CURRICULUM

FOR THE TRADE OF

EXTRUSION MACHINE OPERATOR (PLASTICS)

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

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

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1. ACKNOWLEDGEMENT

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1. Renata Precision, Pune

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

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
1.	Kumbhar N. V.	Govt. ITI Aundh Pune	Expert
2.	Mondake R. V.	ITI Aundhe Pune	Expert
3.	APTE S K	AVTS ITI Aundhe Pune	Expert

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 **Extrusion Machine Operator (Plastic)** trade]

1. Tends machine that extrudes continuous synthetic filaments from resins to be used in making twine.
2. Pours resin into loading drum of machine, and pours buckets of color resin into hopper of machine.
3. Draw or press metal into shapes and diameters.
4. Reel extruded products into rolls.
5. Specify lengths and weights of rolls.
6. Replace worn dies.
7. Observes thermostat heat-control unit and notifies engineer of deviations from prescribed temperature.
8. Notifies supervisor when extruded filaments fail to meet specified standards for thickness and color.
9. Set controls to regulate vacuum, air pressure, sizing rings, and temperature.
10. Synchronize speed of extrusion.
11. Locate defects on extruded products.
12. Check for conformance to specifications.
13. Tends tumbling machine that rotates drums of resin to mix different colors of resins before they are poured into extruder.
14. Splice cables.
15. Install, connect, test, and adjust equipment.
16. String lines or install terminal boxes.
17. Cleans extruding die or installs new die in machine.
18. Position insulation over conductors.
19. Seal splices with moisture-proof covering.
20. Access areas by climbing pols and ladders.
21. Remove excess, entangled, or completed filaments from machines.
22. Operate machines that extrude filaments from synthetic materials such as rayon, fiberglass, or liquid polymers.
23. Start metering pumps.
24. Activate and adjust extruding machines.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Extruding Machine Operator (Plastics) operates machine to extrude thermoplastic materials to form tubes, rods and film, according to specifications. Weighs and mixes pelletized, granular, or powdered thermoplastic materials and colouring pigments in tumbling machine set by Extruding Machine Setter (Plastics) couples hose to die holder to circulate steam, water, air or oil to die; fills machine hopper with mixed materials or stuffs rolls of plastic dough into machine cylinders; starts machine and synchronizes speed of conveyor belt with speed of extrusion through die; examines extruded product for defects, such as wrinkles, bubbles and splits; measures extruded articles for conformance to specifications, using micrometers, calipers and gauges and adjusts speed and weight, controls or turns hot and cold water, air, oil or steam valves to obtain product of specified dimensions. May reel extruded product into rolls of specified length and weight. May oil and clean machine.

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:

i) **NCO-2004:** 8232.20

5. GENERAL INFORMATION

1. **Name of the Trade** : **EXTRUSION MACHINE OPERATOR (PLASTIC)**

2. **N.C.O. Code No.** : **NCO-2004:** 8232.20

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

4. **Duration of Basic Training**: -

a) Block –I : 3 months

b) Block – II : 3 months

Total duration of Basic Training: 6 months

5. **Duration of Practical Training (On -job Training): -**

a) Block–I: 9 months

b) Block–II : 9 months

Total duration of Practical Training: 18 months

6. **Entry Qualification** : Passed 10th class under 10+2 system of education or its equivalent.

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

8. **Rebate for ITI passed trainees** : i) **One year** in the trade of BBBT and Advance module in Extrusion Process in the plastic processing Sector under CoE.
ii) One year in the trade of Plastic Processing Operator

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** : **EXTRUSION MACHINE OPERATOR (PLASTIC)**

2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)

3) **Batch size** : 20

4) **Power Norms** :13.6 KW for Workshop

5) **Space Norms** : 400 Sq. m.

6) **Examination** : The internal assessment will be held on completion of each Block.

7) **Instructor Qualification** :

i) Degree/Diploma in Plastic Processing Engineering/Technology from recognized university/Board with one/two year post qualification experience respectively in the relevant field.

OR

ii) NTC/NAC in the trade of **Extrusion Machine Operator (Plastic)** 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. Safety regarding working with different types of steam and its First-Aid.	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 e.g.; 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. Define environment, environment Pollution, Pollutants, type of Pollution (Air pollution, water pollution, soil pollution noise pollution, thermal pollution, radiation. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2.	Familiarize with Basic fitting and measurement hand tools. Filling a flat surface of Mild steel and cast iron. Check for flatness, straightness and squareness. Physical introduction to measuring instruments – handling of instruments – exercise in the use of Liner measuring instruments such as Steel rule of	Introduction to hand tools and their safety. Classification of files, shapes, sizes & grades. Selection criteria of files Selection of measuring instruments, care, use and maintenance of measuring

	different ranges. Outside calipers, inside calipers for measuring outside & inside parameters. Vernier calipers – Least count, exercise in outside measurement, inside measurements, depth gauge.	instruments–Heading of precision instruments–Vernier Caliper, Micrometer, Height Gauge, Dial Gauge (Plunger and bevel type) with stand (0.01mm Resolution), checking squareness using combination set.
3.	Hack sawing to dimension. Measurement of flat rectangular objects, cylinder objects, hollow components, threaded components. Exercises on external & internal measurements using Micrometers and Height gauges	Introduction to Metrology, Objectives of Metrology – measurements – principles – methods of measurement. Terminology used in Metrology – Accuracy– Repeatability – Resolution etc. SI units of measurements – physical quantities under SI system. Marking and punching tools and their uses. Hacksaw – types, specification and their uses.
4.	Filling flat and square to size to an accuracy of ± 0.1mm. Exercise on angular measurement using combination set & Vernier Bevel protector. Center drilling, drilling, reaming, counter sinking, counter boring and tapping for various sizes of mild steel.	Vernier Bevel Protector – reading and use. Use of thread gauge & screw thread micrometer. Drilling machine – Types – Drilling operation – Drill bits. Reamers – types, care and maintenance. Definition of terms- Hydraulic Fluid, Viscosity, Different Types of Valves and Hydraulic pumps.
5.	Safety precautions while working on live wires/high voltage. Use of hand tools. Joining Practice with single and multi-stand conductors of different wires. Joining practice of bare conductors – soldering Practice on Printed circuit boards	General care & maintenance of common hand tools. Wires & cables – conductors, Insulators & semiconductors – their shapes, sizes with respect to low, medium & high voltage Soldering Printed circuit boards & and its uses – Different fluxes for different purposes on metals – crimping equipment – Joining of conductors by soldering. Importance of Preventive Maintenance and routine tests Earthing and its importance.
6.	Making of simple circuit with a lamp and battery Study and use of Multimeters – measurement of current, voltage, resistance in DC/AC circuits. Demonstration of Series circuits – Parallel circuits. Demonstration & practice on connecting & replacement of common electrical accessories in circuits – use of tong tester and megger.	Resistance, Voltage, Current, open circuit and short circuits – Ohm's law – Voltage drop – series & parallel circuits – Power & energy relations – electrical measuring Instruments – Multi-meters Common electrical accessories used in Industries – Bus – bars, Relays, contactors, Circuit Breakers, etc.

		Fuses and its ratings – materials used.
7.	Repairing & testing of electrical heaters & Temp. Indicator controller use in plastic molding machines Calibration & setting of Temp. controller indicator.	Types of heaters, thermocouples Temp. Indicator controller. Types and function: Electrical heaters, thermocouples and temperature control parameters and timers, electrical motors – types and function.
8.	Starting & shut down a computer. Use start menu for opening an application. Familiarize with Key board and Keys. Open MSWord, create a new file, save a file, open an existing file, type a paragraph, set for left and right margins, draw a simple table, insert rows, insert columns, erase rows, erase columns, print the letter in a printer attached, in portrait and landscape. Search using search engine like Google for certain topics, download a file from the internet, save the downloaded file. Mail a document.	Use of desktop, control panel settings, Explorer, creating shortcuts, Use of simple applications like Paint Creating directories. Creating sample documents using MSWord, Text wrapping, Text formatting, changing letters to different case, drawing table, mail merging, page formatting, using different font types printing a document.
9.	Familiarization with automatic Extrusion Machine and its different parts and their respective functions - sequence to be followed in operating the machine. Familiarization with basic idea of mechanical, electrical and hydraulic system of Extrusion machine and its different parts and their respective functions.	Different plastic molding machines and processes involved in molding operation. Industrial safety while operating Machine. Hazards related to Extrusions process. Study of different types of Extrusion Process. Fundamentals of Extrusion. Classification of Extruders. Extrusion plant, Specifications, Rating, Selection etc.
10.	Operating and controlling of Extrusion machine in Ideal run operation. (Changing and cleaning of screws in extruder, adjusting and controlling temperature, adjusting screen pack arrangement, adjusting variable speed, setting and adjusting die head for profile and film etc.)	<u>PLASTICS MATERIALS</u> Plastics Materials Characteristics requirements, Grades for Extrusion Materials used for various Extruded Products. Processing Behavior of Various Plastics. Importance of Pre-drying Materials. Plastics Materials Identification by Simple Methods. Polymer their properties use and application involving Extrusion process.

		Basic concept of Single Minute Exchange of Die (SMED), its requirement & benefits. Basic concept of Material Handling.
11.	Oiling, lubricating and preventive maintenance of Extrusion Machine. Identification and Testing of Plastic.	Brief description of multi-layer Extrusion. Basic parts of Die and construction details. Printing Technique involved in Film / Pipe.
12.	Operating and controlling of Extrusion Machine in Trial Run Operation using thermoplastic material as available. Process optimization.	Preventive maintenance of Extrusion machine, Technique oiling and lubrication. Brief description of Identification of plastic, different testing machine and their use. Process parameters and its interaction for optimized production.
13.	**Revision &Internal Assessment**	

B. Block –II
Basic Training

Week No.	Professional Skills	Professional Knowledge
1.	Familiarization with the basic ideas of mechanical, electrical, hydraulic System of injection molding machine in(Ideal run operation) and its different parts and their respective function	Occupational Hazards and safety measures related to the trade. Introduction about environment and environment management system. Environment pollution and mechanics role in minimizing the same. Injection molding machine – Hand operated different parts and their respective function.
2.	Operating and controlling of Injection Moulding Machine in Ideal run operation (Fitting of mould injector ,locking and cooling of mould, adjusting feed of screw or ram, Temperature controlling, Fitting and adjusting nozzle, adjusting injector pressure and speed)	Polymer- their properties and use, Basic plastics and difference between thermosetting and thermoplastic properties, use and application. Basic concept of Material Utilization.
3.	Operating and controlling of Injection Molding Machine in Trial Run Operation using-thermoplastic material as available.	Low density polythene, High-density polyethylene, polypropylene, their properties use and application. Styrene groups of plastic – ABS and SAN their properties use and application. PVC, Nylon group, polycarbonate, their properties and use.
4.	Familiarization with basic idea of mechanical electrical and hydraulic system of compression Moulding Machine and its different parts and their respective functions	Hazards related to compression molding process. Plastic process machinery, compression moulding machine- Hand operated different parts and their respective function.
5.	Operating and controlling of compression Moulding Machine in Ideal run operation (movement of platten top or bottom- adjustment and control, adjusting pressure in terms of per-square area, and total lonnage, Fitting and heating of moulds controlling temperature, checking of bulk factor/density etc.)	Compression moulding machine automatic different parts and their respective function
6.	Operating and controlling of compression molding Machine in Ideal run operation using thermosetting material as available.	Polymer- their properties and use, Basic thermosetting material properties, use and application. Thermosetting plastic material Phenol formaldehyde (PF) Urea Formaldehyde (UF) melamine formaldehyde (MF) polyester Based resin in various form and epoxy resin – properties, use and application. Introduction of FRP process. Introduction of Transfer Moulding Process.
7.	Familiarization with automatic Blow Moulding Machine and its different parts and their respective functions - sequence to be followed in operating	Hazards related to Blow molding process. Polymer theory, groups of plastics, blow moulding materials.

	the machine. Familiarization with basic idea of mechanical, Electrical and hydraulic & pneumatic system of Blow Moulding Machine.	Familiarization of Blow moulding process.
8.	Operating and controlling of Blow- Moulding Machine in Ideal Run Operation (Setting of die, adjusting mandrel, controlling, parison, adjusting thickness uniformity).	Polymer, their properties, use and application of LDPE, HDPE, PET, PC. Processibility of plastic material, Processing techniques of plastic material. Introduction of Stretch Blow Moulding Process.
9.	Operating and controlling of Blow- Moulding Machine in Trial Run Operation using thermoplastic material as available.	Basic parts of mould and construction details, Brief description of multi-layer extrusion Blow moulding, Extrusion stretch Blow moulding, Injection stretch Blow moulding, and press blow moulding for squeezable container.
10.	Operating and controlling of Extrusion Machine in Trial Run Operation using thermoplastic material as available.	**DIFFERENT EXTRUSION PROCESS PLANT, EXTRUSION PROCESS: EXRTUDER: -** Working principle, design construction fundamentals. Classification of extruder; specification rating and selection. **EXTRUDER SCREW GEOMETRY: -** Extruders designed for different plastic raw material. Type of screw according to required single thread screw, double thread screw (barrier).
11.	-do-	Reprocessing of Plastics Waste Techniques (Simple methods in detail and over view of advance methods) Statistical Process Control (SPC), Statistical Quality Control (SQC)
12.	-do-	**SPECIAL EXTRUSION PROCESS.** Introduction technology development. Corrugated pipes. Double walled corrugated pipe products. Reinforced flexible hosepipes. Tapes, woven sack, monofilament-manufacturing process. **REPROCESSING CYCLE: -** Introduction, Technology development. Preprocessor plant location. Method of reprocessing. Over view on advance method. Precautionary measures in reprocessing cycles at different level. **UTILITY: -** Agglomerator, pulveriser, low speed / high mixer, grinder, cutter, chilling unit, material handling unit etc.
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** : **EXTRUSION MACHINE OPERATOR (PLASTIC)**

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 Plastic Processing Engineering/Technology from recognized university/Board with one/two year post qualification experience in the relevant field.

OR

ii) NTC/NAC in the trade of **Extrusion Machine Operator (Plastic)** 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 (09 months)

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. Introduction to safety and firefighting equipment and their use related to plastic processing.
4. **EXTRUSION PROCESSES – EXTRUDERS:** Study of extruders in IRO, Free Sketch of Machines, their parts and its functions, list of products manufactured by Extrusion Process.
5. Operations practice on setting up of process – parameters to produce Blown film on film-plant.
6. Observations on Extruder output, Size of film produced and technical specifications of machines to be recorded.
7. **SCRAP REUSE /RECYCLE & AGGLOMERATION:** Machine study in IRO, specification of Machine, Study of parts and function, line diagram of machine. Operation – practice with different materials and output study in Kg/hr for different materials. Waste collection, segregation, size reduction and recycling.
8. **BLOW FILM EXTRUSION PROCESS:** Study of Blown Film Machine Parts and Functions. Procedure for setting up of process parameters e.g. Temperature on different zones, Screw- Speed, Nip-Roller Speed, Wider Speed, Blow Ratio, Control of Cooling the Bubble, Air Pressure inside the Bubble.
9. Methodology and Practice to fix the Blown Film Die on Machine. Familiarization, of Die-parts and their function.
10. Practice of operating machine to produce different sizes of Blown Film.
11. Practice of Die setting on the machine, Procedure for setting up of parameters and operation practice in running the machine to produce film.
12. **PIPES/TUBES EXTRUSION PROCESS:** Study of the pipe machine-parts and functions. Procedure for setting up of process parameters. E.g.- Temperature on different zones, Screw-Speed, Haul off unit speed.
13. Methodology and Practice by trainees to fix the die on machine, Familiarization of Die-parts and their function. Practice of operating machine to produce different sizes on pipes.
14. Practice of Die setting on the machine, sizing techniques.
15. Procedure for setting up of parameters and operation practice in running the machine to produce Pipe/Tube.
16. **EXTRUSION DIES:** Study of different types of Extruder Dies, Mould materials.
17. STUDY & MAINTENANCE OF EXTRUDERS Maintenance & Storage. Practical Exposure to the preventive maintenance check points for Extruder Machines and Auxiliary Equipment.
18. Daily Start-up and Shut down procedure checks, Housekeeping, checking Hydraulics and Electrical Circuit for safety, routine faults and remedies.

B. BLOCK – II (09 months)

1. **SAFETY AT WORK: -** Carry out safe working practices on the shop floor. Demonstrate the use of safety devices.
2. **EXTRUSION PROCESS:** EXTRUDER: - Study of extruder machine, lay outing sketch, main parts and respective functions to be observed. Operation & controls of extruder machine in IRO. Operation and controls of extruder machine in TRO using various plastic.
3. **BLOWN FILM EXTRUSION PLANT: -** Lay out and line diagram. Setting up of process parameter to produce blown film and observation to be recorded like -different zone temperatures, screw speed, nip roller speed, winder speed, blow ratio, bubble cooling air pressure, etc.
4. Methodology and practice to fix the blown film die on extruder machine. Procedure of replacement screw and cleaning. Procedure of die setting on the machine. Dismantling and assembling practice of die. Practice in running the machine in TRO to produce various sizes of blown film using various grades of plastic. Cutting, Sealing and Printing on Blown film.
5. PIPE/TUBE EXTRUSION: - Study of layout and entire line diagram. Setting up process parameter and controls. Practical exposure of die setting and precautions. Replacement and cleaning procedure of pipe die. Practice and produce various sizes of PVC pipes/tubes.
6. Maintenance of Extruder Die & plant: Study to check point extruder machine and Auxiliary equipment. Starting and shut down procedure daily and periodical checkups. Faults, causes and remedies in entire plant. Preventive maintenance, Break down maintenance and precautions.
7. **RECYCLING PROCESS OF PLASTIC WASTE: -** Identification of Plastics. Seven Industrial wastage. Study different method & machinery uses for recycling process of plastic waste material. Machine study in IRO, specification, main parts and function. Line diagram of machine. Daily start up and shut down procedure, precautions. Operation procedure & process techniques of recycling of various plastic waste materials. Output study for different plastic waste.
8. **Testing & quality control: -** Testing of mechanical / Electrical / thermal / chemicals/ flow/ optical properties. Identification of various plastic in relation to properties.
9. **TESTING & QUALITY CONTROL: -**Testing method, testing equipment, product dimensions, Finishing. MFI test, Hardness, Optical, Dart Impact Strength, Burst test (Pipe). Statistical process control (SPC), Statistical quality control (SQC), ISO, ISI. TQM, TPM, Process record up keeping. Entry and upkeep of log sheet, trouble log. Process Validation and information about Production per Minute (PPM).

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 FOR APPRENTICE

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 like Plastic Processing industries.

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: EXTRUSION MACHINE OPERATOR

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

A : TRAINEES TOOL KIT:-

Sl. No.	Items	Qty.
1.	Steel rule 30 cm graduated both in English & Metric units	20 Nos.
2.	Outside spring caliper 200 mm	20 Nos.
3.	Inside spring caliper 200 mm	20 Nos.
4.	Hermaphrodite caliper 150 mm	20 Nos.
5.	Divider spring 200 mm	20 Nos.
6.	Center punch 100 mm	20 Nos.
7.	Hammer B.P.0.5 kg	20 Nos.
8.	Combination pliers 150 mm	20 Nos.
9.	Safety glasses	20 Nos.
10.	File flat bastard 300 mm	20 Nos.
11.	File flat 2^{nd} cut 250 mm	20 Nos.
12.	Engineers screw driver	20 Nos.
13.	File flat smooth 200 mm	20 Nos.
14.	Cold chisel flat 25 X 200 mm	20 Nos.

B. Tools, Instruments and General shop Out fits

Sl. No.	Items	Qty.
1.	Screw driver set (multi heads)	1 Set
2.	Try square 150 mm	2 Nos.
3.	Straight edge steel 1 metre	1 No.
4.	Straight edge steel 500 mm	1 No.
5.	Steel tape 2 metre in case	1 No.

6.	Spirit level 2V 250, 05 metre	1 No.
7.	Hammer B.P. 800 gms with handle	6 Nos.
8.	Spindle blade screw driver 100 mm	2 Nos.
9.	Allen hexagonal key 2.5 to 12	2 sets
10.	Reduction sleeve MT as required	1 set
11.	Oil can pressure feed 500 mg	6 Nos.
12.	Twist drills 3mm to 13 mm (Parallel shank)	1 set
13.	Drill chuck 0-20 with taper shank	1 No.
14.	Center drill A1 to 5	2set
15.	Clamps C 100 & 200 mm	2 each.
16.	Tap and die set in box metric pitch	1 set
17.	Drill HSS taper shank	1set
18.	File H/R 2nd cut 250 mm	4 Nos.
19.	File triangular smooth 200 mm	4 Nos.
20.	Needle file set	1 Nos.
21.	File square 2nd cut 250 mm	4 Nos.
22.	Reamer 6 mm to 13 mm by 1 mm	1 set
23.	Hacksaw adjustable 250 – 300mm with blades	8 Nos.
24.	Hand vice 50 mm jaw	2 Nos.
25.	Magnifying glass 75 mm	2 Nos.
	Measuring Instruments	
26.	Micrometer outside 50-75 mm	2 Nos.
27.	Vernier height gauge 250 mm	1 No
28.	Vernier bevel protractor with least count of 5 minutes	1 No
29.	Radius gauge metric set (1 – 6 mm)	1 set
30.	Feeler gauge	1 No
31.	Drilling machine pillar 20 mm capacity with accessories	1 No
32.	Pedestal grinder	1 No
33.	Hand Drilling Machine Power (10 mm)	1 No
34.	Combination pliers 200 mm insulated	16 Nos.
35.	Screw driver 100mm, 200 mm	16 Nos

36.	Neon tester 500 V pencil bit type	16 Nos
37.	Electrician knife	16 Nos
38.	Hammer ball pein 1.0 kg	1 No.
39.	Plier side cutting 200 mm	4 Nos
40.	Pliers round nose 200 mm	4 Nos
41.	Pliers flat nose 150 mm	4 Nos
42.	Pliers long nose 200 mm	4 Nos
43.	Wall jumper octagonal 37mm x 450 mm	1 No.
44.	Center punch 100 mm	1 No.
45.	Steel measuring tape 20 mts	1 No.
46.	Spanner double ended set of 6	2 Sets
47.	Adjustable spanner	1 No.
48.	Steel rule 300 mm	4 Nos
49.	Electric soldering iron 35 w	4 Nos
50.	Rubber gloves 5000 V	2 pairs
51.	Multimeter 0-5, 100, 200, 500, milli amperes 0-100-1000,	2 Nos
52.	Bar magnet	1 No.
53.	Horse shoe magnet	1 No.
54.	Electric drill machine 6mm capacity universal type 250V	1 No.
55.	D.C. shunt motor 1 H.P. 250 V (Laboratory type)	2 Nos.
56.	Universal motor 750 W AC/DC 250 V	2 Nos.
57.	Squirrel cage induction motor 1 H.P. 230 V with DOL	1 No.
58.	Tong tester	1 No.
59.	Megger	1 No.
60.	DC Power Supply 0 V – 110 V / 5 A	1 No.
61.	Auto – transformer – variac 230 V	1 No.
62.	Crimping tools	1 Set
63.	Pentium IV Computer or latest computer with 512 MB RAM with following accessories DVD combo drive with the latest X version Hard Disk with 80 GB or above, 17 Monitor, AGP Graphics Card with 64 MB, 10/100 Ethernet Card, Modem.	9 Nos.
64.	Centralized UPS with 5KVA capacity	1 No.
65.	Laser Printer	1 No.

66.	Dot Matrix Pinter	1 No.
67.	Windows XP operating system	09 No.
68.	MS – Office 2000	09 No.

General plant and machinery: -

SL. NO.	DESCRIPTION	UNIT
1.	Hand operated Injection moulding M/C, different capacity	4 Nos.
2.	Automatic Injection moulding machine 40 T.cap	1 No.
3.	Micro processor Injection moulding machines 140 T.cap	1 No.
4.	Granulate small & Big size	1 each
5.	Master Batch Mixing unit	1 No.
6.	Hand operated compression moulding machine – 40 T. cap	2 nos.
7.	Automatic compression moulding machine – 100 T cap	1no
8.	Pipe extrusion machine	1 No.
9.	Extrusion for Blow film single layer	1 No.
10.	Printing Machine with oxidizing Treatment nut	1 No.
11.	Hand operated Blow moulding M/C with accessories. Different sizes	4 Nos.
12.	Full Automatic Double stage Blow moulding machine with Multilayer extrusion with Accessories.	1 No.
13.	Semi-Automatic Moulding Machine-80T	1 No.
14.	Scrap Cutter Grinder	1 No.
15.	Moulds/die and accessories for different machines	As required

Sl. No	Furniture – Computer Lab	Qty
1.	Suitable Computer Tables	As required
2.	Computer Chairs	20 Nos
3.	Shoe Rack	As required
4.	Vacuum cleaner	1 No.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: EXTRUSION MACHINE OPERATOR

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: EXTRUSION MACHINE OPERATOR

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.