	Name & Description of Instruments	Quantity
1.	Micrometer outside 0-25 mm	4 nos.
2.	Micrometer outside 25-50 mm	2 no
3.	Micrometer outside 50-75 mm	1 no
4.	Micrometer depth gauge 0-200 mm	1no
5.	Digital micrometer 0-25 mm	1 no
6.	Direct reading vernier caliper 0- 300 (direct reading with dial)	1no
7.	Digital vernier caliper 0- 300 mm	1 no
8.	Vernier height gauge 250 mm	1 no
9.	Vernier gear tooth caliper	1no
10.	Combination set with 300 mm rule	2 sets
11.	Vernier bevel protractor with 150 m blade	1 no
12.	Bevel gauge 200 mm	1 no
13.	Telescopic gauge 13 mm to 300 mm	1set
14.	Sine Bar 200 mm	1 no
15.	Dial test indicator with magnetic gauge type 1 grade A with magnetic base	1 no
16.	Center gauge 60 ⁰	1 no
17.	Slip gauge set (normal set) metric (for the whole institute)	1 set
18.	Screw pitch for metric pitches (25-6 mm)	2 sets
19.	Radius gauge metric set (1-6 mm)	1 set
20.	Limit plug gauges 5 mm to 25 mm by 2.5 mm	1 set
21.	Ring gauges 5 mm to 25 m by 2.5 mm (GO & NO GO)	1 set
22.	Taper gauge M.T. No. 1, 2, 3, 4 & 5	1 set
23.	Feeler gauge	1 no
24.	Planer gauge standard size	1 no
25.	Magnifying glass 75 mm	2nos

E : FURNITURE

Sl. No.	Name & Description	Quantity
1.	Steel lockers for 12 trainees	1 no
2.	Steel chair for Instructor	1 no
3.	Steel table for Instructor	1 no
4.	Work bench for Fitters with 2 vices of 100 mm jaw	1no
5.	Steel cup board 180 x 90 x 45 mm	1 no
6.	Steel cup board 120 x 60 x 45 cm	1no
7.	Black board with easel	1 no
8.	First Aid Box	1 no

F : General Machinery Shop outfit

Sl. No.	Name & Description of Machine	Quantity
1.	Shaping machine 450 mm stroke (motorized) with all attachments	2 nos.
2.	Shaping machine 315 mm stroke (hydraulic) with all attachments	1 no
3.	Slotter 180 mm stroke (motorized) with all attachments	1no
4.	SS and SC centre lathe (all geared) with specification as: Centre height 150 mm and centre distance 1000 mm along with 4 jaw chuck, Taper turning attachment, steadies, auto feed system, safety guard, motorized coolant system, with lighting arrangement and set of lathe tools.	3 nos.
5.	Tool and cutter grinder 250 mm to admit 450 m between center-fully motorized work head supplied with tool rest of different types table clamps and other attachments.	1 no
6.	Pillar Drill machine 20 mm capacity with drill chuck & key.	1 no
7.	Silicon carbide grinder for carbide tipped tools	1 no.
8.	Double ended Pedestal Grinder with 178 mm wheels(one fine and one rough wheel)	1 no.
9.	Universal Milling machine with minimum specification as: Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement and with following attachments such as: a. Vertical head b. Slotting attachment c. Rack cutting attachment d. Rotary table e. Dividing head f. Adaptors, arbors and collects etc. for holding straight shank drills and cutters from 3 mm to 25 mm.	2 nos.
10.	Horizontal Milling Machine with minimum specification as: Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement and 150mm Universal vice.	1no
11.	Vertical Milling Machine with minimum specification as: Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement along with 150mm universal vice.	1 no
12.	Surface Grinding Machine with minimum specification as: 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	1 no

	purpose grinding.	
13.	Cylindrical grinder Max. grinding length 300 mm Height of centre 130 mm Max. distance between centers 340 mm	1 no
14.	a) Multimedia based simulator for CNC technology and interactive CNC part programming software for turning & milling with virtual machine operation and simulation using popular operation control system such as FANUC, Siemens, etc. (Web-based or licensed based) (10 trainees + 1 faculty) b) Desktop with MS-Windows-7 or latest to run above software, networked on LAN.	a) 11 users. b) 11 nos.
15.	LCD projector / large screen TV	1 no.

NOTE

1. No additional items are required to be provided to the batch working in the second and third shift except the items under trainee's lockers.
2. Institute having centralized computer lab may use the existing infrastructure to impart simulation training & in that case not required to procure item no. 14 b

ALLOTMENT OF TIME & MARKS AMONG

THE SUBJECTS FOR EXAMINATION

Sl. No.	SUBJECTS	Duration of exam (in Hrs.)	Full Marks	Pass Marks
1.	Trade Theory + E/S (150+50)	3	200	80
2.	Workshop Cal. & Sc.	3	50	20
3.	Engineering Drawing	4	50	20
4.	Internal Marks (ITI)	--	50	30
5.	Trade Practical –I*	4	50	30
6.	Internal Marks (Industry)	--	50	30
7.	Trade Practical-II** + Project work (200+50)	8	250	150
GRAND TOTAL			700	360

Note:-

- a. “*” represents practical conducted at ITI
- b. “**” represents practical conducted at Industry at the end of training
- c. 40% pass marks for theory subjects and 60% pass marks for practical
- d. The project work will be conducted at industry and industry will allot marks for the same.

Format for Internal Assessment

Name & Address of the Assessor :						Year of Enrollment :								
Name & Address of ITI (Govt./Pvt.) :						Date of Assessment :								
Name & Address of the Industry :						Assessment location: Industry / ITI								
Trade Name :			Block:			Duration of the Trade/course:								
Operation/Skill:														
Sl. No	Maximum Marks (Total 100 Marks)		15	5	10	5	10	10	5	10	15	15	Total internal assessment Marks	Result (Y/N)
	Candidate Name	Father's/Mother's Name	Safety consciousness	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA		
1														
2														

LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation	Organization
1.	Smt. Sandhya Salwan, Director of Training	DGT, MSDE
2.	Shri.A.Mahendiran, Director	FTI Bangalore
3.	Shri.Satya Shankar.BP, Director	APEX-Hi-Tech, Bangalore
4.	Shri N.K Thakur, DGM	L&T Chennai.
5.	Shri Rajeev Khurana, GM	Maruti Suzuki India Ltd Gurgaon.
6.	Shri. Nirmalya Nath, ADT	CSTARI Kolkata.
7.	Shri P. MOULI, ADT	DGT Delhi.
8.	Shri R N Manna, TO	CSTARI Kolkata.
9.	Shri Anil. V. Bhide, Manager	NTTF, Bangalore
10.	Shri Kashinath. P, Director (Training), Bangalore	ACE Designers,
11.	Shri Shankara H. S.	BFW, Bangalore
12.	Shri C. Sekharan, Retd. AGM	HMT, Bangalore
13.	Shri Hemant D. Ganjare, DDT	APEX-Hi-Tech, Bangalore