CURRICULUM

FOR THE TRADE OF

PLASTIC MOULD MAKER

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

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

CONTENTS

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Co-ordinator for the course: Sh. Nirmalya Nath., ADT

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Remarks
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2. BACKGROUND

2. 1. Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

2. 2. Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

2. 3. Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.

- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.

- Scope has been extended also to non-engineering occupations.

- Establishments have been permitted to outsource basic training in an institute of their choice.

- The burden of compliance on industry has been reduced significantly.

3. RATIONALE

(Need for Apprenticeship in **Plastic Mould Maker** trade)

1. It will help the trainees to engage in producing plastic, roto moulded plastic components by using mould process.
2. It will help the trainees to visually inspect each part for quality, and also reject non –conforming parts as needed and places them in designated area.
3. It will help the trainees to ensure proper maintenance of tooling at all times and trim and deburr part and put in cart.
4. It will enhance the ability of the trainees to maintain part counts for inventory and also maintains cleanliness of work area and also follows all appropriate safety regulations.
5. It will enhance the ability of the trainees to measures to improve production methods, equipment performance and quality of product.
6. It will help the trainees to follows instructions, responds to management direction. Takes responsibility for own actions.
7. It will help the trainees to perform a variety of duties such as mixing materials, assembling mold parts, filling molds, and stacking molds to mold a wide range of products.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Die Maker; Die Fitter; Press Tool Fitter makes metal dies to prescribed dimension for punching, cutting, forging and forming of metal or synthetic components for mass production. Studies drawing and specifications of dies to be made. Selects required type of metal or rough cast metal block. Machines or grinds one surface and dimensions and other working details. Cuts shapes, drill holes and mills metal according to marking on various machines. Checks dimensions while working with gauges and other measuring tools. Finishes made die (punch) by filing to required dimension and fits female to it. Files cutting angle and clearance accurately in female die and checks for sizes. Drills holes and cuts thread in female die for driving guide pin and fitting guide plates. Ge ts male and female dies tempered and grinds them to finish ensuring correct shear, cutting angle, clearances, etc. Sets finished dies in press and cuts or forms some trial pieces to ensure accuracy and correct production. May shape female die block to required angle for fitting it in bolster. May repair used dies and grind them to desired finish. May operate lathe, milling and shaping machines and harden and temper dies. Marks it with template or otherwise to indicate

Mould Setter (Plastics) sets up and adjusts compression, injection and similar type of machines used to mould plastic materials to specified shape. Positions assembled mould on press bed of moulding machine or bolts matrix of unassembled mould to bed and aligns die (attached to ram) with matrix; adjusts stroke of ram, using hand tools. Connects steam, oil or water lines to mould or moves controls to regulate mould temperature; sets machine controls to regulate forming pressure of machine and curing time of plastic in mould; installs knock-out pins in mould, and makes other adjustments, using hand-tools; starts machine to produce sample products; examines sample for surface defects, such as bumps, bubbles, and scratches, and adjusts machine set up to eliminate defects; removes, cleans, and greases moulds and places them in storage racks. May supply plastic materials to moulding machines. May direct supplying of necessary equipment, such as jigs, containers or forms to workers engaged in tending moulding machines. May be designated according to type of machine set up, as **COMPRESSION-MOULDING MACHINE SET-UP MAN; INJECTION MOULDING MACHINE SET-UP MAN.**

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.

Perform TPM (Total Production Management), TQM (Total Quality Management) and record keeping system.

Reference NCO & NOS:

i) NCO-2004: 7222.50, 8232.65

5. GENERAL INFORMATION

1. **Name of the Trade** **: PLASTIC MOULD MAKER**

2. **N.C.O. Code No.** **: NCO-2004: 7222.50, 8232.65**

3. **Duration of Apprenticeship Training (Basic Training + Practical Training):**2years

3.1 **For Freshers: -** Duration of Basic Training: -

a) Block –I : 3 months

b) Block – II : 3 months

Total duration of Basic Training: **6 months**

Duration of Practical Training (On -job Training): -

a) Block–I: 9 months

b) Block–II : 9 months

Total duration of Practical Training: **18 months**

3.2 **For ITI Passed: -** Duration of Basic Training: - **NIL**

Duration of Practical Training (On -job Training): **12 months**

4. **Entry Qualification** : Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent

5. **Selection of Apprentices:** The apprentices will be selected as per Apprentices Act amended time to time.

6. **Rebate for ITI passed trainees** : i) **One year** in the trade of TDM (Dies & Moulds)/ TDM (Press Tool, Jig & Fixtures)

Note: Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.

6. COURSE STRUCTURE

Training duration details: -

Time (in months)	1-3	4-12	13-15	16-24
Basic Training	Block– I	-----	Block – II	------
Practical Training (On - job training)	----	Block – I	------	Block – II

Components of Training	Duration of Training in Months																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Basic Training Block - I																								
Practical Training Block - I																								
Basic Training Block - II																								
Practical Training Block - II																								

7. SYLLABUS

7.1 BASIC TRAINING
(BLOCK – I & II)
DURATION: 06 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** : **PLASTIC MOULD MAKER**
2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)
3) **Batch size** : 20
4) **Power Norms** : 29.6 KW for Workshop
5) **Space Norms** : 130 Sq. m.
6) **Examination** : The internal assessment will be held on completion of each Block.
7) **Instructor Qualification** :

i) Degree/Diploma in **Mechanical** Engg. from recognized university/Board with one/two year post qualification experience respectively in the relevant field.

OR

ii) NTC/NAC in the trade of **Tool & Die Maker (Dies &Moulds) / Tool & Die Maker (Press Tool, Jig & Fixtures) / Plastic Mould Maker** with three year post qualification experience in the relevant field.

Preference will be given to a candidate with Craft Instructor Certificate (CIC)

8) **Tools, Equipments & Machinery required** : - As per Annexure – I

7.1.1 DETAIL SYLLABUS OF CORE SKILL

A. Block– I
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1.	Engineering Drawing: Introduction and its importance Different types of standards used in engineering drawing. Drawing Instruments: their uses 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.	**30**	**Units & Measurements-** FPS, CGS, MKS/SI unit, unit of length, Mass and time. Fundamentals and derived units Conversion of units and applied problems.	**20**
2.	Lines : types and applications in Drawing as per BIS SP:46-2003 Drawing geometrical object using all types of lines. **Drawing of Geometrical Figures:** Angle, Triangle, Square, Rectangle and Circle. **Letters: -** Lettering styles, Single stroke letters and numbers as per IS standard. Lettering practice		**Material Science** : properties - Physical & Mechanical, Types - Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals	
3.	**Dimensioning-** Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement, Alignment and indication of dimensions. **Scales**:-Types use and construction. Representative factor of scale.		**Mass .Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density,	
4.	Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view		**Speed and Velocity:** Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation. Average Velocity, Acceleration & Retardation. Related problems. Circular Motion: Relation between circular motion and Linear motion, Centrifugal	

			force, Centripetal force	
5.	**Constructions: -** Draw proportionate free hand sketches of plane figures. Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand		**Ratio & Proportion** : Simple calculation on related problems. **Percentage:** Introduction, Simple calculation.	
6.	Projections: Concept of axes plane and quadrant. Orthographic projections Method of first angle and third angle projections (definition and difference) Symbol of 1^{st} angle and 3^{rd} angle projection as per IS specification. Free hand Drawing of Orthographic projection from isometric/3D view of geometrical blocks		**Work, Power and Energy:** work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy. Meaning of H.P., I.H.P., B.H.P., and F.H.P. and CC and Torque.	

B. Block- II
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1.	**Screw :-** Its Types and Sizes, Screw thread, their standard forms as per BIS, external and internal thread.	**30**	**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	**20**
2.	**Rivets and Joints:-** Prepare a drawing sheet on rivets nomenclature and Joints.		**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.	
3.	Free hand Sketches for simple pipe line with general fittings.		**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. Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple solid blocks.	
4.	Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.		**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. Concept of earthling.	
5.	Simple exercises related to trade related symbols. Basic electrical and electronic symbols		**Simple machines** **Transmission of power: -** Transmission of power by belt, pulleys & gear drive. **Heat treatment process: -**	

			Heat treatment and advantages. Annealing, Normalizing, Hardening, Tempering.	
6.	Free hand sketch of trade related components / parts /cutting tool indicating angles.		**Trigonometry:** Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding the value of unknown sides and angles of a triangle by Trigonometrical method. Finding height and distance by trigonometry. Application of trigonometry in shop problems. (viz. taper angle calculation). Calculate the area of triangle by using trigonometry and application of Pythagoras theorem.	
7.			**Concept of pressure** - **Definition**:-Force, Pressure, and their units, atmospheric pressure, gauges used for measuring pressure, problems. Introduction to pneumatics & hydraulics systems.	
8.	**Simple exercises related to trade related Test Papers. Solution of NCVT test papers.**			

7.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I

Basic Training

Week No.	Professional Skills	Professional Knowledge
1.	Safety: - its importance, classification, personal, general, workshop and job safety. Occupational health and safety. 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. Importance of housekeeping & good shop floor practices. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Fire& safety: Use of Fire extinguishers.	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 Institute system including stores procedures. Introduction of First aid. Safety attitude development of the trainee by educating him to use Personal Protective Equipment (PPE). Response to emergencies eg; power failure, fire, and system failure. Accidents- Definition types and causes. First-Aid, nature and causes of injury and utilization of first-aid. Introduction to 5S concept & its application. Fire: - Types, causes and prevention methods. Fire Extinguisher, its types. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2.	Identification of tools & equipments as per desired specifications for marking & sawing(Hand tools , Fitting tools & Measuring tools) Uses of marking tools, Punch, Try square & basic measuring tools, caliper, steel rule. Marking out lines, gripping suitably in vice jaws, hacksawing to given dimensions, sawing different types of metals of different sections. Filing, Chipping & scraping flat surfaces and measure using different measuring instruments.	Introduction hacksaw cutting, marking, filling operation, need and application, types of files and their construction and usage Perpendicularity, parallelism. Hand tools and its importance, steel rule, Try square, chisel, surface gauge and care & maintenance, Hacksaw frame, blades. Classification and types of chisels, files & uses, vices - its constructions and uses. Hammers and its types. Related safety. Marking block, Steel rule, and calipers-different types and uses. Hacksaw blade, Hacksaw frame and its types. Drill bits- parts, Types & uses. Different measuring instruments and gauges used

		in shop floor, their construction and usage.
3.	Mounting and dismantling of different dills on machines and different practical exercises. Marking and Drilling holes on flat pieces. Tapping as per simple drawing. Exercise on use of pillar drill in drilling, counter sinking, counter boring. Spot facing and use of spot facing tools. Further practice of drilling of Radial drills. Practice of reaming on drilled holes.	Identification of different parts, accessories, attachments', operations and tools used in drilling machines. Introduction to Hand Taps & Dies and their types, applications, care and maintenance. Familiar with tap and drill size, Thread Terminology.
4.	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. Parallel turning between centers, parting off, chamfering using roughing, finishing and parting off tools. Holding the job in three jaw chuck truing, centering facing. Step turning undercutting, knurling drilling and boring.	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. Lathe tools their angles & uses. Driving mechanism, speed and feed mechanism & lathe accessories.
5.	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. Cutting V thread external and internal in a lathe. Checking up with screw pitch gauge. Cutting square thread external & internal on a lathe. Cutting square threads (right hand only) on a lathe-checking with thread gauge-grinding of tool and setting in correct position.	Chucks-different types of job holding devices on lathe and advantages of each type. Mounting and dismounting of chucks. Taper introduction, types and uses. Calculations of tapers. Measurement of taper by sine bar and slip gauges. Different thread forms their related dimensions and calculations screw cutting in a lathe.
6.	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. Sequence of milling six faces of a solid block. Checking the accuracy with the help of try-square	Milling machine importance of milling machine, types and specification of milling machine, driving and feed mechanism of milling machine. Classification & different types of milling cutters & their use. Parts and nomenclature. Vernier height gauge construction, graduations

	scribing block and vernier height gauge. Step milling using side and face cutter checking with micrometer.	vernier setting & reading, vernier bevel protractor, construction graduation setting and reading. Care and maintenance of vernier height gauge and bevel protractor.
7.	Straddle and gang milling operations including up-milling and down milling. Milling concave and convex surfaces. Introduction to indexing head types, setting and aligning of indexing head with reference to job on milling machine. 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. Indexing-introduction & types. Indexing head-constructional details, function of indexing plates and the sector arms. Calculation for various types of indexing.
8.	Milling dovetail and 'T'slots both male & female matching each other. Milling of spur gear. Introduction to grinding machine surface grinder, cylindrical grinder. Driving and feed mechanism, job holding devices mounting of wheels. Different practical exercises with different accuracy levels. Wheel balancing & truing. Grinding of parallel and stepped jobs. Dressing of grinding wheels.	Introduction surface and cylindrical grinding machine, identification of different parts, accessories, attachments', operations and tools used in grinding machines. Selection of grinding wheels, balancing and mounting of grinding wheels. Types of Abrasives and their uses, Glazing and loading of wheels. Explain the importance and necessity of quality.
9.	Precision measurement: Use of different precision measuring instruments viz., Vernier caliper, micrometer, vernier height gauge, dial indicator, slip gauges, etc.	Precision measurement: Different precision measuring instruments, its use and care. Surface finish - importance, symbol, measuring techniques. Lapping & honing process. **Gauges:** Classification and uses of Sine bar, Slip gauge, Limit gauge, Feeler gauge, thread gauge, screw pitch gauge, taper gauge. **Tolerances & interchangeability** -Definition and its necessity, basic size, actual size, limits, deviation, Tolerance, allowance, clearance, interference, Fits- definition, types, description with sketches. Method of expressing Tolerance as per BIS, Hole and Shaft basis (BIS standard). Related calculation on Limit, Fit and Tolerance.

10-11.	Demonstration on selection of grinding wheels for grinding different metals, selection of suitable wheel to obtain rough and IS: 1249- 1958. Grinding different metals with suitable grinding wheels. Setting grinding wheel on wheel flange, truing and balancing of wheels. Dressing of grinding wheel Grinding practice on surface and cylindrical grinding machine. Checking measuring various types of jobs using micrometers, Vernier caliper, Vernier Height gauge etc.	General dressing tools used in grinding section such as wheel, diamond dresser, steel type dresser, abrasive dresser and nonferrous dresser. Precision instruments English and metric micrometer, vernier caliper, dial test indicator etc. their description and uses. Principle and value of grinding in finishing process, various types of grinding wheels their construction and characteristic glazed and loaded wheels. Marking system of grinding wheels IS: 551- 1966.
12.	Introduction to gas welding equipment/arc welding equipment, Simple welding practice. Practice on brazing.	Explanation of gas welding and arc welding techniques. Description of welding equipment, types of welding joints. Knowledge about flux, filler rod material. Die welding techniques. .
13.	**Revision & Internal assessment**	

B. Block –II
Basic Training

Sl. No.	Practical	Theory
1-2.	Boring a cast block on a vertical milling machine, measurement of bore size. Demonstration of marking system of Grinding wheels. Surface grinding practices.	Vertical milling machines its parts, construction, 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.
3.	Parallel block grinding on surface grinding machine within close limits. Wheels dressing for rough and finishing grinding.	Bonding materials their kinds description and uses. Grade and structure at grinding wheels. Brief about I.S.O. 9000. Importance of Quality. Specification and types (shapes & size) of grinding wheels. Mounting of grinding wheels, grinding wheels, collets and mandrels.
4-5.	Grinding sockets and checking depth by depth gauge micrometer. Grinding internal bore of cylindrical job and use of telescopic gauge.	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. Grinding defects vibration, chattering, glazing and loading their causes and remedies. Grinding different defects and remedies on its. Applications of diamond wheel in grinding and grinding of tipped tools.
6.	Achieving interference fit of guide pillar and bush Exposure to Quality of finished products, Exposure to fitting through actual job preparations.	Calculation for Wheel speed and work speed, traverse feed, In-feed and machining time. Concept of dowel pins and its use. Geometrical features. Introduction to mould. Types of mould& uses.
7-8.	**Wire Cut EDM:** Machining practice / observation on Wire cut/EDM Machine.	**Wire Cut EDM:** Electrical discharge machining (EDM) - Introduction, principle of operation, advantages & disadvantages and its applications. Wire cut machine - introduction, principle of operation, advantages & disadvantages and its

		applications.
9.	**Hydraulics & Pneumatics** Identification and familiarization of various types of hydraulic & pneumatic elements such as cylinder, valves, actuators and filters. Study of simple hydraulic & pneumatic circuits.	**Hydraulics & Pneumatics** Basic principles of hydraulic & pneumatic system. Advantages & disadvantages of hydraulic and pneumatic system. Theory of Pascal's law, Brahma's press, pressure & flow. Type of valves used in hydraulic and pneumatic system.
10-11.	Program generation & Simulation with CAD/CAM software for dies & moulds. Inspection of dies with measuring instruments.	**Concepts of CAD/CAM** Basic concepts of inspection of 3D surfaces. Part program generation and setting up the machine for producing punch/dies. 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. Concept of TPM & TQM.
12.	Assembling of different machined components with fasteners and steps to be taken to maintain alignment of assembled components. Video Demonstration of functioning of Jig Boring, Jig Grinding & CNC machines.	Jig Boring & Jig Grinding machine: Constructional features, function and machining parameters. 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 teachware. Parts shown on machine. Programming – G code & M code, 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 and depth of cut. Process planning, tool selection and cutting parameters selection. Explained using multimedia CNC teachware and CNC machine simulator.
13.	**Revision & Internal assessment**	

7.1.3 EMPLOYABILITY SKILLS

GENERAL INFORMATION

1)	**Name of the subject**	**:**	**EMPLOYABILITY SKILLS**
2)	**Applicability**	**:**	ATS- Mandatory for fresher only
3)	**Hours of Instruction**	**:**	**110 Hrs. (55 hrs. in each block)**
4)	**Examination**	**:**	The examination will be held at the end of two years Training by NCVT.
5)	**Instructor Qualification**	**:**	

i) MBA/BBA with two years experience or graduate in sociology/social welfare/Economics with two years experience and trained in Employability skill from DGET Institute.

And

Must have studied in English/Communication Skill and Basic Computer at 12th /diploma level

OR

ii) Existing Social Study Instructor duly trained in Employability Skill from DGET Institute.

7.1.3.1 SYLLABUS OF EMPLOYABILITY SKILLS

A. Block – I
Basic Training

Topic No.	Topic	Duration (in hours)
	English Literacy	**15**
1	**Pronunciation :** Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)	
2	**Functional Grammar** Transformation of sentences, Voice change, Change of tense, Spellings.	
3	**Reading** Reading and understanding simple sentences about self, work and environment	
4	**Writing** Construction of simple sentences Writing simple English	
5	**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.	
	I.T. Literacy	**15**
1	**Basics of Computer** Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	
2	**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.	
3	**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	
4.	**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.	
	Communication Skill	**25**
1	**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. Case study/Exercise	
2	**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.	
3	**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. Case study/Exercise	
4	**Facing Interviews** Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview	
5	**Behavioral Skills** **Organizational Behavior** Problem Solving Confidence Building Attitude Decision making Case study/Exercise	

B. Block– II
Basic Training

Topic No.	Topic	Duration (in hours)
	Entrepreneurship skill	**15**
1	**Concept of Entrepreneurship** **Entrepreneurship**- 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.	
2	**Project Preparation & Marketing analysis** Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of Product Life Cycle (PLC), Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.	
3	**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.	
4	**Investment Procurement** Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.	
	Productivity	**10**
1	**Productivity** Definition, Necessity, Meaning of GDP.	
2	**Affecting Factors** Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.	
3	**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.	
4	**Personal Finance Management** Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	**15**
1	**Safety & Health** Introduction to Occupational Safety and Health importance of safety and health at workplace.	

2	**Occupational Hazards** Basic Hazards, Chemical Hazards, Vibro-acoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.	
3	**Accident & safety** Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.	
4	**First Aid** Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person	
5	**Basic Provisions** Idea of basic provision of safety, health, welfare under legislation of India.	
6	**Ecosystem** Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.	
7	**Pollution** Pollution and pollutants including liquid, gaseous, solid and hazardous waste.	
8	**Energy Conservation** Conservation of Energy, re-use and recycle.	
9	**Global warming** Global warming, climate change and Ozone layer depletion.	
10	**Ground Water** Hydrological cycle, ground and surface water, Conservation and Harvesting of water	
11	**Environment** Right attitude towards environment, Maintenance of in -house environment	
	Labour Welfare Legislation	**5**
1	**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.	
	Quality Tools	**10**
1	**Quality Consciousness :** Meaning of quality, Quality Characteristic	
2	**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.	
3	**Quality Management System :** Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.	
4	**House Keeping :** Purpose of Housekeeping, Practice of good Housekeeping.	
5	**Quality Tools** Basic quality tools with a few examples	

7.2 PRACTICAL TRAINING (ON-JOB TRAINING)
(BLOCK – I & II)
DURATION: 18 MONTHS (9 months in each block)

GENERAL INFORMATION

1) **Name of the Trade** : **PLASTIC MOULD MAKER**

2) **Batch size** : a) Apprentice selection as per Apprenticeship guidelines.
b) Maximum 20 candidates in a group.

3) **Examination** : i) The internal assessment will be held on completion of each block
ii) NCVT exam will be conducted at the end of 2nd year.

4) **Instructor Qualification** :

i) Degree/Diploma in **Mechanical** Engg. from recognized university/Board with one/two year post qualification experience respectively in the relevant field.

OR

ii) NTC/NAC in the trade of **Tool & Die Maker / Plastic Mould Maker** with three year post qualification experience in the relevant field.

Preference will be given to a candidate with Craft Instructor Certificate (CIC)

5) **Infrastructure for On-Job Training** : - As per Annexure – II

7.2.1 BROAD SKILL COMPONENT TO BE COVERED DURING ON-JOB TRAINING

A. BLOCK – I

1. Safety and best practices/Basic Industrial Culture (5S, KAIZEN, etc.)
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Filling and finishing of intricate profiles of punched and dies.
4. Finishing of die cavities using pneumatic hand tools.
5. Process planning - machining sequence, cutting tools selection, cutting parameters, work holding devices.
6. Mould Polishing Technique – Purpose, Different methods and care while polishing, Tools and Equipment used for polishing etc.
7. Differential indexing and milling of spur gears, milling punches involving the use of rotary table, Milling of simple die cavities using end mills and single lip cutters and Boring operation in vertical milling (Conventional/CNC milling machine).
8. Grinding of spilt die inserts, Grinding of lathe form tools and Grinding of profile gauges and templates.
9. Grinding internal and external tapers and mating, Precision grinding of such parts as jig bushes, press tool piller and bushes etc. using **Cylindrical Grinding**
10. Drilling holes to positional accuracies of ±0.01 by using co-ordinate drilling machine.
11. Grinding of die sets, base plates, die blocks etc. and Form grinding of punches etc. (die form grinding) using **Surface Grinding**
12. Work on **Special Purpose Machine viz.,** Honing machine, Die sinking machine.
13. Manipulation of profile projectors and tools-makers' microscopes for measuring/inspecting tools and Use of slip gauges and precision measurements and inspection of tool elements.

B. BLOCK – II

1. Setting of jobs and machining to given datums and Jig boring and jig grinding of few simple jobs with a view to familiarize and get a feel of the machine.
2. Making electrodes for use in EDM in such materials as copper, aluminium and graphite.
3. Finishing profile by filing machine.
4. Setting up of the Spark erosion (EDM) machine and machining "typical die cavities for different plastic components.
5. Setting up of the machine for machining die cavities using templates and stylus. Making of stylus and templates.
6. Jig Boring and Jig Grinding of mould parts to close positional accuracy and size control.
7. Grinding all types of single lip cutters
8. Manufacture of Hand Injection Mould, two cavity injection mould, single compression mould, perform stage inspection and check for functionality.

9. Hand polishing of mould cavities
10. Assembling and finishing of moulds, setting the moulds on machines and taking trial production.
11. CNC part programming, operations and machine settings virtually and practically and producing components/ dies with CNC machine.
12. CAD/CAM skills - simulation of CNC part programs and machine simulation. Preventive maintenance of CNC machines.
13. Quality check and Inspection of Moulds and Dies – Stage Inspection of Core, Cavity and mould elements. Inspection of additional tooling like Electrodes, Templates, Masters etc. Final inspection of the system incorporated in the moulds in respect of alignment, Matching, Feed System, Ejection System, Cooling System etc. and product inspection.
14. Identify potential causes for non conformities to quality assurance standards for different dies and moulds – Trouble shooting – Rectification of tools – Maintenance of tools – Simple hydraulic/ pneumatic circuits.
15. Perform TPM (Total Productive Maintenance), TQM (Total Quality Management) and record keeping system.
16. Temperature control in Moulds – Different type of cooling circuits eg: Integer plate cooling , baffle cooling
17. Moulding defects and their causes. Root cause analysis using 7 Quality tools. Problem Solving Tools : SPC

8. ASSESSMENT STANDARD

8.1 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 scrape/wastage and disposal of scarp/wastage as per procedure, behavioral attitude and regularity in training.

The following marking pattern to be adopted while assessing:

a) Weightage in the range of 60-75% to be allotted during assessment under following performance level:

For this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- many tolerances while undertaking different work are in line 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) Weightage in the range of above75%- 90% to be allotted during assessment under following performance level:

For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- the majority of tolerances while undertaking different work are in line 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) Weightage in the range of above 90% to be allotted during assessment under following performance level:

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.

In this work there is evidence of:

- high skill levels in the use of hand tools, machine tools and workshop equipment
- tolerances while undertaking different work being substantially in line 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

8.2 FINAL ASSESSMENT- ALL INDIA TRADE TEST

(SUMMATIVE ASSESSMENT FOR TWO YEARS TRADE)

SUBJECTS	Marks	Sessional Marks	Full Marks	Pass Marks	Duration of Exam.
Practical	300	100	400	240	**08 hrs.**
Trade Theory	100	20	120	48	3 hrs.
Workshop Cal. & Sc.	50	10	60	24	3 hrs.
Engineering Drawing	50	20	70	28	4 hrs.
Employability Skill	50		50	17	2 hrs.
Grand Total	**550**	**150**	**700**	**-**	

Note: - The candidate pass in each subject conducted under all India trade test.

9. FURTHER LEARNING PATHWAYS

- On successful completion of the course trainees can opt for Diploma course (Lateral entry). [Applicable for candidates only who undergone ATS after CTS]
- On successful completion of the course trainees can opt for CITS course.

Employment opportunities:

On successful completion of this course, the candidates may be gainfully employed in the following industries:

1. Production & Manufacturing industries involved in plastic mould making.
2. In public sector industries (Central and State) and private industries in India & abroad involved in plastic mould making.

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: PLASTIC MOULD MAKER

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

A : Trainee's Tool Kit :

Sl. No.	Description of Tools	For Instructor	For a batch of 20
1	Steel Rule 150 mm English and Metric combined	1	20 nos.
2	Engineer's Square 150 mm with knife edge	1	20 nos.
3	Hacksaw frame adjustable with pistol grip for 200-300 mm blade	1	20 nos.
4	Centre punch 100 mm	1	20 nos.
5	Prick punch 150 mm	1	20 nos.
6	File flat bastard 300 mm	1	20 nos.
7	File flat 2nd cut 250 mm	1	20 nos.
8	File flat safe edge 200 mm	1	20 nos.
9	File triangular smooth 200 mm	1	20 nos.

B: Tools and Equipments:

Sl. No.	Name of Tools and Equipments	Quantity
1	Caliper inside spring type-150 mm	4 nos.
2	Caliper outside spring type-150 mm	4 nos.
3	Divider spring type – 150 mm	4 nos.
4	Odd leg caliper firm joint 0- 150 mm	2 nos.
5	Screw driver – 150 mm	1 no.
6	Screw driver – 200 mm	1 no.
8	Centre gauge 55^0 and 60^0	2 nos.
9	Oil can 250 ml	1 no.
10	File flat smooth 200 mm	4 nos.
11	File flat smooth with safe edge 200 mm	4 nos.
12	File half round bastard 300 mm	4 nos.
13	File half round smooth 250 mm	4 nos.
14	File triangular bastard 250 mm	4 nos.
15	File triangular smooth 200 mm	4 nos.
16	File round bastard 250 mm	4 nos.
17	File square bastard 300 mm	4 nos.

18	File square smooth 250 mm	4 nos.
19	Knife edge file 150 mm	4 nos.
20	Needle file assorted (12 nos.) 150 mm	4 sets
21	File card	4 nos.
22	Scraper flat 250 mm	4 nos.
23	Hammer Ball Peen 0.5 kg with handle	4 nos.
24	Hammer Cross Peen 0.75 kg with handle	4 nos.
25	Chisel cold flat 18 x 150 mm	4 nos.
26	Chisel Cross Cut 10 x 3 x 200 mm	4 nos.
27	Chisel Half Round 10 x 250 mm	4 nos.
28	Chisel diamond point 10 x 200 mm	4 nos.
29	Scribing block universal 300 mm	2 nos.
30	C.I. Surface plate 300 x 300 mm	1 no.
31	Granite Surface plate 600 x 600x80 mm	1 no
32	Tap extractor 3 mm to 12 mm x 1.5 mm (ezzy out)	1 set
33	Screw extractor sizes 1 to 8	1 set
34	Taps and dies metric 5 mm to 12 mm complete set in a box	2 sets
35	Twist Drill with St. Shank Ø 5 to Ø 12 mm in steps of 0.5 mm	1 set
36	Twist Drill St. Shank Ø 8 mm to Ø 12 mm in steps of 2 mm	1 set
37	Taper shank drills Ø 6 mm to Ø 20 mm in steps of 1 mm	1 set
38	D.E spanners 3-4 , 6-8, 10-12, 13-14, 15-16, 18-19, 20-22, 24-26 (8 spanners)	2 sets
39	Letter punch 5 mm set	1 set
40	Number punch 5 mm set	1 set
41	Drill chuck 12 mm capacity with key	1 no.
42	Allen key metric 3 to 12 mm set	2 sets
43	Centre drills 3, 4,5 mm	2 each
44	Parallel hand reamer 6 mm to 12 mm in steps of 1 mm	1 set
45	Star dresser	2 nos.
46	Diamond dresser with holder	2 nos.
47	Safety goggles (Personal Protective Equipments)	4 nos.
48	Demagnetizer	1 no.
49	Snips 200 mm blade	1 no.
50	Workbench 240 cm x 120 cm x 75 cm with 150 mm vice (Each bench fitted with 4 vices)	4 nos.
51	Bench Vice 150 mm	16 nos.
52	Steel lockers for 16 trainees (Pigeon Cup Board)	2 nos.
53	Steel cupboard 180 cm x 60 cm x 45 cm	6 nos.
54	Metal rack 180 cm x 60 cm x 45 cm	1 nos.
55	Fire extinguisher	2 nos.
56	Fire buckets with stand	4 nos.
57	Feeler gauge 0.05 mm to 0.3 mm by 0.05 and 0.4 mm to 1 mm by 0.1 mm (13 leaves)	1 set
58	Metric Screw pitch gauge-Range 0.4 -6 mm pitch 60^{0} (21 leaves)	1 set
59	Radius gauge 1 - 3 mm by 0. 25 mm and 3.5-7mm by 0.5 mm (34 leaves)	1 no.
60	Vernier height gauge - Range 300 mm, with 0.02 mm least count	1 no.
61	Universal vernier caliper-Range 200 mm, with 0.02 mm least count	2 nos.

62	Dial vernier caliper 0-200 mm, with 0.02 mm least count	1 no.
63	Vernier caliper-Range 300 mm Vernier scale 0.02 mm	2 nos.
64	Vernier bevel protractor-Blade range 150 and 300 mm, dial 1^0 , least count 5' (min.) with head, Acute Angle attachment	1 no.
65	Outside micrometer 0-25 mm, with 0.01 mm least count	2 nos.
66	Outside micrometer 25-50 mm, with 0.01 mm least count	1 no.
67	Outside micrometer 50-75mm, with 0.01 mm least count	1 no.
68	Combination square sets-300 mm blade with square head, centre head, protractor head	1 set
69	Telescopic gauge range 8 -150 mm (6 pcs/set)	1 set
70	Sine bar 150 mm with stopper plate	1 no.
71	Sine table 200 mm length with magnetic bed	1 no.
72	Slip Gauge Box (workshop grade) -87 pieces per set	1 set
73	Gauge block accessories consisting holders, half round jaws, scriber point, centre point , triangular straight edge (14 pcs/set)	1 set
74	Central square – Size 400 x 250 mm blade	1 no.
75	V-Block-Approx. 32 x 32 x 41 mm with clamping capacity of 25 mm with clamps	2 pairs
76	V-Block-Approx 65x65x80 mm with clamping capacity of 50 mm with clamps	1 pairs
77	Magnetic V-Block 100x100x125 mm	2 pairs
78	Angle plate 150 x 150 x 200 mm	1 no.
79	Angle plate-adjustable 250x250x300 mm	1no.
80	Inside micrometer – Range 50-63 mm with std extension rods upto 200mm..	1 set
81	Depth micrometer – Range 0-25 mm, accuracy 0.01 mm with std set of extension rods.	1set.
82	Magnetic stand with magnetic base 60 x 47.5 mm and with universal swivel clamp, dial holding rod (150 mm) scriber	2 nos.
83	Dial test indicator-Lever type- Range 0-0.8 mm –Graduation 0.01mm, reading 0-50-0 with accessories	1 nos.
84	Dial test indicator – Plunger type-Range 0-10 mm , Graduation 0.01 mm, Reading 0-100 with revolution counter	1 nos.
85	Bore gauge with dial indicator (1 mm range, 0-0.01 mm graduation)-Range of bore gauge 18-150 mm	1 set
86	Straight edge-Single beveled-Size 150 mm and 250 mm	1 each
87	Tool makers clamp 50 mm & 75 mm	2 nos. each
88	C – clamp- 50 mm & 75 mm	2 nos. each

C : Cutting Tools :

Sl. No.	Name of Tools and Equipments	Quantity
1	Side and face milling cutter Ø 100 x 10 X Ø 25 mm	2 nos.
2	Side and face cutter Ø 80 x 10 X Ø 27 mm	2 nos.
3	Cylindrical milling cutter Ø 63 x 70 x Ø 27 mm	2 nos.
4	Slitting Saw cutter Ø 75 x 3 X Ø 27 mm	2 nos.

5	Slitting Saw cutter Ø 100 x 6 X Ø 27 mm	2 nos.
6	Single angle cutter Ø 75 x 16 x Ø 27mm - 60^0	2 nos.
7	Single angle cutter Ø 75 x 20 x Ø 27 - 45^0	2 nos
8	Equal angle cutter Ø75x 30 x Ø 27 - 90^0	2 nos
9	Shell End Mill Ø 50 x 36 x Ø 22 (preferably inserted tip type)	2 nos.
10	Shell End Mill Ø 75 mm x 50 x Ø 22 (preferably inserted tip type)	2 nos.
11	Parallel shank end mills Ø6, Ø10 and Ø 16 are (double fluted), Ø 20 mm & Ø 25mm (four fluted)	4 nos. each
12	'T' slot cutter with parallel shank- Ø 17.5 x 8 mm width x dia. of shank 8 mm	2 nos.
13	Concave Milling cutter Ø 63 x 6 radius x Ø 27 mm	1 nos.
14	Convex Milling cutter Ø 63 x 6 radius x Ø 27 mm	1 nos.
15	Disc type form milling cutter (involutes form -2 module, 20° pressure angle)	1 set
16	Tool holder (straight) to suit 6, 8 mm sq. bit size	2 nos. each
17	Parting tool holders to suit 3 and 4 mm thick tool blade.	2 nos.
18	Boring bars with holders to accommodate 4, 6 and 8 mm HSS tool bits	3 each
19	Knurling tool (straight & diamond)	2 nos. each

D : General Machinery & Installation:

(Note: The specification given under "General Machinery & Installation" can be considered to the nearest size according to the availability in the Indian Market.)

Sl. No.	**Name of Machineries and Equipment**	**Qty.**
1.	Sensitive drilling machine - capacity 12 mm Motorized –with drill chuck and key etc.	1No.
2.	Pillar/column type Drilling machine – 25 mm capacity-motorized with drill chuck, key etc.	1No.
3.	Radial Drill machine to drill up to 32 mm diameter.	1No.
4.	Power hacksaw machine to accommodate 21" or more length blade.	1no.
5.	Double ended Pedestal Grinder with 178 mm wheels(one fine and one rough wheel)	1 no.
6.	SS and SC centre lathe (all geared) with centre height 150 mm and centre distance 1000 mm along with 3 jaws, 4 jaw chuck, auto feed system, taper turning attachment, coolant pump, safety guard and machine light arrangement.	3 nos.
7.	Shearing machine (lever type)hand operated complete with 300 mm blade length	1 no.
8.	Arc and gas welding and cutting equipment (**Not required if Welding Trade is available in the Institute**)	1No.
	(i) Transformer welding set 300 amps-continuous welding current with all accessories and electrode holder	1 set
	(ii) Welding cable to carry 400 amps 50 meter with flexible rubber cover.	12 nos.
	(iii) Lugs for cable	2 nos.
	(iv) Earth clamps	1 set
	(v) Arc welding table (all metal top) 122cm x 12 cm x 60 cm with positioner	1 no.
	(vi) Oxy-acetylene gas welding set-equipment with hoses, regulator and other	1 set

	accessories	
	(vii) Gas welding table with positioner	6 nos.
	(viii) Welding torch tips of different sizes	1 no
	(ix) Gas lighter	2 nos.
	(x) Trolley for gas cylinders	2 pairs
	(xi) Chipping hammer	2 nos.
	(xii) Gloves (Leather)	1 set
	(xiii) Leather apron	2 nos.
	(xiv) Welding torches 5 to 10 nozzles	4 pair
	(xv) Spindle key for cylinder valve	2 nos.
	(xvi) Welding goggles	10 sets
	(xvii) Welding helmets with coloured glass	2 nos.
	(xviii) Tip cleaner	1 no.
9.	Universal Milling Machine -	1 no
	Longitudinal traverse 700 - 800 mm Cross traverse 300 - 400 mm Vertical traverse 200 - 350 mm Swivel of table on either side 45^0 Speed range rpm 30 to 1800 With universal dividing head, circular table, long arbors, slab arbor, slotting attachment, vertical indexing head, etc.	
10.	Horizontal and Vertical milling machine	2 Nos. each
	Table Length x width 1350x310 mm Longitudinal traverse 700 - 800 mm Cross traverse 200 - 265 mm Vertical traverse 300 - 400 mm Speed range rpm 20 to 1800	
11.	Hydraulic Surface Grinding Machine	2 Nos.
	Table Clamping area 600 x 178 mm Grinding area 400 x 200 mm Distance table-centre of spindle 400 - 500 mm Table speed 1-25 m/min. With standard accessories like dust extractor with water separator, balancing device, table-mounted Radius-tangent wheel dresser, wheel flanges, etc.	
12.	Universal cylindrical Grinding Machine	1No.
	Max. dia ground (effective) 250 mm Max. grinding length 300 mm Height of centre 130 mm Max. distance between centers 340 mm With special accessories like face plate, steady, radius and face dressers, find hand feed attachment etc.	

13.	Rockwell Hardness Testing Machine with standard accessories	1No.
14.	Spark erosion EDM with standard accessories	1 No.
15.	Polishing kit	1 No.
16.	Hand Injection Moulding Machine 103 hand injection	1 No.
17.	CAD/CAM software (Program generation and simulation software for moulds and dies)	4 nos.
18.	Desktop computers with latest configuration suitable for CAD/CAM software with necessary furniture	5 sets
19.	Vertical machining centre (VMC) (Optional)	01
20.	Co-ordinate measuring machine (Optional)	01
21.	Profile projector (Optional)	01

Note: Any institute not having the optional machines may tie up with an industry having the above machine for exposure.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: PLASTIC MOULD MAKER

LIST OF TOOLS& EQUIPMENTS FOR 20 APPRENTICES

1) **Space Norms** : 45 Sq. m.(For Engineering Drawing)

2) Infrastructure:

A : TRAINEES TOOL KIT:-

Sl. No.	Name of the items	Quantity (indicative)
1.	Draughtsman drawing instrument box	20 Nos.
2.	Set square celluloid 45^0 (250 X 1.5 mm)	20 Nos.
3.	Set square celluloid 30^0-60^0 (250 X 1.5 mm)	20 Nos.
4.	Mini drafter	20 Nos.
5.	Drawing board (700mm x500 mm) IS: 1444	20 Nos.

B : FURNITURE REQUIRED

Sl. No.	Name of the items	Quantity (indicative)
1	Drawing Board	20 Nos.
2	Models : Solid & cut section	as required
3	Drawing Table for trainees	as required
4	Stool for trainees	as required
5	Cupboard (big)	01
6	White Board (size: 8ft. x 4ft.)	01
7	Trainer's Table	01
8	Trainer's Chair	01

ANNEXURE – II

INFRASTRUCTURE FOR ON-JOB TRAINING

TRADE: PLASTIC MOULDER MAKER

For Batch of 20 APPRENTICES

Actual training will depend on the existing facilities available in the establishments. However, the industry should ensure that the broad skills defined against On-Job Training part (i.e. 9 months + 9 months) are imparted. In case of any short fall the concern industry may impart the training in cluster mode/ any other industry/ at ITI.

ANNEXURE-III

GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1. Due care to be taken for proper & inclusive delivery among the batch. Some of the following some method of delivery may be adopted:

A) LECTURE
B) LESSON
C) DEMONSTRATION
D) PRACTICE
E) GROUP DISCUSSION
F) DISCUSSION WITH PEER GROUP
G) PROJECT WORK
H) INDUSTRIAL VISIT

2. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. may be adopted.

3. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.