Curriculum

For

“Dies and Moulds Technology”

(Machinist)

(Level -2)

National Vocational & Technical

Training Commission

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Introduction

Definition/ Description of the training programme for *Dies and Moulds Technology*

There is an increasing demand of the Dies and Moulds technologist. If an individual is planning to pursue a career in Dies and Moulds technology, this program will be helpful in targeting various industries including mechanical, electrical, automobile, hydraulics, computers, home appliances, ceramics, household products, plastic (especially furniture, Food packaging, crockery and aerospace sector) etc.

Purpose of the training programme

The purpose of this training is to develop a range of skills and techniques, personal skills and attributes essential for successful performance in Dies & Mould sector in accordance with industry requirements. Graduates of this program may find employment in local and international industries.

Overall objectives of training programme

The main objective of this training program is to improve the employability of young graduates through qualifying job-related training in the Dies & Mould sector and to train them so that they can prove to be an asset to this sector.

Competencies to be gained after completion of course

- Maintain Personal Health, Hygiene and Safety
- Perform Basic Communication Skills
- Perform Basic Computer Application
- Perform Calculations and Estimation for Mechanical Work

- Carryout General Maintenance
- Perform Bench Works
- Perform Shaper and Planar Operations
- Perform Basic Grinding Operations
- Perform Lathe Operations
- Perform Basic Milling Operations
- Perform Engineering Drawing

Possible available job opportunities available immediately and later in the future

- Machinist
- Machine Operator
- Semi-skilled Worker
- Lathe Operator
- Turner

Trainee entry level

Middle (with English, Urdu and Numeracy reading and writing skills)

Minimum qualification of trainer

- DAE in Dies and Mould/ Mechanical Technology or Equivalent with atleast 3 years experience*
- B.E/BSc/BS Technology in Mechanical/Mechatronics/Industrial and Manufacturing

*Other formal qualifications in the Dies & Mould would be useful in addition to the above

Recommended trainer: trainee ratio

The recommended maximum trainer: trainee ratio for this programme is 1 trainer for 25 trainees.

Medium of instruction i.e. language of instruction

Instruction will be Urdu and English.

Duration of the course (Total time, Theory & Practical time)

This curriculum comprises 11 modules. The recommended delivery time is 600 hours. Delivery of the course could therefore be full time, 5-6 days a week. Training providers are at liberty to develop other models of delivery, including part-time and evening delivery.

The full structure of the course is as follow:

Module	Theory[1] Days/hours	Workplace[2] Days/hours	Total hours
Module 1: Maintain Personal Health, Hygeine and Safety	20	10	30
Module 2: Perform Basic Communication Skills	20	10	30
Module 3: Perform Basic Computer Application	20	30	50
Module 4: Perform Calculations and Estimation for Mechanical Work	10	40	50
Module 5: Carryout General Maintenance	10	40	50
Module6: Perform Bench Works	11	39	50
Module7: Perform Shaper and Planar Operations	11	39	50
Module8: Perform Basic Grinding Operations	11	39	50
Module9: Perform Lathe Operations	17	63	80
Module10: Perform Basic Milling Operations	17	63	80
Module11: Perform Engineering Drawing	17	63	80

Sequence of the Modules

Each module covers a range of learning components. These are intended to provide detailed guidance to teachers (for example the Learning Elements component) and give them additional support for preparing their lessons (for example the Materials Required component). The detail provided by each module will contribute to a standardized approach to teaching, ensuring that training providers in different parts of the country have clear information on what should be taught. Each module also incorporates the industrial needs of Pakistan.

The distribution table is shown below:

<table>
<tr><td></td><td colspan="2">Module11: Perform Engineering Drawing
80 Hours</td><td rowspan="2"></td></tr>
<tr><td rowspan="2">Module 1: Maintain Personal Health, Hygiene and Safety
30 Hours</td><td rowspan="3">Module 5: Carryout General Maintenance
50 Hours</td><td>Module 6: Perform Bench Works
50 Hours</td></tr>
<tr><td>Module9: Perform Lathe Operations
80 Hours</td><td rowspan="2">Module 4: Perform Calculations and Estimation for Mechanical Work
50 Hours</td></tr>
<tr><td>Module 2: Perform Basic Communication Skills
30 Hours</td><td>Module7: Perform Shaper and Planar Operations
50 Hours</td></tr>
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		Module8: Perform Basic Grinding Operations 50 Hours	
Module 3: Perform Basic Computer Application 50 Hours		**Module10:** Perform Basic Milling Operations 80 Hours	

Summary – overview of the curriculum

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 1: Maintain Personal Health, Hygiene and Safety Guidelines **Aim:** After successful completion of this module, the trainee is competent in maintaining personal Health, Hygiene and safety	**LU1:** Identify Hazards at Workplace **LU2:** Apply Personal Protective and Safety Equipment (PPE) **LU3:** Observe Occupational Safety and Health (OSH) **LU4:** Dispose of hazardous Waste/materials	20	10	30
Module 2: Perform Basic Communication Skills **Aim:** After successful completion of this module, the trainee is competent in performing basic communication skills	**LU1:** Work in Team **LU2:** Follow Supervisor's instructions **LU3:** Demonstrate Basic IT Skills	20	10	30

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 3: Perform Basic Computer Application **Aim:** After successful completion of this module, the trainee is competent in performing basic computer application	**LU1:** Configure Computer System **LU2:** Prepare a MS word document **LU3:** Prepare Spreadsheet in MS Excel **LU4:** Prepare presentation in MS Power Point	20	30	50
Module 4: Perform Calculations and Estimation for Mechanical Work **Aim:** After successful completion of this module, the trainee is competent in performing calculations and estimation for mechanical work	**LU1:** Perform Estimation of Materials **LU2:** Prepare Costing for the Work	10	40	50
Module 5: Carryout General Maintenance **Aim:** After successful completion of this module, the trainee is competent in carrying out general maintenance	**LU1:** Perform General Housekeeping & Maintenance **LU2:** Perform Preventive Maintenance **LU3:** Perform Maintenance of Tooling	10	40	50

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 6: Perform Bench Works **Aim:** After successful completion of this module, the trainee is competent in performing bench works	**LU1:** Carry out Sawing **LU2:** Carry out Filing **LU3:** Carry out Drilling **LU4:** Carry out Reaming **LU5:** Carry out Tapping **LU6:** Carry out Counter Sinking	11	39	50
Module7: Perform Shaper and Planar Operations **Aim:** After successful completion of this module, the trainee is competent in performing shaper and planar operations	**LU1:** Prepare Shaper Machine for Operation **LU2:** Set tool and job for Shaper Machine for Operation **LU3:** Perform simple Shaping Operation (Square Job) **LU4:** Perform Angular Shaping Operations **LU5:** Prepare planar machine for operation **LU6:** Set tool and Job for Planar Machine Operation **LU7:** Perform Planar Operation	11	39	50
Module 8: Perform Basic Grinding Operations **Aim:** After successful completion of this module, the trainee is competent in performing basic grinding operations	**LU1:** Carry out Hand Grinding **LU2:** Perform single point Tool Grinding on Pedestal Grinder **LU3:** Perform Mounting and Dressing of Grinding Wheel on surface Grinding machine **LU4:** Perform Surface Grinding	11	39	50

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 9: Perform Lathe Operations **Aim:** After successful completion of this module, the trainee is competent in performing lathe operations	**LU1:** Prepare a Lathe machine for operation **LU2:** Perform Facing **LU3:** Perform Turning **LU4:** Perform Thread Cutting **LU5:** Perform Parting **LU6:** Perform Drilling/Boring **LU7:** Perform Knurling	17	63	80
Module10: Perform Basic Milling Operations **Aim:** After successful completion of this module, the trainee is competent in performing basic milling operations	**LU1:** Prepare Milling machine for job **LU2:** Perform workpiece and tool setting for milling operation **LU3:** Prepare a job by performing basic Milling Operations **LU4:** Inspect the job as per drawing	17	63	80
Module 11: Perform Basic Engineering Drawing **Aim:** After successful completion of this module, the trainee is competent in performing basic engineering drawing	**LU1:** Explore the Lettering and Lines **LU2:** Create a Design Using Different Geometrical Shapes **LU3:** Explore Orthographic views of simple shapes **LU4:** Explore types of dimensioning and drawing symbols **LU5:** Draw drawing of fasteners **LU6:** Explore Assembly and detailed drawings	17	63	80

Modules

Module 1: Maintain Personal Health, Hygiene and Safety

Objective of the module: The aim of this module to get knowledge, skills and understanding to maintain personal health, hygiene and safety

Duration: 30hours **Theory:** 20 hours **Practical:** 10 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Identify Hazards at Workplace	**The trainee will be able to:** **1.** Interpret work processes and procedures correctly to identify risk to Health, hygiene and safety at workplace **2.** Recognize processes, tools, equipment and consumable materials that have the potential to cause harm	• Types of hazards that are most likely to cause harm to health and safety • Health and safety precautions • Techniques and methods to identify the risks of hazards at workplace • Explain different types of tools, equipment and consumable materials • Methods of Dealing with hazard to avoid any accident or injury	**Total:** 07hrs **Theory:** 05hrs **Practical:** 02hrs	• Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system	Class room

	3. Prepare Report of the identified risk to Health, hygiene and safety				
LU2: Apply Personal Protective and Safety Equipment (PPE)	**The trainee will be able to:** **1.** Select personal protective equipment in terms of type and quantity according to work orders **2.** Wear, adjust, and maintain personal protective equipment to ensure correct fit and optimum protection in compliance with company procedures **3.** Ensure personal protective equipment is	• Describe the types of Personal protective equipment (PPEs) • Importance of personal protective equipment • Define the Maintenance and cleaning of PPEs	**Total:** 07hrs **Theory:** 05hrs **Practical:** 02hrs	• Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system • PPEs (Safety glasses, Ear muffs/ear plugs, Protective Gloves, Cap, Safety shoes etc.)	

	cleaned and stored in proper place				
LU3: Observe Occupational Safety and Health (OSH)	**The trainee will be able to:** **1.** Maintain cleanliness and hygiene as per organizational policy **2.** Comply with Health, hygiene and safety precautions before starting work **3.** Follow organizational Health, hygiene and safety guidelines during work **4.** Deal with resolvable problems according to	• Types of personal hygiene • Define safety reporting procedures and documentation • Importance of organizational Health, hygiene and safety guidelines • Explain resolvable problems at workplace • Importance of housekeeping at workplace	**Total** 07hrs **Theory:** 05hrs **Practical:** 02hrs	• Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system • Safety manuals	

	prescribed procedures **5.** Report un resolvable problems to immediate supervisor **6.** Place the tools equipment etc. at their prescribed place after completion of work				
LU4: Dispose of hazardous Waste/materials	**The trainee will be able to:** **1.** Identify hazardous waste/ drug materials which needs to be disposed off **2.** Collect hazardous or non-hazardous waste carefully from the designated area as	• Types of hazardous waste/ drug materials • Types of non-hazardous waste • Explain the difference between non-hazardous and hazardous waste • Explain the hazardous or non-hazardous waste collection procedures • Define the hazardous or non-hazardous waste disposal procedures	**Total:** 09hrs **Theory:** 05hrs **Practical:** 04hrs	• Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system	

	per approved procedure **3.** Use proper disposal hazardous containers for dispose-off hazardous waste as per procedure **4.** Take necessary precautions like putting masks and gloves while disposing hazardous waste/ materials as per standard operating procedure				

Module 2: Perform Basic Communication Skills

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform basic communication.

Duration: 30 hours **Theory:** 20 hours **Practical:** 10hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Work in Team	**The trainee will be able to:** **1.** Treat team members with respect and maintain positive relationships to achieve common organizational goals **2.** Listen to instructions carefully & comply with those instructions **3.** Provide work related information to team members and identify interrelated work activities to avoid confusion **4.** Adopt communication skills, appropriate to	• Importance and application of Work ethics • Explain the importance of good communication skills (7Cs of effective communication) • Define Workplace dress code • Describe the role of team members and functionality of the teams • Describe team dynamics and stages of team development • Describe Conflict resolution strategies	**Total:** 08hrs **Theory:** 07hrs **Practical:** 02hrs	• Notebooks • Pen • White board • Multimedia • Internet • Computer system	Class room

	work activities and organizational/medical procedures **5.** Identify problems and resolve them through discussion and mutual agreement				
LU2: Follow Supervisor's instructions	**The trainee will be able to:** **1.** Carefully listen and note down the instructions of Supervisor **2.** Carry out the instructions of the supervisor **3.** Report to the supervisor as per organizational SOPs	• Define Reporting techniques	**Total:** 08hrs **Theory:** 07hrs **Practical:** 02hrs	• Notebooks • Pen • White board • Multimedia • Internet • Computer system	Class room

LU3: Demonstrate Basic IT Skills	**The trainee will be able to:** **1.** Create folders and files and learn major commands of operating system/windows **2.** Type text and use major commands such as printing, editing, creating tables and graphs etc. **3.** Generate office reports using appropriate computer applications **4.** Use internet for sending/receiving emails and connecting through social or other media	• Explain the importance of Basic computer skills • Different Types of computer applications for office reports • Types of internet browser • Enlist different types of social media • Explain Internet and E-mailing	**Total:** 14hrs **Theory:** 06hrs **Practical:** 06hrs	• Notebooks Pen • White board • Multimedia • Internet • Computer system	Class room

Module 3: Perform Basic Computer Operations

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform basic computer operations.

Duration: 50 hours **Theory:** 20 hours **Practical:** 30 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Configure Computer System	**The trainee will be able to:** **1.** Connect computer components and peripherals as per requirement **2.** Install drivers and applications according to the software specification • Troubleshoot applications to trace and fix faults in a specific application to bring it in a running condition	• Describe Operating systems • Describe Hardware and Software • Define Troubleshooting	**Total:** 15hrs **Theory:** 05hrs **Practical:** 10hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • White board • Multimedia • Internet • Computer system	Class room

LU2: Prepare a MS word document	**The trainee will be able to:** **1.** Compose a document as per the requirement **2.** Format Word Document according to given requirements. **3.** Print Word Documents according to requirements	• Define Hyperlink and referencing • Describe Printing • Define Formulas • Explain Short Keys • Describe WPM (Word Per Minute)	**Total:** 10hrs **Theory:** 04hrs **Practical:** 06hrs	• Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system • Pen	Class room
LU3: Prepare Spreadsheet in MS Excel	**The trainee will be able to:** **1.** Develop a worksheet as per given data **2.** Format the worksheet according to given criteria	• Define Hyperlink and referencing • Describe Printing • Explain Short Keys • Describe WPM (Word Per Minute)	**Total:** 15hrs **Theory:** 07hrs **Practical:** 08hrs	• Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet	Class room

	3. Apply Formulas according to the requirement **4.** Generate Charts/Graphs according to the given data **5.** Print Worksheet according to requirements			• Computer system • Pen	
LU4: Prepare presentation in MS Power Point	**The trainee will be able to:** **1.** Insert Slides with different Layouts according to requirements of presentation **2.** Insert text, tables, images, etc. according to the requirement **3.** Apply a set of effects to animate the slide according to requirement	• Define Formulas • Explain Short Keys • Types of different slides	**Total:** 10hrs **Theory:** 04hrs **Practical:** 06hrs		

	4. Apply Slide Transitions on Slides according to requirement **5.** Apply Sound Effects on Objects/text/images according to requirement **6.** Present a presentation according to 7Cs of communication				

Module 4: Perform Calculations and Estimation for Mechanical Work

Objective of the module: The aim of this module is to get knowledge, skills and understanding to perform calculations and estimation for mechanical work

Duration: 50 hours **Theory:** 10 hours **Practical:** 40 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform Estimation of Materials	**The trainee will be able to:** **1.** Interpret Basic Mechanical Drawing **2.** Identify requirements of the material(s) for the work in accordance with the job specifications and drawing **3.** Confirm the requirement of the materials from the client or supervisor for accurate estimation **4.** Quantify the material as per drawing **5.** Make necessary adjustments in estimates, where required **6.** Calculate man-hours and machine-hours for work in accordance with the job	• Common Types of materials used in machinist work and their costing • Norms and standard formats of preparing estimates • Record keeping and reporting • Knowledge of current market prices of materials and accessories to calculate the job costs • Norms in interacting & negotiating with customers/clients **Practical Activity:** • Calculate material and working hours required for the given job	**Total:** 25hrs **Theory:** 5hrs **Practical:** 20hrs	• Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system • Pen • Measuring instruments and marking tools	Class room

	requirements			Scientific calculator	
LU2: Prepare Costing for the Work	**The trainee will be able to:** **1.** Use required methods for the calculation of cost of material and accessories keeping in view the current market prices **2.** Prepare labour cost for the work as per job requirement **3.** Prepare overheads cost for the work as per job requirement **4.** Present the cost estimates to the client for approval	• Knowledge of current market prices of materials and accessories to calculate the job costs • Norms in interacting & negotiating with customers/clients • Method of calculating labour costs/overheads/profit margin etc. • Record keeping and reporting **Practical Activity:** • Calculate material and working hours required for the given job	**Total:** 25hrs **Theory:** 5hrs **Practical:** 20hrs	• Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system	Class room

Module 5: Carryout General Maintenance

Objective of the module: The aim of this module is to get knowledge, skills and understanding to carry out general maintenance

Duration: 50 hours **Theory:** 10hours **Practical:** 40 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform General Housekeeping & Maintenance	**The trainee will be able to:** **1.** Apply appropriate methods and techniques for cleanliness and maintenance of machines & tools **2.** Clean and maintain all workplace tools & machines as per housekeeping checklists or given instructions **3.** Prepare checklist for daily cleanliness of the workplace **4.** Respond appropriately to safety hazards on all bench-work tools and machines **5.** Place all the tools &	• Knowledge of guidelines and checklists to conduct maintenance and housekeeping of machines and tools • Cleanliness of the machine and workplace • Knowledge of storing all tools and material in specified place • Knowledge of guidelines and checklists to conduct maintenance • Housekeeping of machines and tools as instructions given **Practical Activity:** • Prepare a checklist to conduct maintenance and housekeeping of given equipment	**Total:** 15hrs **Theory:** 03hrs **Practical:** 12hrs	• Notebooks • Pencils • Erasers • Sharpeners • Cleaning Tools • Cleaning Cloth • Lubricants • White board • Multimedia • Internet • Computer system • Pen	Class room /Workshop

	material in proper place to ensure safe work **6.** Prepare specific guidelines and checklists to conduct maintenance and housekeeping of machines & tools				
LU2: Perform Preventive Maintenance	**The trainee will be able to:** **1.** Read and interpret maintenance schedule carefully **2.** Prepare oiling and greasing chart (daily, weekly as per machine requirement) **3.** Prepare machine history record - date of installation, condition, oiling and maintenance	• Personal protective equipment (PPEs) and workplace safety • Understand machine operations • Understand machine manuals for oiling, greasing and function of machines • Knowledge and scope of preventive maintenance of machines • Preparation of check list for preventive maintenance of machines.	**Total:** 15hrs **Theory:** 03hrs **Practical:** 12hrs	• Notebooks • Pencils • Erasers • Sharpeners • Cleaning Tools • Cleaning Cloth • Lubricants • Tool Box	Class room /Workshop

	4. Inspect and assess the general condition of an assigned machine on regular basis **5.** Observe problems and carry out routine maintenance as per given instructions and schedules **6.** Identify faulty/damaged/ worn out parts and take appropriate steps to replace them **7.** Report faults and problems of the machines, if not controllable, to the person concerned	• Identify faulty/damaged/ worn out parts and removing minor faults by replacing them • Maintaining history record of assigned machines • Observation of routine maintenance problems and solving them. writing report to authority for those problems which are beyond the scope **Practical Activity:** • Perform preventive maintenance of given equipment according to checklist		• White board • Multimedia • Internet • Computer system • Pen	
LU3: Perform Maintenance of Tooling	**The trainee will be able to:** **1.** Clean and maintain all bench-work tools and machines as per housekeeping checklists or instructions provided **2.** Prepare checklist for daily cleanliness of the	• Knowledge of guidelines and checklists to conduct maintenance and housekeeping of work bench machines and tools. • Storing the tools and materials in specified place to ensure safe work	**Total:** 20hrs **Theory:** 04hrs **Practical:** 16hrs	• Notebooks • Pencils • Erasers • Sharpeners	Class room /Workshop

	workplace **3.** Respond appropriately to safety hazards on all bench-work tools & machines **4.** Identify all the tools and material in proper place to ensure safe work **5.** Perform installation and setting of tool on machine **6.** Adopt methods and techniques for cleanliness and maintenance of tools	• Adopt methods and techniques for cleanliness and maintenance of tools **<u>Practical Activity:</u>** • Perform installation of tool for machine operation		• Cleaning Tools • Cleaning Cloth • Lubricants • Tool box • Cutting Tools • White board • Multimedia • Internet • Computer system • Pen	

Module 6: Perform Bench Works

Objective of the module: **The aim of this module is to get knowledge, skills and understanding to** perform bench works

Duration: 50 hours **Theory:** 11 hours **Practical:** 39 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place

LU1: Carry out Sawing	**The trainee will be able to:**
	1. Select appropriate blade according to the material and set in hacksaw frame
	2. Mark layout of job as per drawing using appropriate marking tool
	3. Perform clamping of the work piece according to the instructions
	4. Perform sawing according to the instructions
	5. Check quality of the component at
		• Define sawing process
		• Describe Types of hacksaw frames:
		  ○ Fixed
		  ○ Adjustable
		• Types of hacksaw blades i.e.
		  ○ Rigid
		  ○ Flexible
		• TPI of hacksaw blades i.e. (4 TPI, 18 TPI, 24 TPI, 32 TPI, etc.)
		• Measuring and marking tools
		• Workpiece clamping device: (Bench vice, machine vice, v-blocks, c- clamps, etc.)
		• Standard procedure for sawing (gestures, griping, stroking, etc.)
		• Interpretation of drawing
		<u>Practical Activity:</u>
			Total: 08hrs
			Theory: 02hrs
			Practical: 06hrs
				• Notebooks
				• Pencils
				• Erasers
				• Sharpeners
				• Pen
				• Raw materials
				• Hacksaw blades
				• Marking ink
				• White board
				• Multimedia
				• Internet
				• Computer system
				• Steel rule
					• Class Room
					• Workshop

	suitable intervals **6.** Verify the final job with the given drawing	• Perform sawing operation of the given metal plate with the help of Hacksaw		• Measuring tools • Marking tools • Clamping devices	
LU2: Carry out Filing	**The trainee will be able to:** **1.** Select appropriate file type according to the material & profile **2.** Select appropriate marking tool and mark layout of job as per drawing **3.** Select appropriate clamping device and clamp the work piece **4.** Perform filing as per standard procedures **5.** Check quality of the component at suitable intervals	• Define File • Classification of files according to shapes, cuts and finish • Standard procedure for filing i.e. (gesture, griping, stroking, etc.) • Standard procedures to clean the file during the filing procedure • Standard procedures to check quality of the component at suitable intervals using appropriate tools **<u>Practical Activity:</u>** • Perform filing operation of given metal plate (LU1) according to given angle	**Total:** 18hrs **Theory:** 03hrs **Practical:** 15hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Raw materials • White board • Multimedia • Internet • Computer system • Measuring tools • Marking Tools	• Class Room • Workshop

	6. Verify the final job with the given drawing			• Clamping devices • Files • File cards • Cleaning brush	
LU3: Carry out Drilling	**The trainee will be able to:** **1.** Select appropriate tool & clamping device according to the job requiremen **2.** Manage the marking tool and measuring instruments as per job requirement **3.** Clamp the work piece as per job requirement **4.** Set the machine RPM according to the drill size and work piece	• Define Drill bits • Classification of drills according to size and material • Types of drill machines (bench type, pillar type, column type, radial type, etc.) • Major functional parts of a drill machine (machine head, work table, speed pulley, feed lever, spindle / quill, drill chuck, sleeves, etc.) • Types of metal (Ferrous and non-ferrous, etc.) • Types of drill bits according to shape and material • Cutting speed of common engineering materials (aluminum, mild steels, cast iron, carbon steels, copper, brass, etc.) • Calculation method for RPM	**Total:** 10hrs **Theory:** 02hrs **Practical:** 08hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Raw materials • Coolants • Lubricants • White board • Multimedia • Internet • Computer system • Measuring tools	• Class Room • Workshop

	material **5.** Perform drilling as per standard procedures **6.** Perform post drilling operations **7.** Check quality of the component at suitable intervals. **8.** Verify the final job with the given drawing	• Standard procedures to perform drilling • Post drilling operations (chamfering, bur removing etc.) • Standard procedures to check quality of the component at suitable intervals using appropriate tools **Practical Activity:** • Perform drilling operation of required size on given job		• Marking Tools • Clamping devices • Drilling tools • Cleaning brush	
LU4: Carry out Reaming	**The trainee will be able to:** **1.** Select appropriate reamer according to the job specification **2.** Select appropriate marking tool and mark layout of job as per drawing **3.** Select appropriate clamping device and clamp the work piece	• Define Reamers • Explain purpose of reaming operation (Size as per tolerance, Roundness of holes, Surface finish of holes) • Types of reamers (Machine reamer, Hand reamer) • Knowledge of tolerances and fits • Standard procedure for drilling to produce hole according to the size of reamer as per drawing tolerance • Standard procedures for hand or machine reaming	**Total:** 04hrs **Theory:** 01hrs **Practical:** 03hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Raw materials • Coolants • Lubricants • White board • Multimedia	• Class Room • Workshop 2

	4. Perform drilling to produce hole according to the size of reamer **5.** Perform reaming as per job specification **6.** Verify the final job with given drawing	• Standard procedures to check quality of the component using appropriate tools **Practical Activity:** • Perform reaming operation of required size on given job		• Internet • Computer system • Measuring tools • Marking Tools • Clamping devices • Drilling tools • Cleaning brush	
LU5: Carry out Tapping	**The trainee will be able to:** **1.** Select appropriate tap according to the job specification **2.** Select appropriate marking tool and mark layout of job as per drawing **3.** Select appropriate clamping device and clamp the work piece	• Define Taping • Types of taps (machine taps and hand taps) • Selection of drill size according to tap size • Standard procedures for taping • Standard procedures to check quality of the component using appropriate tool **Practical Activity:** • Perform tapping operation of required size on given job	**Total:** 07hrs **Theory:** 02hrs **Practical:** 05hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Raw materials • Coolants • Lubricants • White board	• Class Room • Workshop

	4. Perform drilling to produce hole according to tap size **5.** Perform taping as per job specification **6.** Verify the final job with given drawing			• Multimedia • Internet • Computer system • Measuring tools • Marking Tools • Clamping devices • Tap set • Cleaning brush	
LU6: Carry out Counter Sinking	**The trainee will be able to:** **1.** Select appropriate counter sinking tool according to the drawing **2.** Select appropriate marking tool and mark layout of job as per drawing **3.** Select appropriate clamping device and clamp the	• Define Counter Sinking • Purpose of counter sink • Selection of counter sinking drill • Standard procedures for counter sinking • Standard procedures to check quality of the component as per requirement **<u>Practical Activity:</u>** • Perform counter sinking operation on given job	**Total:** 03hrs **Theory:** 01hrs **Practical:** 02hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Raw materials • Coolants • Lubricants	• Class Room • Workshop

	work piece **4.** Perform drilling operation as per drawing **5.** Set the machine RPM according to the counter sink size and work piece material **6.** Perform counter sinking as per standard procedures **7.** Verify the final job with the given drawing			• White board • Multimedia • Internet • Computer system • Measuring tools • Marking Tools • Clamping devices • Drill set • Counter Sinking tools • Cleaning brush	

Module 7: Perform Shaper and Planer Operations

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform shaper and planer operations

Duration: 50 hours **Theory:** 11 hours **Practical:** 39 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare Shaper Machine for Operation	**The trainee will be able to:** **1.** Switch on the machine **2.** Check oil levels **3.** Run machine warm-up cycle **4.** Select appropriate tool & clamping device according to the job requirement **5.** Manage the measuring instruments as per job requirement	• Introduction to shaping machine and Shaping Operation • Working principles of shaping machine and its parts • Understanding the Ram and stroke settings • Explain how to calculate Feed and stroke per minute and set as per the prescribed procedure • Selection of appropriate tool & clamping device according to the job requirement • Understand measuring tool as per Requirement • Understanding of measuring and angle checking gauge **<u>Practical Activity:</u>**	**Total:** 06hrs **Theory:** 04hrs **Practical:** 02hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Lubricants • Coolant • White board • Multimedia • Internet • Computer system • Measuring tools • Marking Tools	• Class Room • Workshop

		• Run warm up cycle for Shaper Machine		• Clamping devices • Shaping tool • Cleaning brush • Cotton rags • PPEs'	
LU2: Set tool and job for Shaper Machine for Operation	**The trainee will be able to:**	• Mounting and dialing of machine vice • Clamping methods of shaping tool • Clamping methods of workpiece on shaping machine • Explain how to maintain safe distance between surface of work-piece and tooltip for the initial setting of Ram stroke and depth of cut • Define Speed, feed and depth of cut settings of shaping machine **Practical Activity:** • Perform job and tool setting on shaper machine	**Total:** 05hrs **Theory:** 01hrs **Practical:** 04hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Lubricants • Coolant • White board • Multimedia • Internet • Computer system • Measuring tools	• Class Room • Workshop

	1. Clamp the material of work-piece and tool into its holding devices as per standard practice **2.** Maintain safe distance between surface of work-piece and tooltip as per prescribed method **3.** Adjust the ram placement and stroke length according to the length of job **4.** Adjust the parameters of shaping (speed and feed) from control unit as per prescribed method **5.** Start shaping operation by locating the initial touching point and			• Marking Tools • Clamping devices • Shaping tool • Cleaning brush • Cotton rags • PPEs'	

	adjust the depth of cut as per SOPs				
LU3: Perform simple Shaping Operation (Square Job)	**The trainee will be able to:** **1.** Perform the shaping operation at top surface of workpiece to get flatness as per initial requirements **2.** Re-clamp the work-piece by rotating to next surface as per prescribed method **3.** Shape entire work-piece by following the above stated method for next surfaces to get square shaped workpiece according to drawing **4.** Check quality of	• Interpreting information given in the engineering drawings and job specifications • Describe square shaping procedure • Explain the procedure to clamp workpiece for squaring • Explain how to perform shaping of each side one by one and check squareness • Describe importance of Deburring and checking size • Re clamp the job and complete the square • Standard procedures for Shaping • Standard procedures to check quality of the workpiece as per requirement • Explain how to neutralize and shut down the machine as per standard procedures **<u>Practical Activity:</u>**	**Total:** 10hrs **Theory:** 01hrs **Practical:** 09hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Lubricants • Coolant • White board • Multimedia • Internet • Computer system • Measuring tools • Marking Tools • Clamping devices • Shaping tool	• Class Room • Workshop

	the component at suitable intervals **5.** Shut down the machine at safe position after finishing the work.	• Perform squaring of given job on Shaper Machine		• Cleaning brush • Cotton rags • PPEs'	
LU4: Perform Angular Shaping Operations	**The trainee will be able to:** **1.** Mark work-piece according to the drawing **2.** Ensure proper clamping of the work-piece and the tool according to standard practice **3.** Set and align the sliding degree of head according to required angle **4.** Start the angular shaping operation to get required angle as per marked lines of layout	• Interpreting information given in the engineering drawings and mark the work-piece according to the drawing • Describe Angular shaping procedure • Explain the procedure to clamp workpiece for Angular shaping • Explain how to perform Angular shaping on required side of work-piece and check the required angle • Standard procedures for Angular Shaping • Standard procedures to check quality of the workpiece as per requirement • Explain how to neutralize and shut down the machine as per standard procedures	**Total:** 10hrs **Theory:** 01hrs **Practical:** 09hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Lubricants • Coolant • White board • Multimedia • Internet • Computer system • Measuring tools • Marking Tools	• Class Room • Workshop

	5. Shape entire work-piece to get angle and sizes of work-piece according to the drawing **6.** Check quality of the component at suitable interval **7.** Shut down the machine at safe position after finishing the work	**Practical Activity:** • Perform angular shaping of given job on Shaper Machine		• Clamping devices • Shaping tool • Cleaning brush • Cotton rags • PPEs'	
LU5: Prepare planer machine for operation	**The trainee will be able to:** **1.** Switch on the machine **2.** Check oil levels **3.** Run machine warm-up cycle **4.** Select appropriate tool & clamping device according to the job requirement **5.** Manage the	• Introduction to Planer machine and Planer Operation • Working principles of Planer machine and its parts • Describe the Platen and stroke setting • Explain how to calculate Feed and stroke per minute and set as per the prescribed procedure	**Total:** 04hrs **Theory:** 02hrs **Practical:** 02hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Lubricants • Coolant • White board • Multimedia • Internet	• Class Room • Workshop

	measuring instruments as per job requirement	• Selection of appropriate tool & clamping device according to the job requirement • Explain measuring and angle checking gauge **Practical Activity:** • Run warm up cycle for planer machine		• Computer system • Measuring tools • Marking Tools • Clamping devices • Planer machine and tools • Cleaning brush • Cotton rags • PPEs'	
LU6: Set tool and Job for Planer Machine Operation	**The trainee will be able to:** Clamp the material of work-piece and tool into its holding devices as per standard practice	• Clamping methods of Planer tool • Clamping methods of workpiece on Planer machine • Explain how to maintain safe distance between surface of work-piece and tooltip for the initial setting of depth of cut and table movement • Define Speed, feed and depth of cut settings of Planer machine	**Total:** 05hrs **Theory:** 01hrs **Practical:** 04hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Lubricants • Coolant	• Class Room • Workshop

	1. Maintain safe distance between surface of work-piece and tooltip as per prescribed method **2.** Adjust the platen stroke length according to the length of job **3.** Adjust the parameters of planer (speed and feed) from control unit as per prescribed method **5.** Start planer operation by locating the initial touching point and adjust the depth of cut as per SOPs	**Practical Activity:** • Perform job and tool setting on planer machine		• White board • Multimedia • Internet • Computer system • Measuring tools • Marking Tools • Clamping devices • Planer machine and tools • Cleaning brush • Cotton rags • PPEs'	
LU7: Perform Planar Operation	**The trainee will be able to:**	• Interpreting information given in the engineering drawings and job specifications	**Total:** 10hrs	• Notebooks • Pencils • Erasers	• Class Room • Workshop

	1. Perform the planer operation at top surface of workpiece to get flatness as per initial requirements **2.** Re-clamp the work-piece by rotating to next surface as per prescribed method **3.** Complete entire work-piece by following the above stated method for next surfaces to get required shape and size of workpiece according to drawing **4.** Check quality of the component at suitable intervals **5.** Shut down the	• Describe square shaping procedure • Explain the procedure to clamp workpiece for squaring • Explain how to perform Planer operation on each side one by one and check squareness • Describe importance of Deburring and checking size • Re clamp the job and complete the square • Standard procedures for Planer operations • Standard procedures to check quality of the workpiece as per requirement • Explain how to neutralize and shut down the machine as per standard procedures **<u>Practical Activity:</u>** • Perform planer operation in planning machine as per required dimensions	**Theory:** 01hrs **Practical:** 09hrs	• Sharpeners • Pen • Lubricants • Coolant • White board • Multimedia • Internet • Computer system • Measuring tools • Marking Tools • Clamping devices • Planer machine and tools • Cleaning brush • Cotton rags • PPEs'	

	machine at safe position after finishing the work.				

Module 8: Perform Basic Grinding Operations

Objective of the module: The aim of this module is to get knowledge, skills and understanding to perform basic grinding operations

Duration: 50 hours **Theory:** 11 hours **Practical:** 39 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Carry out Hand Grinding	**The trainee will be able to:** **1.** Select appropriate hand grinder & grinding wheel / disc as per job specifications **2.** Mount the grinding wheel / disc as per standard procedure **3.** Perform grinding as per standard procedures	• Explain Hand grinder functions and its attachments • Testing and mounting of grinding disc for hand grinder • Standard procedures for Hand grinding operations **<u>Practical Activity:</u>** • Perform deburring operation with the help of Hand Grinder	**Total:** 06hrs **Theory:** 01hrs **Practical:** 05hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Grinding disc • White board • Multimedia • Internet • Computer system • Measuring tools • Marking Tools	• Class Room • Workshop

				• Clamping devices • Hand Grinder • Cleaning brush • Cotton rags • PPEs'	
LU2: Perform single point Tool Grinding on Pedestal Grinder	**The trainee will be able to:** **1.** Perform tool grinding operation by holding the tool firmly against the rotating wheel by placing it on the tool rest **2.** Dip tool in coolant at intervals to avoid over heating of the job **3.** Adopt technique and methods as per requirements of tool geometry	• Pedestal grinding machine function and Its attachments. • Testing and mounting of grinding wheel • Setting of tool rest • Knowledge of care and maintenance of grinding machine and wheel dressing • Explain the standing position during grinding • Standard procedures for single point Tool Grinding operations • Describe the procedure to dip the tool in coolant (water) at intervals to avoid over heating of the job • Interpret basic features of tool Geometry	**Total:** 12hrs **Theory:** 02hrs **Practical:** 10hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • HSS Tool cotter • Grinding wheel • White board • Multimedia • Internet • Computer system	• Class Room • Workshop

	4. Check quality of the tool at suitable intervals **5.** Shut down the grinder after finishing the work	• Standard procedures to check quality of the workpiece as per requirement • Explain how to neutralize and shut down the machine as per standard procedures **Practical Activity:** • Perform sharpening of single point cutting tool on pedestal grinder		• Measuring tools • Pedestal grinder • Wheel dresser • Cleaning brush • Cotton rags • PPEs'	
LU3: Perform Mounting and Dressing of Grinding Wheel on surface Grinding machine	**The trainee will be able to:** **1.** Select appropriate grinding wheel according to the work piece material **2.** Mount the grinding wheel as per standard procedure **3.** Dress the grinding wheel as per standard procedure	• Explain the types of grinding wheels according to abrasive, grit, grade, binder, etc. • Describe the sizes and shapes of grinding wheels • Standard procedure to mount the grinding wheel (Testing, balancing, mounting, dressing, etc.) • Explain how to neutralize and shut down the machine as per standard procedures **Practical Activity:**	**Total:** 10hrs **Theory:** 05hrs **Practical:** 05hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Grinding wheel • White board • Multimedia • Internet • Computer system	• Class Room • Workshop

	4. Shut down the machine after completion the task	• Perform Dressing of Grinding Wheel on surface Grinding machine		• Measuring tools • Surface grinder • Diamond wheel dresser • Cleaning brush • Cotton rags • PPEs'	
LU4: Perform Surface Grinding	**The trainee will be able to:** **1.** Select appropriate tool & clamping device according to the job requirement **2.** Manage the measuring instruments as per job requirement **3.** Switch on the machine and check coolant	• Surface grinding machine parts, attachments and functions • Standard procedures for surface grinding, including: o Managing measuring instruments o Dressing of grinding wheel (when required) o Mounting of workpiece on required holding device (Magnetic chuck, grinding vice, Angle Plate, etc.)	**Total:** 22hrs **Theory:** 03hrs **Practical:** 19hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Coolant • Grinding wheel • White board • Multimedia • Internet	• Class Room • Workshop

	levels **4.** Run machine warm-up cycle **5.** Clamp the work piece as per standard procedure **6.** Set travel length of machine table as per workpiece	○ Setting Surface grinding machine (Warm-up cycle, level checks of coolants, etc.) ○ Setting travel length of machine table ○ Setting table feed and depth of cut ○ Use of coolants ○ Cleaning and deburring the work-piece ○ Verification of dimensional and geometrical accuracy at suitable intervals ○ Taking standard safety measures during the whole process ○ Checking quality of the workpiece • The process of neutralization and shutting down the machine as per standard procedures • Dressing of Grinding Wheel on surface Grinding machine **<u>Practical Activity:</u>** • Perform squaring of job on surface grinding machine		• Computer system • Measuring tools • Surface grinding machine • Wheel dresser • Cleaning brush • Cotton rags • PPEs'	

	7. Check the grinding machine safety covers before starting the process **8.** Maintain safe distance between work piece & grinding wheel **9.** Apply coolant on grinding surface **10.** Perform grinding as per standard procedure **11.** Clean & deburr the workpiece **12.** Verify dimensional and geometrical accuracy at suitable intervals **13.** Shut down the machine in safe position after finishing the work				

Module 9: Perform Lathe Operations

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform lathe operations

Duration: 80 hours **Theory:** 17 hours **Practical:** 63 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare a Lathe machine for operation	**The trainee will be able to:** **1.** Switch on the machine **2.** Check oil levels **3.** Run machine warm-up cycle **4.** Select appropriate tool & clamping device according to the job requirement **5.** Manage the measuring instruments as per job requirement	• Define Lathe Operations (Turning, facing, Knurling, etc.) • Types of lathe machine (Bench lathe, center lathe, tool room lathe, Turret lathe, Automatic lathe, special purpose lathe, etc.) • Major functional parts of a lathe machine (carriage, head stock, tailstock, etc.) • Precision measuring tools (Vernier caliper, micrometer, etc.) • Types of cutting tools (HSS, carbide tip tools, etc.) • Define tools clamping methods • Method of setting machine parameters (speed, feed etc.)	**Total:** 11hrs **Theory:** 06hrs **Practical:** 05hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Coolant • Cutting tools • White board • Multimedia • Internet • Computer system • Measuring tools	• Class Room • Workshop

		• Workpiece clamping devices (three jaws chuck, four jaws chuck, face plate and tail stock, collets, etc.) • Use of dial indicators (dial indicator, lever gauge, magnetic stand, etc.) • Methods of dialing **<u>Practical Activity:</u>** • Follow SOPs to start lathe machine		• Lathe machine • Cleaning brush • Cotton rags • PPEs'	
LU2: Perform Facing	**The trainee will be able to:**	• Define Facing • Define cutting parameters and calculations (cutting speed, feed and depth of cut) • Tool angles and their application for different materials (Rack angle, clearance angle, wedge angle, face clearance, etc.) • Standard procedures for Facing operations, including: o Clamping and centering of work-piece	**Total:** 09hrs **Theory:** 02hrs **Practical:** 07hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Coolant • Cutting tools • White board • Multimedia • Internet	• Class Room • Workshop

	1. Clamping and centring the work piece as per SOPs **2.** Ensure final clamping as per requirement **3.** Clamp the tool in tool post & set in required angle **4.** Set machine parameter as per job specifications **5.** Start facing operation by initial touching and adjust the depth of cut as per SOPs. **6.** Carry out facing operation as per standard procedure **7.** Check quality of the component at suitable intervals **8.** Shut down the machine at safe	○ Clamping of tool ○ Setting machine parameters ○ Adjusting depth of cut ○ Carrying out facing operations ○ Taking standard safety measures during the whole process ○ Inspection of the workpiece • Explain how to neutralize and shut down the machine as per standard procedures **<u>Practical Activity:</u>** • Perform facing operation as per dimensions on lathe machine		• Computer system • Measuring tools • Lathe machine • Cleaning brush • Cotton rags • PPEs'	

	position after finishing the work				
LU3: Perform Turning	**The trainee will be able to:** **1.** Clamp the tool in tool post & set in required angle **2.** Set machine parameter as per job specifications **3.** Centring the work piece as per SOPs **4.** Ensure final clamping as per requirement **5.** Start turning operation by initial touching and adjust the depth of cut as per SOPs **6.** Carry out turning operation as per drawing **7.** Check quality of the component at suitable intervals	• Define Turning • Describe Turning operations (Straight, step and tapper) • Explain methods of Tapper turning • Standard procedures for Turning operations, including: o Clamping and centering of work-piece o Clamping of tool o Setting machine parameters o Adjusting depth of cut o Carrying out turning operations o Taking standard safety measures during the whole process o Inspection of the workpiece • Explain how to neutralize and shut down the machine as per standard procedures **<u>Practical Activity:</u>**	**Total:** 22hrs **Theory:** 03hrs **Practical:** 19hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Coolant • Cutting tools • White board • Multimedia • Internet • Computer system • Measuring tools • Lathe machine • Cleaning brush • Cotton rags • PPEs’	• Class Room • Workshop

	8. Shut down the machine at safe position after finishing the work	• Perform turning operation as per dimensions on lathe machine			
LU4: Perform Thread Cutting	**The trainee will be able to:**	• Define Thread cutting • Explain Thread terminology • Types of Thread according to shape and start and their applications • Thread cutting calculations • Standard procedures for Thread Cutting operations, including: o Clamping and centering of work-piece o Clamping of tool o Setting machine parameters o Carrying out Thread cutting operations o Taking standard safety measures during the whole process o Inspection of the workpiece • Explain how to neutralize and shut down the machine as per standard procedures	**Total:** 11hrs **Theory:** 02hrs **Practical:** 09hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • Coolant • Threading tools • White board • Multimedia • Internet • Computer system • Measuring tools • Lathe machine	• Class Room • Workshop

	1. Clamping and centring the work piece as per SOPs **2.** Ensure final clamping as per requirement **3.** Clamp and set the tool in tool post **4.** Set machine gear drive mechanism and other parameters as per job specifications **5.** Engage half nut lever at specific point on thread dial **6.** Start thread cutting operation by initial touching and adjust the depth of cut micrometer at zero point **7.** Disengage half nut lever at the end of threading length **8.** Move back the	**<u>Practical Activity:</u>** • Perform thread cutting operation as per dimensions on lathe machine		• Thread Pitch Gauge • Cleaning brush • Cotton rags • PPEs'	

	cross slides to maintain appropriate clearance distance between tool and job **9.** Move back the carriage before starting point of thread **10.** Set the next depth of cut and repeat threading cycle up to the completion of thread according to required depth **11.** Check quality of the component at suitable intervals **12.** Shut down the machine at safe position after finishing the work				

LU5: Perform Parting	**The trainee will be able to:**
	1. Clamping and centring the work piece as per SOPs
	2. Ensure final clamping as per requirement
	3. Clamp & set the tool in tool post.
	4. Set machine parameter as per job specifications
	5. Carry out parting operation as per standard procedure
	6. Check quality of the component at suitable intervals
	7. Shut down the machine at safe position after finishing the work
		• Define Parting
		• Describe Angles (Rack angle, clearance angle, wedge angle, face clearance, etc.)
		• Tools for Straight parting and Parting
		• Clamping method of parting tool
		• Standard procedures for Parting operations, including:
		  ○ Clamping and centering of work-piece
		  ○ Clamping of parting tool
		  ○ Setting machine parameters
		  ○ Carrying out Parting operations
		  ○ Taking standard safety measures during the whole process
		  ○ Inspection of the workpiece
		• Explain how to neutralize and shut down the machine as per standard procedures
		
		<u>Practical Activity:</u>
			Total:
			07hrs
			Theory:
			01hrs
			Practical:
			06hrs
				• Notebooks
				• Pencils
				• Erasers
				• Sharpeners
				• Pen
				• Coolant
				• Cutting tools
				• White board
				• Multimedia
				• Internet
				• Computer system
				• Measuring tools
				• Lathe machine
				• Cleaning brush
				• Cotton rags
				• PPEs’
					• Class Room
					• Workshop

		Perform parting off operation as per given size on lathe machine			

LU6: Perform Drilling/Boring	**The trainee will be able to:**	• Define Drilling, Boring and counter Boring operations
		• Describe Drilling/Boring tools and their settings for lathe machine
		• Standard procedures for Drilling/Boring operations, including:
		  ○ Clamping and centering of work-piece
		  ○ Clamping of tool
		  ○ Setting machine parameters
		  ○ Carrying out Drilling and Boring operations
		  ○ Taking standard safety measures during the whole process
		  ○ Inspection of the workpiece
		• Explain how to neutralize and shut down the machine as per standard procedures
		
		<u>Practical Activity:</u>
			Total:
			11hrs
			Theory:
			02hrs
			Practical:
			09hrs
				• Notebooks
				• Pencils
				• Erasers
				• Sharpeners
				• Pen
				• Coolant
				• Drills
				• Boring tips/inserts
				• White board
				• Multimedia
				• Internet
				• Computer system
				• Measuring tools
				• Lathe machine
				• Boring bars
					• Class Room
					• Workshop

	1. Clamping and centring the work piece as per SOPs **2.** Ensure final clamping as per requirement. **3.** Clamp & set the tool in tail stock. **4.** Set machine parameter as per job specifications. **5.** Perform drilling to produce appropriate hole size for boring as per SOPs **6.** Clamp the boring tool in the tool post **7.** Carry out Boring operation as per standard procedure **8.** Check quality of the component at suitable intervals **9.** Shut down the	Perform drilling and boring operation on lathe machine		• Cleaning brush • Cotton rags • PPEs'	

	machine at safe position after finishing the work				

LU7: Perform Knurling	**The trainee will be able to:**	• Define Knurling
		• Types of knurling tools (straight and diamond knurling)
		• Standard procedures for Knurling operations, including:
		  ○ Clamping and centering of work-piece
		  ○ Clamping of tool
		  ○ Setting machine parameters
		  ○ Carrying out Knurling operations
		  ○ Taking standard safety measures during the whole process
		  ○ Inspection of the workpiece
		• Explain how to neutralize and shut down the machine as per standard procedures
		<u>Practical Activity:</u>
		• Perform knurling operation on lathe machine
			Total:
			09hrs
			Theory:
			01hrs
			Practical:
			08hrs
				• Notebooks
				• Pencils
				• Erasers
				• Sharpeners
				• Pen
				• Coolant
				• Cutting tools
				• White board
				• Multimedia
				• Internet
				• Computer system
				• Measuring tools
				• Lathe machine
				• Cleaning brush
				• Cotton rags
					• Class Room
					• Workshop

	1. Clamping and centring the work piece as per SOPs **2.** Ensure final clamping as per requirement **3.** Set machine parameter as per job specifications **4.** Clamp the knurling tool in tool post **5.** Carry out machining operation for Knurling as per standard procedure **6.** Check quality of the component at suitable intervals **7.** Shut down the machine at safe position after finishing the work			• PPEs'	

Module 10: Perform Basic Milling Operations

Objective of the module: The aim of this module is to get knowledge, skills and understanding to perform basic milling operations

Duration: 80 hours **Theory:** 17 hours **Practical:** 63 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare Milling machine for job	**The trainee will be able to:** **1.** Select appropriate tool & clamping device according to the job requirement **2.** Manage the measuring instruments as per job requirement **3.** Mount the cutter as per standard procedure	• Define Milling • Types of milling machines (vertical, horizontal and universal) • Major functional parts of a milling machine (machine bed, head, speed control lever, bed travel, etc.) • Milling accessories and attachments • Milling cutter types (End mill, shell end mill, face mill, profile cutters, etc.) • Standard procedures to set machine parameters **Practical Activity:** • Follow SOPs to start Milling machine	**Total:** 14hrs **Theory:** 08hrs **Practical:** 06hrs	• Notebooks • Pencils • Erasers Sharpeners • Pen • Coolant • Lubricants • Cutting tools • White board • Multimedia • Internet • Computer system • Measuring tools	• Class Room • Workshop

	4. Set machine parameters according to the job requirement **5.** Arrange cutting fluid as per job requirement			• Milling machine • Cleaning brush • Cotton rags • PPEs'	
LU2: Perform workpiece and tool setting for milling operation	**The trainee will be able to:** **1.** Verify the dimension of material according to the drawing **2.** Identify appropriate clamping device and check its alignment on machine table **3.** Clamp the workpiece as per requirement **4.** Dial the work piece & ensure final clamping	• Interpret different drawing views of job (Isometric, orthographic) • Dialing of clamping devices for milling (Machine vice, step clamps, parallel blocks, etc.) • Standard procedure to clamp work-piece **<u>Practical Activity:</u>** • Perform tool and job setting for Milling Machine Operation	**Total:** 10hrs **Theory:** 02hrs **Practical:** 08hrs	• Notebooks • Pencils • Erasers Sharpeners • Pen • Coolant • Lubricants • Cutting tools • White board • Multimedia • Internet • Computer system • Measuring tools	• Class Room • Workshope

				• Milling machine • Cleaning brush • Cotton rags • PPEs'	

LU3: Prepare a job by performing basic Milling Operations	**The trainee will be able to:**
	1. Perform Face milling as per given instructions
	2. Perform Side milling as per given instructions
	3. Perform Slot milling as per given instructions
	4. Perform Drilling as per given instructions
	5. Perform Counter boring as per given instructions
	6. Check quality of the component at suitable intervals
		• Describe different milling operations (face milling, side milling, slot milling, drilling and counter boring)
		• Standard operating procedures for following Milling Operations:
		  ○ Face Milling
		  ○ Side Milling
		  ○ Slot Milling
		  ○ Drilling
		  ○ Counter Boring
		• Standard procedure to check quality of the component at suitable intervals
		• Explain how to neutralize and shut down the machine as per standard procedures
			Total:
			45hrs
			Theory:
			05hrs
			Practical:
			40hrs
				• Notebooks
				• Pencils
				• Erasers
				• Sharpeners
				• Pen
				• Coolant
				• Lubricants
				• Milling cutters
				• Cleaning brush
				• Cotton rags
				• White board
				• Multimedia
				• Internet
					• Class Room
					• Workshop

	7. Shut down the machine at safe position after finishing the work.	**Practical Activity:** • Perform Milling machine operation on a job as per given drawing		• Computer system • Measuring tools • Milling machines with accessories and attachments • PPEs'	
LU4: Inspect the job as per drawing	**The trainee will be able to:** **1.** Perform cleaning/deburring of the job using appropriate tool **2.** Final inspection of job according to drawing	• Explain Post milling operations (deburring, chamfering, cleaning, etc.) • Use of datum to measure different components (Edge datum, surface datum, point datum, line datum, etc.) • Use of different inspection tools to verify sizes, positions and geometry • Standard procedures to inspect job according to the drawing using appropriate tool **Practical Activity:**	**Total:** 11hrs **Theory:** 02hrs **Practical:** 09hrs	• Notebooks • Pencils • Erasers • Sharpeners • Pen • White board • Multimedia • Internet • Computer system	• Class Room • Workshop

		• Perform the dimensional inspection of the final product as per drawing		• Measuring tools • PPEs'	

Module 11: Perform Basic Engineering Drawing

Objective of the module: The aim of this module is to get knowledge, skills and understanding to perform basic engineering drawings.

Duration: 80 hours **Theory:** 17 hours **Practical:** 63 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Explore the Lettering and Lines	**The trainee will be able to:** **1.** Draw different types of lettering **2.** Draw different types of lines	• Describe lettering and its types and importance in Drawing • Explain line and its Types • Describe application of lines **<u>Practical Activity:</u>** • Prepare graph sheet/ drawing sheet of different types of lettering • Draw different types of lines on drawing sheet	**Total:** 11hrs **Theory:** 02hrs **Practical:** 09hrs	• Notebooks • Pen • Drawing Pencils • Geometry box • Thumb Pin/ Squash Tape • Drawing Sheets • White board • Multimedia • Internet • Computer system	Classroom/ Drawing Hall

				• Drawing Board • T-Scale • Set Square • Flexible Curve	
LU2: Create a Design Using Different Geometrical Shapes	**The trainee will be able to:** **1.** Draw different shapes through lines including: • Circle • Triangle • Square • Rectangle • Curves **2.** Create a design using different shapes	• Describe Geometry shapes and its types • Describe geometrical construction methods of Circle, Triangle, Squares, Polygons and Curves • Describe construction of Circumscribed and Inscribed geometrical shapes **<u>Practical Activity:</u>** • Prepare a drawing sheet for different types of geometrical shapes • Prepare a drawing sheet for Circumscribed and Inscribed geometrical shapes	**Total:** 15hrs **Theory:** 02hrs **Practical:** 13hrs	• Notebooks • Pen • Drawing Pencils • Geometry box • Thumb Pin/ Squash Tape • Drawing Sheets • White board • Multimedia • Internet • Computer system • Drawing Board	Classroom/ Drawing Hall

				• T-Scale • Set Square • Flexible Curve	
LU3: Explore Orthographic views of simple shapes	**The trainee will be able to:** **1.** Draw first angle projection **2.** Draw third angle projection **3.** Draw missing views **4.** Draw different section views	• Describe Projection and its types • Explain Difference between 1st Angle & 3rd Angle Projection • Explain sections and its types • Explain Hatching of different materials • Describe application of section views **<u>Practical Activity:</u>** • Prepare a drawing sheet of orthographic views of 3D object in 1st angle projection • Prepare a drawing sheet of orthographic views of a 3D object in 3rd angle projection • Prepare a drawing sheet of orthographic views of a 3D object using full sectioning technique	**Total:** 20hrs **Theory:** 05hrs **Practical:** 15hrs	• Notebooks • Pen • Drawing Pencils • Geometry box • Thumb Pin/ Squash Tape • Drawing Sheets • White board • Multimedia • Internet • Computer system • Drawing Board • T-Scale	Classroom/ Drawing Hall

		• Prepare a drawing sheet of orthographic views of a 3D object using half/removed/revolved/broken sections		• Set Square • Flexible Curve	
LU4: Explore types of dimensioning and drawing symbols	**The trainee will be able to:** **1.** Draw different types of dimensions **2.** Draw different drawing symbols **3.** Draw geometrical tolerance	• Explain Dimensioning general rules and principles • Describe geometric dimensioning • Explain symbols used in engineering drawing and manufacturing • Describe application of tolerances, type of fits and allowances used in manufacturing drawings **<u>Practical Activity:</u>** • Prepare a drawing sheet of orthographic views of a 3D object in 1st angle projection and use base line dimensioning style • Prepare a drawing sheet of orthographic views of a 3D object in 3rd angle projection and use continuous dimensioning style	**Total:** 09hrs **Theory:** 03hrs **Practical:** 06hrs	• Notebooks • Pen • Drawing Pencils • Geometry box • Thumb Pin/ Squash Tape • Drawing Sheets • White board • Multimedia • Internet • Computer system • Drawing Board • T-Scale	Classroom/ Drawing Hall

		• Prepare a drawing sheet of orthographic views of a 3D object in 3rd angle projection and use ordinate dimension style		• Set Square • Flexible Curve	

LU5: Draw drawing of fasteners	**The trainee will be able to:** **1.** Draw different types of screw threads **2.** Draw multi view of nut and bolt	• Describe screw threads, types and its application • Describe section views of all threads used in design & manufacturing drawings • Describe types of nuts and bolts • Describe procedure of nut and bolt projection drawing **<u>Practical Activity:</u>** • Draw drawing sheet of different types of welded joints (Permanent Fastener) along their symbols • Draw drawing sheet of different types of Screws (Temporary Fastener) along their symbols • Draw drawing sheet of different types of Nuts and Bolts	**Total:** 12hrs **Theory:** 02hrs **Practical:** 10hrs	• Notebooks • Pen • Drawing Pencils • Geometry box • Thumb Pin/ Squash Tape • Drawing Sheets • White board • Multimedia • Internet • Computer system • Drawing Board	Classroom/ Drawing Hall

		(Temporary Fastener) along their symbols		• T-Scale • Set Square • Flexible Curve	
LU6: Explore Assembly and detailed drawings	**The trainee will be able to:** **1.** Draw detailed drawings of different parts **2.** Draw assembly drawings	• Describe auxiliary view, detail view and broken view • Explain Assemblies, exploded views and BOQ **<u>Practical Activity:</u>** • Draw a detailed and assembly drawing of bench vice • Draw a detailed drawings of lathe machine tail stock parts • Draw an assembly drawing of tail stock	**Total:** 13hrs **Theory:** 03hrs **Practical:** 10hrs	• Notebooks • Pen • Drawing Pencils • Geometry box • Thumb Pin/ Squash Tape • Drawing Sheets • White board • Multimedia • Internet • Computer system • Drawing Board • T-Scale	Classroom/ Drawing Hall

				• Set Square • Flexible Curve	

General assessment guidance for *Dies & Mould Technology*

Good practice in Pakistan makes use of sessional and final assessments, the basis of which is described below. Good practice by vocational training providers in Pakistan is to use a combination of these sessional and final assessments, combined to produce the final qualification result.

Sessional assessment is going on all the time. Its purpose is to provide feedback on what students are learning:

- To the student: to identify achievement and areas for further work
- To the teacher: to evaluate the effectiveness of teaching to date, and to focus future plans.

Assessors need to devise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy

Final assessment is the assessment, usually on completion of a course or module, which says whether or not the student has "passed". It is – or should be – undertaken with reference to all the objectives or outcomes of the course, and is usually fairly formal. Considerations of security – ensuring that the student who gets the credit is the person who did the work – assume considerable importance in final assessment.

Methods of assessment

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted. For workplace lessons, assessment can focus on the quality of planning the related process, the quality of executing the process, the quality of the product and/or evaluation of the process.

Methods include direct assessment, which is the most desirable form of assessment. For this method, evidence is obtained by direct observation of the student's performance.

Examples for direct assessment of a Dies & Mould Technology include:

- Work performances, for example perform basic communication, maintain personal health, hygiene and safety and perform basic computer operations
- Demonstrations, for example organize Milling and Drilling
- Direct questioning, where the assessor would ask the student how to perform personal safety at work place, how they can communicate work place policy and procedures, how they can perform Milling, what are the benefits of Drilling
- Paper-based tests, such as multiple choice or short answer questions on communication at work place policy and procedures, Milling and Drilling
- Indirect assessment is the method used where the performance could not be watched and evidence is gained indirectly.

Examples for indirect assessment of a Dies & Mould Technology include:

- Work products, such as preparing and handling documents, perform some procedures of Milling

Indirect assessment should only be a second choice. (In some cases, it may not even be guaranteed that the work products were produced by the person being assessed.)

Principles of assessment

All assessments should be valid, reliable, fair and flexible:

Fairness means that there should be no advantages or disadvantages for any assessed person. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information.

Validity means that a valid assessment assesses what it claims to assess. For example, if documentation or organizing procedures of Milling are to be assessed and certificated, the assessment should involve performance criteria that are directly related to that documentation activity. An interview about the organization of Milling Operations would not meet the performance criteria.

Reliability means that the assessment is consistent and reproducible. For example, if the work performance of preparing documents in words has been assessed, another assessor (e.g. the future employer) should be able to see the same work performance and witness the same level of achievement.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a power failure during the assessment, the assessor should modify the arrangements to accommodate the students' needs.

Assessment strategy for Dies & Mould Technology

This curriculum consists of 11modules:

- **Module 1:** Maintain Personal Health, Hygiene and Safety
- **Module 2:** Perform Basic Communication Skills
- **Module 3:** Perform Basic Computer Operations
- **Module 4:** Perform Calculations and Estimation for Mechanical Work
- **Module 5:** Carryout General Maintenance
- **Module 6:** Perform Bench Works
- **Module 7:** Perform Shaper and Planar Operations
- **Module 8:** Perform Basic Grinding Operations
- **Module 9:** Perform Lathe Operations
- **Module 10:** Perform Basic Milling Operations
- **Module11:** Perform Engineering Drawings

Sessional assessment

The sessional assessment for all modules shall be in two parts: theoretical assessment and practical assessment. The sessional marks shall contribute to the final qualification.

Theoretical assessment for all learning modules must consist of a written paper lasting at least one hour per module. This can be a combination of multiple choice and short answer questions.

For practical assessment, all procedures and methods for the modules must be assessed on a sessional basis. Guidance is provided below under Planning for assessment.

Final assessment

Final assessment shall be in two parts: theoretical assessment and practical assessment. The final assessment marks shall contribute to the final qualification.

The assessment team

The number of assessors must meet the needs of the students and the training provider. For example, where two assessors are conducting the assessment, there must be a maximum of five students per assessor. In this example, a group of 25 students shall therefore require assessments to be carried out over a four-day period. For a group of only 10 to 15 students, assessments would be carried out over a two-day period only.

Planning for assessment

Sessional assessment: assessors need to plan in advance how they will conduct sessional assessments for each module. The tables on the following pages are for assessors to use to insert how many hours of theoretical and practical assessment will be conducted and what the scheduled dates are.

Final assessment: Training providers need to decide ways to combine modules into a cohesive two-day final assessment programme for each group of five students. Training providers must agree the content for practical assessments in advance.

Complete list of tools and equipment

Sr#	Description	Quantity
1.	Computer with internet	26
2.	White board	1
3.	Multimedia	1
4.	Lathe machine with accessories	5
5.	Lathe Tools (Facing, Threading, Knurling, parting off, Forming etc.)	10 each
6.	Drilling tools (twist drill, center drill, counter boring tool, reamer, taps etc.)	10 each
7.	Milling Machine with accessories	5
8.	Milling tools (End mill, Ball nose, Face mill, Side and face mill, Slab mill, Convex cutter, Concave cutter, Dovetail cutter, Involute cutter, etc.)	10 each
9.	Surface Grinding Machine with accessories and consumables	2
10.	Cylindrical Grinding Machine with accessories and consumables	2
11.	Pedestal Grinder with accessories and consumables	2
12.	Tool and cutter Grinder with accessories and consumables	2
13.	Steel Rules	10
14.	Tri Square	10
15.	Inside Vernier Caliper	10

16.	Odd leg Vernier Caliper	10
17.	Outside Vernier Caliper	10
18.	Vernier Depth gauge	5
19.	Vernier Bevel protractor	5
20.	Thread gauges	5
21.	Screw pitch gauges	5
22.	Fillet gauges	5
23.	Feeler gauges	5
24.	Vernier Height gauge	5
25.	Dial indicators with magnetic stand	5
26.	Vernier Micrometer	5
27.	Inside Micrometer	5
28.	Outside Micrometer	10
29.	Depth Micrometer	5
30.	Snap Gauge set	2
31.	Dial Bore Gauge	5
32.	Set of Adjustable Wrench	5
33.	Set of Spanners (Open end, Ring)	5 each
34.	Pipe wrench	2
35.	Pipe Dies	2
36.	L-key sets	5

37.	Nose pliers	5
38.	Grip pliers	5
39.	Straight peen Hammer	5
40.	Ball peen Hammer	5
41.	Mallets Hammer	5
42.	Claw Hammer	5
43.	Long nose Tong	5
44.	Short nose tong	5
45.	Scriber	10
46.	Hand hacksaw	25
47.	Chipping hammer	10
48.	Disc grinder 4 inch	5
49.	Disc cutter	5
50.	Mould polishing stones(Mesh no 240 to 1200)	10 each
51.	Sand papers of different grade(Mesh no 180 to 2000)	10 each
52.	Diamond Paste tubes of different grades (Micron 2500 to 5000)	2 each
53.	Ceramics stones of different grades (Mesh no 300 to 1200)	5 each
54.	Diamond hand file set	5 set
55.	Riffle hand file set	5
56.	Needle hand file set	5
57.	Round hand file	5

58.	Half round hand file	5
59.	Triangular hand file	5
60.	Square hand file	5
61.	Flat hand file	5
62.	Ultra-sonic Polishing box	2
63.	Drawing board	25

List of consumable supplies

Sr no	Material	Quantity
1.	Note book	25
2.	Pencil	25
3.	White sheets	25
4.	Eraser	25
5.	Sharpener	25
6.	Pen	25
7.	Clutch pencils	25
8.	Sticky Notes	25
9.	Card sheets	100
10.	Cleaning brush	25
11.	Cotton rags	1KG

12.	PPE's	25
13.	Lubricants	In Litters
14.	Milling Cutters	5
15.	Coolant	In litters
16.	Drawing Board	25
17.	Drawing Sheets	25 Books

Credit values

The credit value of the National Certificate Level 2 in Dies & Mould Technology is defined by estimating the amount of time/ instruction hours required to complete each competency unit and competency standard. The NVQF uses a standard credit value of 1 credit = 10 hours of learning (Following Higher Education Commission (HEC) guidelines.

The credit values are as follows:

Competency Standard	Estimate of hours	Credit
A. Maintain Personal Health,Hygeine and Safety	30	03
B. Perform Basic Communication Skills	30	03
C. Perform Basic Computer Application	50	05
D. Perform Calculations and Estimation for Mechanical Work	50	05
E. Carryout General Maintenance	50	05
F. Perform Bench Works	50	05
G. Perform Shaper and Planar Operations	50	05
H. Perform Basic Grinding Operations	50	05

Competency Standard	Estimate of hours	Credit
I. Perform Lathe Operations	80	08
J. Perform Basic Milling Operations	80	08
K. Perform Engineering Drawing	80	08

Curriculum Validation Committee

Name	Designation
1. Mr. Nadeem Shahid	Vice Principal, PITAC Lahore
2. Mr. Naveed Aslam Qureshi	Deputy Director, PITAC Lahore
3. Mr. Muhammad Tariq Pervaiz	Retd , PITAC, Lahore
4. Ms Tehrim Ijaz	BS industrial Engineer, Lahore
5. Ms. Ariba Afzal Kazi	BS Metallurgy, Material Engineer, Lahore
6. Mr. Muhammad Arshad	Chief Instructor, PSTC, Lahore
7. Engr. Rashid Bashir	Instructor, PSTC, Lahore

Name	Designation
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