

Curriculum
For
“Dies and Moulds Technology”
(CAD/CAM Supervisor)
(Level -4)



National Vocational & Technical
Training Commission

Table of Contents

Introduction	1
Definition/ Description of the training programme for <i>Dies and Moulds Technology</i>	1
Purpose of the training programme	1
Overall objectives of training programme	1
Competencies to be gained after completion of course	1
Possible available job opportunities available immediately and later in the future	2
Trainee entry level	2
Minimum qualification of trainer	2
Recommended trainer: trainee ratio	2
Medium of instruction i.e. language of instruction	3
Duration of the course (Total time, Theory & Practical time)	3
Sequence of the Modules	5
Summary – overview of the curriculum	7
Modules	12
Module 1: Establish and Maintain the Occupational Health and Safety System	12
Module 2: perform Advance Communication	19
Module 3: Perform CAD/CAM Operations	22
Module4: Perform Electric Discharge Machining (EDM) Sinker Operations	26
Module5: Perform (EDM) Wire Cut Operations	31
Module 6: Analyze with Workplace Policy and Procedures	36
Module 7: Perform Heat Treatment	40
Module 8: Perform CNC Milling/Machining Centre Operations	50
Module 9: Perform Advance Grinding Operations	59
Module 10: Perform Die and Mould Maintenance	69
General assessment guidance for <i>Dies & Mould Technology</i>	73
Assessment strategy for Dies & Mould Technology	76
Complete list of tools and equipment	77

List of consumable supplies	82
Credit values	84

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

- Establish and maintain the occupational Health and safety system
- Perform Advance communication
- Perform CAD/CAM Operations
- Perform Electric Discharge Machining (EDM) Sinker Operations

- Perform (EDM) Wire Cut Operations
- Analyse Workplace Policies and Procedures
- Perform Heat Treatment
- Perform CNC Milling/Machining Centre Operations
- Perform Advance Grinding Operations
- Perform Die and Mould Maintenance

Possible available job opportunities available immediately and later in the future

- Die & Mould Maker
- Dies & Mould Designer
- CNC Programmer
- CAD/CAM Programmer
- Workshop Supervisor
- Charge Man
- Associate Engineer

Trainee entry level

For National Vocational Certificate Level-4 in “CAD/CAM Supervisor” (Dies and Moulds Technology), the entry requirement is award of National Vocational Certificate Level-3 in “CNC Machinist”.

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

Module	Theory¹ Days/hours	Workplace² Days/hours	Total hours
Module 1: Establish and maintain the occupational Health and safety system	10	20	30
Module 2: Perform Advance communication	10	20	30
Module 3: Perform CAD/CAM Operations	20	180	200

¹ Learning Module hours in training provider premises

² Training workshop, laboratory and on-the-job workplace

Module 4: Perform Electric Discharge Machining (EDM) Sinker Operations	30	120	150
Module 5: Perform (EDM) Wire Cut Operations	30	120	150
Module6: Analyse Workplace Policies and Procedures	10	20	30
Module7: Perform Heat Treatment	27	63	90
Module8: Perform CNC Milling/Machining Centre Operations	39	201	240
Module9: Perform Advance Grinding Operations	29	111	140
Module10: Perform Die and Mould Maintenance	29	111	140

The full structure of the course is as follow:

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:

Module 1: Establish and maintain the occupational Health and safety system 30 Hours	Module 4: Perform Electric Discharge Machining (EDM) Sinker Operations 150 Hours	Module 2: Perform Advance communication 30 Hours
---	--	--

	Module 5: Perform (EDM) Wire Cut Operations 150 Hours	
	Module8: Perform CNC Milling/Machining Centre Operations 240 Hours	Module 3: Perform CAD/CAM Operations 50 Hours
Module 6: Analyse Workplace Policies and Procedures 30 Hours	Module7: Perform Heat Treatment 90 Hours	Module9: Perform Advance Grinding Operations 140 Hours
	Module 10: Perform Die and Mould Maintenance 140 Hours	

Summary – overview of the curriculum

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 1: Establish and Maintain the Occupational Health and Safety System Aim: After successful completion of this module, the trainee is competent in establishing and Maintaining the Occupational Health and Safety System	LU1: Organise consultation process LU2: Design Occupational Health and Safety framework LU3: Design and implement an Occupational Health and Safety awareness training program LU4: Establish, monitor and maintain Occupational Health and safety system LU5: Establish and maintain a system for accident investigation LU6: Evaluate the organization's Occupational Health and Safety system and related policies procedures and programs	10	20	30
Module 2: Perform Advance Communication Aim: After successful completion of this module, the trainee is competent in performing Advance Communication	LU1: Demonstrate professional skills LU2: Plan and Organize work LU3: Provide trainings at workplace	10	20	30

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 3: Perform CAD/CAM Operations Aim: After successful completion of this module, the trainee is competent in performing CAD/CAM Operations	LU1: Develop 3D Product/ Model LU2: Manipulate 3D objects using Editing Tools LU3: Perform Tool Path Generation and Simulation	20	180	200
Module 4: Perform Electric Discharge Machining (EDM) Sinker Operations Aim: After successful completion of this module, the trainee is competent in performing Electric Discharge Machining (EDM) Sinker Operations	LU1: Prepare a Machine before performing (EDM) machining Process LU2: Perform setting of workpiece and electrode LU3: Carryout (EDM) Process LU4: Inspect the job as per drawing	30	120	150

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 5: Perform (EDM) Wire Cut Operations Aim: After successful completion of this module, the trainee is competent in Performing (EDM) Wire Cut Operations	LU1: Prepare a Machine before performing (EDM) wire cutting Process LU2: Generate program and carry out simulation LU3: Perform workpiece and wire setting LU4: Perform (EDM) Wire cutting process LU5: Inspect the job as per drawing	30	120	150
Module 6: Analyse Workplace Policy and Procedures Aim: After successful completion of this module, the trainee is competent in Analysing Workplace Policy and Procedures	LU1: Manage work timeframes LU2: Manage to convene meeting LU3: Set and meet own work priorities at instant LU4: Develop and maintain professional competence LU5: Follow and implement work safety requirements	10	20	30

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module7: Perform Heat Treatment Aim: After successful completion of this module, the trainee is competent in performing Heat Treatment	LU1: Prepare material for heat treatment LU2: Perform Annealing LU3: Perform Normalizing LU4: Perform Hardening LU5: Perform Tempering LU6: Perform Flame hardening LU7: Perform Induction hardening LU8: Perform carburizing	27	63	90
Module 8: Perform CNC Milling/Machining Centre Operations Aim: After successful completion of this module, the trainee is competent in performing CNC Milling/Machining Centre Operations	LU1: Prepare a Machine before performing CNC Milling/Machining centre operations LU2: Perform workpiece and tools setting on the machine LU3: Generate the part program for CNC Milling LU4: Feed the program LU5: Perform CNC Milling Operations LU6: Inspect the job as per drawing	39	201	240

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 9: Perform Advance Grinding Operations Aim: After successful completion of this module, the trainee is competent in performing Advance Grinding Operations	LU1: Prepare Machine Before Grinding Operation LU2: Perform mounting and dressing Before Grinding Operation LU3: Perform Cylindrical Grinding LU4: Perform Tool and Cutter Grinding LU5: Perform Jig Grinding LU6: Inspect the job as per drawing	29	111	140
Module10: Perform Die and Mould Maintenance Aim: After successful completion of this module, the trainee is competent in performing Die and Mould Maintenance	LU1: Perform overhauling of die and mould LU2: Perform inspection of faulty product LU3: Perform Remedial action	29	111	140

Modules

Module 1: Establish and Maintain the Occupational Health and Safety System

Objective of the module: The aim of this module to get knowledge, skills and understanding to identify and implement workplace policies and procedures

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
CU1. Organise consultation process	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify and invite relevant personnel or other representative personnel into the development and maintenance processes. 2. Handle issues raised through consultation according to issue resolution procedures. 3. Verify results from the consultation process and makes it available to relevant personnel. 	<ul style="list-style-type: none"> • Identify and invite relevant personnel or other representative personnel into the development and maintenance processes. • Handle issues raised through consultation according to issue resolution procedures. • Verify results from the consultation process and makes it available to relevant personnel. 	Total: 05hrs Theory: 02hrs Practical: 03hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system 	Class room

LU2: Design Occupational Health and Safety framework	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify hazards and risks correctly and confirm according to occupational health and safety legislation, codes of practice and prevailing trends. 2. Develop procedure for ongoing identification of hazards and risks and integrated within work systems and procedures 	<ul style="list-style-type: none"> • Identify hazards and risks correctly and confirm according to occupational health and safety legislation, codes of practice and prevailing trends. • Develop procedure for ongoing identification of hazards and risks and integrated within work systems and procedures • Develop occupational health and safety policies line with relevant legislation. • Incorporate and define occupational health and safety 	Total: 05hrs Theory: 02hrs Practical: 03hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system • PPEs (Safety glasses, 	Class room

	<p>3. Develop occupational health and safety policies line with relevant legislation.</p> <p>4. Incorporate and define occupational health and safety responsibilities and duties into job descriptions/statements.</p> <p>5. Provide adequate resources in a timely and consistent manner.</p> <p>6. Develop and implement measures to control assessed risks in accordance with the hierarchy of control, relevant occupational health and safety legislation, codes of</p>	<p>responsibilities and duties into job descriptions/statements.</p> <ul style="list-style-type: none"> • Provide adequate resources in a timely and consistent manner. • Develop and implement measures to control assessed risks in accordance with the hierarchy of control, relevant occupational health and safety legislation, codes of practice and trends. • Implement interim solutions until a permanent control measure. • Record details clearly and efficiently according to organization policy and procedures and relevant legislation 		<p>Ear muffs/ear plugs, Protective Gloves, Cap, Safety shoes etc.)</p>	
--	---	---	--	--	--

	<p>practice and trends.</p> <p>7. Implement interim solutions until a permanent control measure.</p> <p>8. Record details clearly and efficiently according to organisation policy and procedures and relevant legislation</p>				
<p>LU3: Design and implement an Occupational Health and Safety awareness training program</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Communicate procedures to help implement workplace policy 2. Inform those involved in implementing the policy about expected outcomes, activities to be undertaken and assigned responsibilities 	<ul style="list-style-type: none"> • Devise educational information on the occupational health and safety system and make it available to all relevant personnel. • Provide appropriate training to all relevant personnel to enable the implementation of safety procedures 	<p>Total</p> <p>05hrs</p> <p>Theory:</p> <p>02hrs</p> <p>Practical:</p> <p>03hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system • Safety 	Class room

				manuals	
LU4: Establish, monitor and maintain Occupational Health and safety system	The trainee will be able to: <ol style="list-style-type: none"> 1. Establish a system for keeping occupational health and safety records in accordance with legislative requirements. 2. Work activities are monitored to ensure that hazard identification and risk assessment and control procedures are effectively adopted. 3. Inadequacies in hazard identification, risk assessment and established risk control measures are identified in accordance with the hierarchy of control and reported to designated personnel. 4. Amendments to procedures are undertaken through 	<ul style="list-style-type: none"> • Establish a system for keeping occupational health and safety records in accordance with legislative requirements. • Work activities are monitored to ensure that hazard identification and risk assessment and control procedures are effectively adopted. • Inadequacies in hazard identification, risk assessment and established risk control measures are identified in accordance with the hierarchy of control and reported to designated personnel. • Amendments to procedures are undertaken through appropriate consultation methods 	Total: 05hrs Theory: 02hrs Practical: 03hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system 	Class room

	appropriate consultation methods				
LU5: Establish and maintain a system for accident investigation	<ol style="list-style-type: none"> 1. A system is developed and implemented for reporting and investigation of all accidents/incidents in accordance with the policies and procedures. 2. Training is provided to employees responsible for accident investigation for effective implementation of accident investigation policy. 3. Policies and procedures for reporting and investigating all accidents/incidents are reviewed and updated as required 	<ul style="list-style-type: none"> • Explain the system for reporting and investigation of all accidents/incidents according to the policies and procedures. • Importance of training to employees responsible for accident investigation • Describe the policies and procedures for reporting and investigating all accidents/incidents 	Total: 05hrs Theory: 01hrs Practical: 04hrs		

<p>LU6: Evaluate the organization's Occupational Health and Safety system and related policies procedures and programs</p>	<ol style="list-style-type: none"> 1. The effectiveness of the occupational health and safety system and related policies, procedures and programs is assessed according to the organization's occupational health and safety policy. 2. Improvements to the occupational health and safety system are developed and implemented. 3. Compliance with occupational health and safety legislation and codes of practice is assessed to ensure that legal occupational health and safety standards are maintained 	<ul style="list-style-type: none"> • Importance of occupational health and safety system and related policies, procedures and programs according to the organization 	<p>Total: 05hrs</p> <p>Theory: 01hrs</p> <p>Practical: 04hrs</p>		
---	---	---	---	--	--

Module 2: Perform Advance Communication

Objective of the module: The aim of this module to get knowledge, skills and understanding to communicate at workplace.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Demonstrate professional skills	The trainee will be able to: <ol style="list-style-type: none"> 1. Use different modes of communication to communicate 2. Speaking 3. Reading 4. Writing 5. Listening 6. Presentation 7. visual representation etc 8. Develop CV Skills according requirements 9. Upgrade professional skills by attending trainings, webinars, 	<ul style="list-style-type: none"> • Importance of different modes of communication to communicate • Describe skills for CV <ul style="list-style-type: none"> ○ Creativity. ○ Interpersonal Skills. ○ Critical Thinking. ○ Problem Solving. ○ Public Speaking. ○ Customer Service Skills. ○ Teamwork Skills. ○ Communication.etc • Importance of hard skills 	Total: 08hrs Theory: 03hrs Practical: 02hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • White board • Multimedia • Internet • Computer system 	Class room

	<p>conferences etc.</p> <p>10. Perform Continuous professional development as required at workplace</p> <p>11. Develop interview skills</p>				
LU2: Plan and Organize work	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Identify task requirements. 2. Plan steps to complete tasks. 3. Review planning and organizing process. 4. Organize work. 	<ul style="list-style-type: none"> • Importance of task requirements. • Describe the planning and organizing process 	<p>Total:</p> <p>09hrs</p> <p>Theory:</p> <p>03hrs</p> <p>Practical:</p> <p>06hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet • Computer system • Pen 	Class room
LU3: Provide trainings at workplace	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Assess the need for 	<ul style="list-style-type: none"> • Explain the need for training • Importance of learning experience for 	<p>Total:</p> <p>16hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils 	Class room

	<p>training</p> <ol style="list-style-type: none"> 2. Prepare trainees for the learning experience 3. Present training session 4. Support trainees in managing their own learning 5. Facilitate group learning 6. Provide opportunity for practice 7. Provide feedback on progress on trainees 8. Review delivery experience 	trainees	<p>Theory:</p> <p>04hrs</p> <p>Practical:</p> <p>12hrs</p>	<ul style="list-style-type: none"> • Erasers • Sharpeners • White board • Multimedia • Internet Computer system Pen 	
--	---	----------	--	---	--

Module 3: Perform CAD/CAM Operations

Objective of the module: The aim of this module is to get knowledge, skills and understanding to perform CAD/CAM Operations

Duration: 200hours **Theory:** 20 hours **Practical:** 180 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Develop 3D Product/ Model	The trainee will be able to: <ol style="list-style-type: none"> 1. Set up template for required specifications 2. Create/link/fetch/merge 2D drawing to make 3D objects according to given specification 3. Use Geometry & shapes to make 3D objects according to given specification. 	<ul style="list-style-type: none"> • Describe Units, workspace and setup for job • Explain how to create 3D model from 2D sketch • Explain how to use Modification and editing tools of 3D sketches and 3D model <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Develop 3D Models of different products assigned by instructor 	Total: 57hrs Theory: 07hrs Practical: 50hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Drawing sheets • USB • White board • Multimedia • Internet • Computer system Printer 	<ul style="list-style-type: none"> • Class room/Lab

LU2: Manipulate 3D objects using editing Tools	The trainee will be able to <ol style="list-style-type: none"> 1. Modify 3D objects in line with the requirements 2. Make customized 3D models according to the requirement of given job. 3. Generate core and cavity inserts of the product model 	<ul style="list-style-type: none"> • Describe 3D part modeling, assembly modeling using different techniques and their modification according to requirement • Describe the generation process of parting line/surface to extract core and cavity inserts of the product model • Explain how to extract electrodes • Setup drafting of assemblies and their parts <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Manipulate 3D model by applying shrinkage, draft analysis, core cavity separation and electrode extracting • Prepare assembly modelling of core and cavity parts 	Total: 83hrs Theory: 08hrs Practical: 75hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Drawing sheets • USB • White board • Multimedia • Internet • Computer system • Printer 	Class room
LU3: Perform	The trainee will be able to:		Total:		Class room

Tool Path Generation and Simulation	<ol style="list-style-type: none"> 1. Select appropriate CAM software according to the machine control unit 2. Import 3D CAD model 3. Reference point and apply material/stock for machining to the model as per job requirements 4. Use appropriate part programming credentials (Coordinates, Feed, Speed, Tooling Information etc.) according to the CNC machine control unit 5. Apply machining feature(s), toolpath strategies and leads/links as per prescribed procedure 6. Check the simulation according to the applied tool path strategy to verify movements of tool/cutter to get same results as per defined 	<ul style="list-style-type: none"> • Define setup of machine control unit in CAM software • Describe how to import 3D model into CAM software • Describe reference point and application of material/stock for machining to the model as per job requirements • Explain the use of appropriate part programming credentials (Coordinates, Feed, Speed, Tooling Information etc.) according to the CNC machine control unit • Describe machining feature(s), toolpath strategies and leads/links as per prescribed procedure • Explain the simulation process according to the applied tool path strategy to verify movements of tool/cutter to get same results as per defined 	60hrs Theory: 05hrs Practical: 55hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Drawing sheets • USB • White board • Multimedia • Internet • Computer system • Printer 	Workshop
-------------------------------------	---	--	--	---	----------

	<p>sequence</p> <p>7. Generate part program file against the applied machining sequence according to the post processor of CNC machine</p>	<p>sequence</p> <ul style="list-style-type: none"> • Explain generation of part program file against the applied machining sequence according to the post processor of CNC machine • Procedure to save the program <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Import 3D CAD model into CAM software. Apply stock set-up, set job reference tool path strategy, apply part programming credentials and generate part program tool path • Generate part program coding file according to post processor of CNC machine and perform simulation 			
--	--	--	--	--	--

Module4: Perform Electric Discharge Machining (EDM) Sinker Operations

Objective of the module: The aim of this module is to get knowledge, skills and understanding to prepare a machine before performing (EDM) machining process, perform setting of workpiece and electrode, carryout (EDM) process and inspect the job as per drawing

Duration: 150 hrs.

Theory: 30hrs.

Practical: 120 hrs.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare a Machine before performing (EDM) machining Process	The trainee will be able to: <ol style="list-style-type: none"> 1. Switch on the machine 2. Check die-electric fluid level 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. 	<ul style="list-style-type: none"> • Define Electrical Discharge Machining (EDM) • Working principle and applications of EDM • Electrode materials (copper, graphite, etc.) • Inspection of electrode size with respect to roughing and finishing <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Start EDM machine according to SOP and run machine warm up cycle 	Total: 22hrs Theory: 12hrs Practical: 10hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Dielectric fluid • Electrode material • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer 	<ul style="list-style-type: none"> • Class Room • Workshop

				system <ul style="list-style-type: none"> Measuring tools EDM Sinker machine Electrode holders 	
LU2: Perform setting of workpiece and electrode	The trainee will be able to: <ol style="list-style-type: none"> 1. Mount the workpiece on machine table 2. Align the workpiece 3. Mount electrode on machine head as per requirement 4. Align the electrode as per requirement 5. Set reference for electrode and workpiece 6. Set flushing as per job requirement 	<ul style="list-style-type: none"> Dialing devices (dial indicator, lever gauge, magnetic stand, c clamp, etc.) Work holding devices for EDM (magnetic table, grinding vice, concentric chuck, laminated blocks, etc.) Method of dialing work piece Electrode mounting tools (electrode holder, collect, fixture, etc.) Method of aligning electrode with work piece. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Perform setting of job and electrode according to 	Total: 35hrs Theory: 05hrs Practical: 30hrs	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Dielectric fluid Electrode material Cotton rags PPEs' White board Multimedia Internet Computer 	<ul style="list-style-type: none"> Class Room Workshop

		requirement of EDM operation		system <ul style="list-style-type: none"> Measuring tools EDM Sinker machine Electrode holders Vice 	
LU3. Carryout (EDM) Process	The trainee will be able to: <ol style="list-style-type: none"> 1. Set EDM parameters (on time, off time, ampere, depth, etc. 2. Prepare a workpiece by performing EDM machining process as per standard procedure 3. Check quality of the component at suitable intervals 4. Shut down the machine at safe position after finishing the work. 	<ul style="list-style-type: none"> Knowledge of machine parameters and its effects. (Amperage, voltage, on time, off time, electrode height, pulse time, flushing Knowledge of grades of surface textures) Purpose of flushing and its methods of flushing (injection, suction, through nozzle, through electrode, die electric fluid height limit in tank etc. Method of setting flushing (external / internal)) Standard procedures to check quality of the workpiece during the process Explain how to neutralize and 	Total: 68hrs Theory: 08hrs Practical: 60hrs	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Dielectric fluid Electrode material Cotton rags PPEs' White board Multimedia Internet 	<ul style="list-style-type: none"> Class Room Workshop

		<p>shut down the machine as per standard procedures</p> <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Set EDM Machining parameters on machine and execute EDM process according to job requirement 		<ul style="list-style-type: none"> Computer system Measuring tools EDM Sinker machine Electrode holders 	
<p>LU4. Inspect the job as per drawing</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> Perform cleaning of the job using appropriate method Inspect the job using appropriate measuring tool 	<ul style="list-style-type: none"> Describe Post EDM operations (cleaning, unmounting of electrode and work-piece, inspection, etc.) <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Inspect the job as per drawing 	<p>Total: 25hrs</p> <p>Theory: 05hrs</p> <p>Practical: 20hrs</p>	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Dielectric fluid Electrode material Cotton rags PPEs' White board Multimedia 	<ul style="list-style-type: none"> Class Room Workshop

				<ul style="list-style-type: none"> • Internet • Computer system • Measuring tools • EDM Sinker machine 	
--	--	--	--	--	--

Module5: Perform (EDM) Wire Cut Operations

Objective of the module: The aim of this module is to get knowledge, skills and understanding to prepare a Machine before performing (EDM) wire cutting process, generate program and carry out simulation, perform workpiece and wire setting, perform (EDM) Wire cutting process and Inspect the job as per drawing.

Duration: 150 hrs.

Theory: 30hrs.

Practical: 120 hrs.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare a Machine before performing (EDM) wire cutting Process	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Switch on the machine 2. Check die-electric fluid level 3. Run machine warm-up cycle 4. Select appropriate work-piece clamping device according to the job requirement 5. Manage the measuring instruments as per job requirement. 	<ul style="list-style-type: none"> Describe working principle of EDM Wire Cut Machine Application of EDM Wire Cut Process EDM Wire materials (Brass, Tungsten, etc.) Describe function of Dielectric fluid in EDM Wire Cut process Types and treatments of Dielectric fluids <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Start EDM wire cut machine according to SOP and run machine warm up cycle 	<p>Total: 20hrs</p> <p>Theory: 10hrs</p> <p>Practical: 10hrs</p>	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Dielectric fluid EDM Wire Cotton rags PPEs' White board Multimedia Internet Computer system Measuring 	<ul style="list-style-type: none"> Class Room Workshop

				tools <ul style="list-style-type: none"> EDM Wire Cut machine 	
LU2: Generate program and carry out simulation	The trainee will be able to: <ol style="list-style-type: none"> 1. Import the file of CAD drawing into machine computer 2. Prepare the program for wire cutting Process 3. Perform simulation to verify required cutting path 	<ul style="list-style-type: none"> Interpretation of drawing according to job requirement Method to Import the file of CAD drawing into computer Preparation of the program for wire cutting Process Explain how to perform simulation to verify required cutting path <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Perform setting of job and wire 	Total: 37hrs Theory: 07hrs Practical: 30hrs	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Dielectric fluid EDM Wire Cotton rags PPEs' White board 	<ul style="list-style-type: none"> Class Room Workshop

		according to requirement of EDM wire cut operation		<ul style="list-style-type: none"> • Multimedia • Internet • Computer system • Measuring tools • Clamping • EDM Wire Cut machine 	
LU3: Perform workpiece and wire setting	The trainee will be able to: <ol style="list-style-type: none"> 1. Clamp and align the work piece according to job requirement 2. Perform wire setting according to work piece and cutting path requirement 3. Set EDM Wire cutting parameters 	<ul style="list-style-type: none"> • Method of dialing work piece • Dialing devices (dial indicator, lever gauge, magnetic stand, c clamp, etc.) • Work holding devices for EDM (machine table, precision vice, parallel clamp, etc.) • Explain how to perform wire setting according to work piece and cutting path requirement • Procedure to set EDM Wire cut parameters <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Set EDM wire cut parameters on 	Total: 24hrs Theory: 04hrs Practical: 20hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Dielectric fluid • EDM Wire • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system 	<ul style="list-style-type: none"> • Class Room • Workshop

		machine and execute EDM program according to job requirement		<ul style="list-style-type: none"> Measuring tools EDM Wire Cut machine 	
CU4. Perform (EDM) Wire cutting process	The trainee will be able to: <ol style="list-style-type: none"> 1. Setup die-electric as per job requirement 2. Carryout (EDM) wire cutting process as per job requirement 3. Check quality of the component at suitable intervals. 4. Shut down the machine at safe position after finishing the work. 	<ul style="list-style-type: none"> Standard procedure to perform (EDM) wire cut process Standard procedures to check quality of the workpiece during the process Explain how to neutralize and shut down the machine as per standard procedures 	Total: 55hrs Theory: 05hrs Practical: 50hrs	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Dielectric fluid EDM Wire Cotton rags PPEs' White board Multimedia Internet Computer system Measuring tools EDM Wire Cut machine 	<ul style="list-style-type: none"> Class Room Workshop
CU5. Inspect	The trainee will be able		Total:		<ul style="list-style-type: none"> Class Room

the job as per drawing	to: <ol style="list-style-type: none"> 1. Perform cleaning of the job using appropriate method 2. Inspect the job using appropriate measuring tool 	<ul style="list-style-type: none"> • Describe Post EDM operations (cleaning, unmounting of work-piece, inspection, etc.) <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Inspect the job as per drawing 	14hrs Theory: 04hrs Practical: 10hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Dielectric fluid • EDM Wire • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring tools EDM Wire Cut machine 	<ul style="list-style-type: none"> • Workshop
------------------------	---	---	--	---	--

Module 6: Analyze with Workplace Policy and Procedures

Objective of the module: The aim of this module to get knowledge, skills and understanding to manage work timeframes, manage to convene meeting, set and meet own work priorities at instant, develop and maintain professional competence and follow and implement work safety requirements.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Manage work timeframes	The trainee will be able to: <ol style="list-style-type: none"> 1. Complete work tasks within deadlines in according to order of priority 2. Supervisors are informed of any delays in work times or projects 	<ul style="list-style-type: none"> • Importance of time management strategies <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Prepare a work timeframe for a given scenario 	<p>Total: 04hrs</p> <p>Theory: 01hrs</p> <p>Practical: 03hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • White board • Multimedia • Internet • Computer system 	Class room

LU2: Manage to convene meeting	The trainee will be able to: <ol style="list-style-type: none"> 1. Develop agenda in line with meeting purpose 2. Select participants and notify them accordingly 3. Carryout meeting arrangements according to the time 4. Record the minutes of the meeting 	<ul style="list-style-type: none"> • Explain meeting terminologies • Importance of structures and arrangement of meeting • Explain the organizational procedures and policies regarding meetings, chairing and minutes. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Generate minutes of meeting 	Total: 05hrs Theory: 01hrs Practical: 03hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Pen 	Class room
LU3: Set and meet own work priorities at instant	The trainee will be able to: <ol style="list-style-type: none"> 1. Take initiative to prioritize and facilitate competing 	<ul style="list-style-type: none"> • Describe Healthy work life balance 	Total: 04hrs Theory:	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners 	Class room

	<p>demands to achieve organizational goals and objectives</p> <p>2. Use technology efficiently and effectively to manage work priorities and commitments</p> <p>3. Maintain appropriate work-life balance</p>	<p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Generate a report on healthy work life balance 	<p>01hrs</p> <p>Practical:</p> <p>03hrs</p>	<ul style="list-style-type: none"> • White board • Multimedia • Internet Computer system Pen 	
<p>LU4: Develop and maintain professional competence</p>	<p>1. Assess personal knowledge and skills against competency</p> <p>2. Participate in networks to enhance personal knowledge, skills and work relationships</p> <p>3. Seek feedback from employees, clients and colleagues to develop and improve competence</p>	<ul style="list-style-type: none"> • Explain the professional competence • Importance of feedback <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Record the feedback from customer and carryout the required analysis 	<p>Total:</p> <p>04hrs</p> <p>Theory:</p> <p>01hrs</p> <p>Practical:</p> <p>03hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <ul style="list-style-type: none"> • White board • Multimedia • Internet Computer system Pen 	<ul style="list-style-type: none"> • Explain the • Importance of

LU5: Follow and implement work safety requirements	<ol style="list-style-type: none"> 1. Identify and report emergency incidents 2. Practice organizational policy and procedures for responding to emergency incidents 3. Identify and implement workplace procedures and work instructions for controlling risks 	<ul style="list-style-type: none"> • Explain the emergency incidents • Importance of organizational policy and procedures for emergency incidents <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Demonstrate the safety drill 	<p>Total:</p> <p>04hrs</p> <p>Theory:</p> <p>01hrs</p> <p>Practical:</p> <p>03hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board • Multimedia • Internet Computer system • Pen 	<ul style="list-style-type: none"> • Explain the • Importance of
---	--	---	--	---	--

Module 7: Perform Heat Treatment

Objective of the module: The aim of this module is to get knowledge, skills and understanding to prepare material for heat treatment, perform annealing, perform normalizing, perform hardening, perform tempering, perform flame hardening, perform induction hardening and perform carburizing

Duration: 90 hours

Theory: 27 hours

Practical: 63 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare material for heat treatment	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Prepare provision for holding the workpiece in furnace. 2. Check the hardness of the workpiece using appropriate hardness tester. 3. Set the workpiece according to the requirement. 	<ul style="list-style-type: none"> • Define heat treatment process • Basic types of heat treatment • Basic purposes of heat treatment • Explain how to hold the workpiece as per standard procedures • Define hardness • Types of hardness tests • Standard parameters of different hardness tests • Applications and limits of hardness tests <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Carryout the surface cleaning of given workpiece with different emery paper grits 	<p>Total: 06hrs</p> <p>Theory: 03hrs</p> <p>Practical: 03hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Quenching media • White board • Multimedia • Internet • Computer system • Heat treatment furnace • Long Tong 	<ul style="list-style-type: none"> • Class Room • Workshop

		<ul style="list-style-type: none"> • Perform hardness inspection of work piece • Prepare heat treatment furnace as per job requirement and load the material in the furnace 		<ul style="list-style-type: none"> • Hardness Tester • Metallurgical Microscope • Heat treatment color temperature charts • PPEs' 	
LU2: Perform Annealing	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Set the temperature of furnace as per material specification 2. Held the part in the furnace to reach the required soaking time 3. Cool the workpiece inside the furnace. 	<ul style="list-style-type: none"> • Define annealing. • Describe the purposes of annealing • Explain annealing of steel. • Describe the effect of carbon contents on annealing temperature of steel • Describe equilibrium phases of steel • Define soaking time. • Describe the factors affecting the soaking time <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Pre-heat the annealing furnace 	<p>Total: 16hrs</p> <p>Theory: 04hrs</p> <p>Practical: 12hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Quenching media • White board • Multimedia • Internet • Computer system • Heat 	<ul style="list-style-type: none"> • Class Room • Workshop

		as per job requirement <ul style="list-style-type: none"> • Run the required heat treatment cycle on workpiece 		treatment furnace <ul style="list-style-type: none"> • Long Tong • Hardness Tester • Metallurgical Microscope • Heat treatment color temperature charts • PPEs' 	
LU3: Perform Normalizing	The trainee will be able to: <ol style="list-style-type: none"> 1. Set the temperature of furnace as per material specification. 2. Held the part in the furnace to reach the required soaking time. 3. Cool the workpiece 	<ul style="list-style-type: none"> • Define Normalizing. • Describe the purposes of normalizing. • Explain normalizing of steel. • Describe the effect of carbon contents on normalizing temperature of steel <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Select and pre-heat the furnace as per job requirement • Run the required heat treatment cycle on workpiece 	Total: 09hrs Theory: 03hrs Practical: 06hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Quenching media • White board • Multimedia • Internet 	<ul style="list-style-type: none"> • Class Room • Workshop

	at room temperature.			<ul style="list-style-type: none"> • Computer system • Heat treatment furnace • Long Tong • Hardness Tester • Metallurgical Microscope • Heat treatment color temperature charts • PPEs' 	
LU4: Perform Hardening	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Set the temperature of furnace as per material specification 2. Held the part in 	<ul style="list-style-type: none"> • Define quenching process. • Types of quenching media • Explain stages of quenching • Define martensite. • Define hardening • Explain effect of hardening on properties and microstructure of steel. <p><u>Practical Activity:</u></p>	<p>Total:</p> <p>16hrs</p> <p>Theory:</p> <p>04hrs</p> <p>Practical:</p> <p>12hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Quenching media 	<ul style="list-style-type: none"> • Class Room • Workshop

	<p>the furnace to reach the required soaking time.</p> <p>3. Ensure that quenching media temperature is as per standard requirement of the material.</p> <p>4. Dip the part in specific quenching media (bath) to achieve required hardness</p> <p>5. Agitate quenching media as per requirement to absorb heat of a part.</p> <p>6. Verify the required hardness</p>	<ul style="list-style-type: none"> • Select and pre-heat the furnace as per job requirement • Carryout the hardening as per standard heat treatment cycle of given job 		<ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Heat treatment furnace • Long Tong • Hardness Tester • Metallurgical Microscope • Heat treatment color temperature charts • PPEs' 	
LU5: Perform Tempering	<p>The trainee will be able to:</p> <p>1. Take hardened sample</p>	<ul style="list-style-type: none"> • Define tempering. • Describe the purposes of tempering. • Types of tempering process 	<p>Total:</p> <p>09hrs</p> <p>Theory:</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers 	<ul style="list-style-type: none"> • Class Room • Workshop

	2. Place the sample in the furnace 3. Adjust the tempering temperature of furnace and soaking time of the furnace according to requirement. 4. Cool the specimen at room temperature.	<ul style="list-style-type: none"> Describe the effect of carbon contents on tempering temperature of steel <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Pre-heat the tempering furnace as per job requirement Carryout the tempering as per job requirement 	03hrs Practical: 06hrs	<ul style="list-style-type: none"> Sharpeners Pen Quenching media White board Multimedia Internet Computer system Heat treatment furnace Long Tong Hardness Tester Metallurgical Microscope Heat treatment color temperature charts PPEs' 	
LU6: Perform Flame	The trainee will be		Total:		<ul style="list-style-type: none"> Class Room

hardening	<p>able to:</p> <ol style="list-style-type: none"> 1. Place the workpiece in flame exposed area 2. Adjust the oxyacetylene flame torch. 3. Gently heat all the surface of workpiece for a prescribed time. 4. Quench the workpiece in quenching media. 5. Clean the workpiece. 6. Verify the required hardness 	<ul style="list-style-type: none"> • Define case hardening of steel. • Types of case hardening process • Describe the case hardening of low carbon steel, medium carbon steel and alloy steel. • Define flame hardening. • Explain the working of flame hardening torch. • Describe the parameters controlling the case depth • Applications of flame hardening <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Prepare the flame hardening apparatus as per standard • Carryout the flame hardening process as per job requirement 	<p>13hrs</p> <p>Theory:</p> <p>04hrs</p> <p>Practical:</p> <p>09hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Quenching Media • Oxyacetylene gas • White board • Multimedia • Internet • Computer system • Fixtures • Flame hardening torch • Hardness tester • Metallurgical microscope • Heat treatment 	<ul style="list-style-type: none"> • Workshop
-----------	---	--	---	---	--

				color temperature charts • PPEs'	
LU7: Perform induction Hardening	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Set on the induction heating apparatus. 2. Place the workpiece in heat exposed area of induction heating apparatus. 3. Control the heat-up times to within ± 0.1s and should be less than 20s to avoid penetration of heat deep from the surface of workpiece 4. Quench the workpiece in quenching media 5. Clean the 	<ul style="list-style-type: none"> • Define electromagnetic induction. • Define induction heating. • Define induction hardening of steel. • Describe the factors controlling the case depth in induction hardening. • Applications of induction hardening <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Prepare the induction hardening machine as per SOPs • Select induction coil as per job requirement • Execute the induction hardening process 	<p>Total: 09hrs</p> <p>Theory: 03hrs</p> <p>Practical: 06hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Quenching media • White board • Multimedia • Internet • Computer system • Induction heating coil • Hardness tester • Metallurgical microscope • Heat 	<ul style="list-style-type: none"> • Class Room • Workshop

	workpiece 6. Verify the required hardness			treatment color temperature charts • PPEs'	
LU8: Perform Carburizing	The trainee will be able to: <ol style="list-style-type: none"> 1. Handle the samples with appropriate care. 2. Pack the samples in carbonaceous material in steel box and seal the boxes by suitable method. 3. Place the boxes in the furnace 4. Heat the samples for suitable time and temperature. 5. Turn off the furnace and remove the steel boxes from furnace and 	<ul style="list-style-type: none"> • Define carburizing. • Define pack carburizing. • Describe the composition of carburizing compound. • Define gas carburizing. • Describe the environment of furnace used for carburizing. • Applications of carburizing process <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Pack the carburizing box as per job requirement • Select and pre-heat the furnace as per job requirement • Carryout the pack carburizing cycle as per job requirement 	Total: 12hrs Theory: 03hrs Practical: 09hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Carbonaceous material • Quenching media • White board • Multimedia • Internet • Computer system • Heat treatment furnace • Metallurgical 	<ul style="list-style-type: none"> • Class Room • Workshop

	<p>recover the specimen.</p> <p>6. Clean the workpiece.</p> <p>7. Verify the required hardness</p>			<p>microscope</p> <ul style="list-style-type: none"> • Hardness tester • Heat treatment color temperature charts • PPEs' 	
--	--	--	--	---	--

Module 8: Perform CNC Milling/Machining Centre Operations

Objective of the module: The aim of this module is to get knowledge, skills and understanding to perform CNC Milling/Machining Centre Operations

Duration: 240hrs

Theory: 39hrs

Practical: 201hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare a Machine before performing CNC Milling/Machining center operations	The trainee will be able to: <ol style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> • Introduction to CNC milling/Machining Center (MC) • Advantages of using CNC Milling/MC • Major functional parts of CNC milling/MC • Knowledge of milling machine operations & tools. <p>Operations: facing, side milling, pocketing, grooving, contouring, chamfering, etc.</p> <p>Tools: end mill, shell end mill, face mill, boring bars, removable carbide tips and holders, etc.</p> <ul style="list-style-type: none"> • Knowledge of machine axis traveling concept (right hand rule, etc.) • Standard procedures to prepare 	Total: 28hrs Theory: 07hrs Practical: 21hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Milling Cutters • Coolants • Lubricants • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system 	<ul style="list-style-type: none"> • Class Room • Workshop

		<p>a Machine before performing CNC Milling/Machining center operations</p> <ul style="list-style-type: none"> • Know the method of setting of home position • Difference between feed, speed and override • Difference between single block and Auto execution mode • Understand relation between machine coordinates system and work coordinates system • Acquire home positioning and reference positioning subsequently <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Perform machine start up as per SOPs • Perform machine warm-up cycle 		<ul style="list-style-type: none"> • Measuring tools • Tool Measuring devices • Clamping devices • CNC milling machine/MC • Tool holding Devices 	
--	--	--	--	---	--

LU2: Perform workpiece and tools setting on the machine	The trainee will be able to: <ol style="list-style-type: none"> 1. Mount the work-piece as per SOPs 2. Mount the cutter in spindle/ATC as per job requiremen 3. Perform off-set setting of the workpiece and tools (compensations) 	<ul style="list-style-type: none"> • Dialing and alignment setting techniques • Method of reference setting for workpiece • Method of calculating offset values and setting the values in machine control unit • Knowledge of touch probe • Selection of milling cutters/tools and its types with respect to operations and material of workpiece • Attaining the proper alignment of cutter and its rigid clamping against the workpiece <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Perform workpiece and tool mounting on machine as per requirement • Perform off-set setting of workpiece and tools 	Total: 36hrs Theory: 06hrs Practical: 30hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Milling Cutters • Coolants • Lubricants • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring tools • Tool Measuring devices • Clamping 	<ul style="list-style-type: none"> • Class Room • Workshop
--	--	--	---	--	--

				devices <ul style="list-style-type: none"> • CNC milling machine/MC • Tool holding Devices 	
LU3: Generate the part program for CNC Milling	The trainee will be able to: <ol style="list-style-type: none"> 1. Set reference point for machining as per job requirements 2. Use appropriate part programming credentials (Coordinates, Feed, Speed, Tooling Information etc.) according to the CNC machine control unit 3. Generate part program using G & M codes 4. Perform simulation of 	<ul style="list-style-type: none"> • Understand graph and Cartesian coordinates system • Work with absolute and incremental measuring systems • Interpret and develop drawing to be machined according to the job requirements • G & M code programming concepts for milling operations • Knowledge of miscellaneous functions • Knowledge of tool path generation/programming according to requirement • Know the method of performing post processing of program • Know the method of test run the program. • Use of CAM generated part program for milling operations 	Total: 67hrs Theory: 12hrs Practical: 55hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Milling Cutters • Coolants • Lubricants • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring 	<ul style="list-style-type: none"> • Class Room • Workshop

	generated program	<ul style="list-style-type: none"> Method of editing of program <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Generate part program as per job requirement Perform simulation to check the program and edit if required 		<p>tools</p> <ul style="list-style-type: none"> Tool Measuring devices Clamping devices CNC milling machine/MC Tool holding Devices 	
LU4: Feed the program	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> Ensure proper synchronization between machine control unit and part program file as per procedure Switch machine to receiving mode and feed the desired part program file into machine control unit for further 	<ul style="list-style-type: none"> Construction of proper synchronization for part program and its feeding to the machine control unit Switching machine control unit modem to receiving mode from the control panel Transferring the part program file to the machine control as per prescribed method <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Transfer the CAM generated program from computer to machine control unit by using 	<p>Total: 18hrs</p> <p>Theory: 03hrs</p> <p>Practical: 15hrs</p>	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Milling Cutters Coolants Lubricants Cotton rags PPEs' White board 	<ul style="list-style-type: none"> Class Room Workshop

	<p>execution as per procedure</p> <p>3. Select the desired part program file for execution as per procedure</p>	<p>appropriate DNC protocol</p> <ul style="list-style-type: none"> • Perform dry run to check the program and edit if required 		<ul style="list-style-type: none"> • Multimedia • Internet • Computer system • Measuring tools • Tool Measuring devices • Clamping devices • CNC milling machine/MC • Tool holding Devices 	
LU5: Perform CNC Milling Operations	<p>The trainee will be able to:</p> <p>1. Ensure to control the safe operation of working on CNC machines before executing part program according to the safety measures</p>	<ul style="list-style-type: none"> • Control the feed and speed adjustments in milling machine operations before starting the operation • Run the milling operation (plane milling, side milling, drilling, boring, grooving, slotting, pocket milling, boss milling, contour/profile milling, etc.) as per program, inserted and 	<p>Total: 76hrs</p> <p>Theory: 06hrs</p> <p>Practical: 70hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Milling Cutters • Coolants • Lubricants 	<ul style="list-style-type: none"> • Class Room • Workshop

	<p>2. Control the feed and speed override of machine before and during the operation according to the requirement</p> <p>3. Carry out CNC Milling Operations</p>	<p>executed into the machine control unit</p> <ul style="list-style-type: none"> • Standard procedures to perform milling machine operations as per job requirements • Explain how to neutralize and shut down the machine as per standard procedures <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Execute the part program according to SOPs to complete the job • Neutralize and shut down the machine as per standard procedures 		<ul style="list-style-type: none"> • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring tools • Tool Measuring devices • Clamping devices • CNC milling machine/MC • Tool holding Devices 	
--	--	--	--	---	--

LU6: Inspect the job as per drawing	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Perform deburring of the job using appropriate tool 2. Inspect the job using appropriate measuring tool 	<ul style="list-style-type: none"> • Describe Post CNC Milling operations (cleaning, inspection, unmounting of work-piece, etc.) • Standard procedures to check quality of the workpiece as per requirement <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Perform inspection of the workpiece to verify the job accuracy according to drawing requirement 	<p>Total: 15hrs</p> <p>Theory: 05hrs</p> <p>Practical: 10hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Milling Cutters • Coolants • Lubricants • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring tools • Tool Measuring devices • Clamping 	<ul style="list-style-type: none"> • Class Room • Workshop
--	--	--	---	--	--

				<div>devices</div> <ul style="list-style-type: none">• CNC milling machine/MC• Tool holding Devices	
--	--	--	--	--	--

Module 9: Perform Advance Grinding Operations

Objective of the module: The aim of this module is to get knowledge, skills and understanding to perform advance Grinding Operations

Duration: 140 hours **Theory:** 29 hours **Practical:** 111 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare Machine Before Grinding Operation	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Switch on the machine 2. Check the safety measures as per SOPs. 3. Check and maintain coolant level. 4. Run machine warm-up cycle. 	<ul style="list-style-type: none"> Describe different types of grinding operations (Cylindrical grinding, tool and cutter grinding, off-set grinding, center less grinding, profile grinding, jig grinding, etc.) Standard procedures to prepare Machine Before Grinding Operation <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Follow SOPs to start grinding machine Run machine warm-up cycle 	<p>Total: 18hrs</p> <p>Theory: 06hrs</p> <p>Practical: 12hrs</p>	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Grinding wheels Coolants Lubricants Cotton rags PPEs' White board Multimedia Internet Computer system 	<ul style="list-style-type: none"> Class Room Workshop

				<ul style="list-style-type: none"> • Measuring tools • Tool Measuring devices • Clamping devices • Grinding machine • Grinding wheel balancing arrangement 	
LU2: Perform mounting and dressing before Grinding Operation	The trainee will be able to: <ol style="list-style-type: none"> 1. Select appropriate grinding wheel according to the work piece material 2. Mount the grinding wheel as per standard procedure. 3. Dress the grinding 	<ul style="list-style-type: none"> • Clamping devices for cylindrical grinding (collets face plate with dog clamp, dead center, half center, revolving center, etc.) • Clamping devices for tool and cutter grinding (tool holder, collets, etc.) • Clamping devices for Jig grinding (precision vice, rotary table, angular vice, magnetic table, etc.) • Method of using workpiece clamping devices as per job 	Total: 24hrs Theory: 06hrs Practical: 18hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Grinding wheels • Coolants • Lubricants • Cotton rags • PPEs' 	<ul style="list-style-type: none"> • Class Room • Workshop

	<p>wheel as per standard procedure</p> <p>4. Shut down the machine after completion the task.</p>	<p>requirement</p> <ul style="list-style-type: none"> • Method of setting table travel / movement • Knowledge of grinding discs for tool and cutter grinder • Knowledge of grinding stones for Jig grinding operations • Standard procedure to perform mounting and dressing for different grinding machines • Explain how to neutralize and shut down the machine as per standard procedures <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Select grinding wheel according to job requirement • Carryout inspection and wheel balancing procedure • Perform installation of grinding wheel on the machine and carryout wheel dressing process 		<ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Tool Measuring devices • Clamping devices • Grinding machine • Grinding wheel balancing arrangement 	
--	---	--	--	---	--

LU3: Perform Cylindrical Grinding	The trainee will be able to: <ol style="list-style-type: none"> 1. Select appropriate tool& clamping device according to the job requirement 2. Manage the measuring instruments as per job requirement 3. Check the grinding machine safety covers before starting the process 4. Set travel length of grinding wheel as per workpiece requirement 5. Set the appropriate RPM according to the requirement 6. Perform center to 	<ul style="list-style-type: none"> • Cylindrical grinder machine major operational parts (Headstock, tailstock, feed, bed travel limit switch, adjustment of taper degree, etc.) • Setting of safe table travel length • Knowledge of wheel speed and workpiece speed • Use of dial indicators for checking parallelism • Standard procedures to perform Cylindrical grinding, including: <ul style="list-style-type: none"> ◦ Selection of appropriate grinding wheel and clamping device ◦ Managing the measuring instruments ◦ Setting travel length of grinding wheel ◦ Setting the appropriate RPM ◦ Performing center to center alignment of machine ◦ Mount the work piece between centres ◦ Perform Cylindrical grinding 	Total: 30hrs Theory: 06hrs Practical: 24hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Grinding wheels • Coolants • Lubricants • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring tools • Tool Measuring devices • Clamping 	<ul style="list-style-type: none"> • Class Room • Workshop
--	---	---	---	--	--

	<p>center alignment of machine</p> <p>7. Mount the work piece between centres as per requirement</p> <p>8. Apply coolant on cylindrical grinding process</p> <p>9. Perform Cylindrical grinding as per standard procedure</p> <p>10. Check quality of the component at suitable intervals</p> <p>11. Shut down the machine after completion the task.</p>	<ul style="list-style-type: none"> Standard procedures to check quality of the workpiece during the process Explain how to neutralize and shut down the machine as per standard procedures <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Mount the job on machine and perform its alignment procedure Perform setting of machine travelling limits, feeds and depth of cut Carryout grinding operation and achieve accuracy as per job requirement 		<p>devices</p> <ul style="list-style-type: none"> Grinding machine Grinding wheel balancing arrangement 	
<p>LU4: Perform Tool and Cutter Grinding</p>	<p>The trainee will be able to:</p> <p>1. Select the suitable size, type and shape of grinding</p>	<ul style="list-style-type: none"> Tool and cutter grinder machine major operational parts (adjustment of cutting angles, tool holding unit, etc.) 	<p>Total: 27hrs</p> <p>Theory: 03hrs</p> <p>Practical:</p>	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners 	<ul style="list-style-type: none"> Class Room Workshop

	<p>wheel</p> <ol style="list-style-type: none"> 2. Mount work piece onto correct attachment for required procedure 3. Adjust the attachments according to different types of tools and cutter 4. Follow procedure for sharpening of tools and cutter that is safe and appropriate. 5. Check quality of the component at suitable intervals 6. Shut down the machine after completion the task. 	<ul style="list-style-type: none"> • Introduction to Cutting tool Geometry of different tools (milling cutter, drills, etc.) • Introduction to Cutting tool Materials (HSS, Carbide, Diamond, etc.) • Standard procedures to perform Tool and Cutter grinding, including: <ul style="list-style-type: none"> ○ Selection of the suitable size, type and shape of grinding wheel ○ Mounting of the work piece onto correct attachment ○ Adjustment of the attachments according to different types of tools and cutter ○ Perform Cylindrical grinding • Standard procedures to check quality of the workpiece during the process • Explain how to neutralize and shut down the machine as per standard procedures 	24hrs	<ul style="list-style-type: none"> • Pen • Grinding wheels • Coolants • Lubricants • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring tools • Tool Measuring devices • Clamping devices • Grinding machine • Grinding wheel balancing 	
--	---	--	-------	---	--

		<u>Practical Activity:</u> <ul style="list-style-type: none"> • Fix the cutter on machine to perform grinding operation • Carryout grinding operation 		arrangement	
LU5: Perform Jig Grinding	The trainee will be able to: <ol style="list-style-type: none"> 1. Select appropriate tool& clamping device according to the job requirement. 2. Manage the measuring instruments as per job requirement 3. Mount the grinding tool as per SOPs. 4. Check the grinding machine safety covers before starting the process 5. Execute Jig grinding operation 	<ul style="list-style-type: none"> • Introduction to Jig Grinder • Jig grinding machine major operational parts (Abrasive Wheel, Wheel Guard, Abrasive Wheel Head, etc.) • Calculation of positioning coordinates for performing jig grinding operations on workpiece according to the drawing • Standard procedures to perform Jig grinding, including: <ul style="list-style-type: none"> ○ Selection of appropriate clamping device for workpiece ○ Selection of the suitable size, type and shape of grinding wheel ○ Managing the measuring instruments ○ Mounting of the work piece onto correct attachment 	Total: 27hrs Theory: 03hrs Practical: 24hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Grinding wheels • Coolants • Lubricants • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring 	<ul style="list-style-type: none"> • Class Room • Workshop

	<p>according to SOPs as per requirement</p> <p>6. Check quality of the component at suitable intervals</p> <p>7. Shut down the machine after completion the task.</p>	<ul style="list-style-type: none"> ○ Explain how to maintain safe distance between surface of work-piece and grinding stone for the initial setting for attaining the initial touching of grinding stone with workpiece ○ Perform Jig grinding • Standard procedures to check quality of the workpiece during the process • Explain how to neutralize and shut down the machine as per standard procedures <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Mount the job on machine and perform its alignment procedure • Perform setting of machine travelling limits, feeds and depth of cut • Carryout grinding operation and achieve accuracy as per job requirement 		<p>tools</p> <ul style="list-style-type: none"> • Tool Measuring devices • Clamping devices • Grinding machine • Grinding wheel balancing arrangement 	
--	---	---	--	---	--

<p>LU6: Inspect the job as per drawing</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Perform deburring of the job using appropriate tool 2. Inspect the job using appropriate measuring tool 	<ul style="list-style-type: none"> • Describe Post grinding operations (cleaning, unmounting of work-piece, inspection, etc.) • Standard procedures to check quality of the workpiece <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Perform deburring/cleaning of job and carry out its inspection according to requirement 	<p>Total: 14hrs</p> <p>Theory: 05hrs</p> <p>Practical: 09hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Grinding wheels • Coolants • Lubricants • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring tools • Tool Measuring devices • Clamping 	<ul style="list-style-type: none"> • Class Room • Workshop
---	--	--	---	--	--

				devices <ul style="list-style-type: none"> • Grinding machine • Grinding wheel balancing arrangement 	
--	--	--	--	--	--

Module 10: Perform Die and Mould Maintenance

Objective of the module: The aim of this module is to get knowledge, skills and understanding to perform Die and Mould Maintenance

Duration: 140 hours **Theory:** 29 hours **Practical:** 111 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform overhauling of die and Mould	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select tooling as per requirement 2. Perform disassembling of die/mould 3. Perform cleaning and remove corrosion from different parts 4. Inspect all parts by appropriate method and take remedial action on defective parts 5. Perform assembling of all parts as per 	<ul style="list-style-type: none"> • Types of Moulding Materials • Types of Die/Mould Metals • Basic structure of Mould • Guide system • Types of injection • Types of Ejection • Air vents • Parting lines • Mould Strength • Cooling System • Draft angles • Moulding Machines and their operating parameters • Press machines and their operating parameters <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Perform disassembling of die/mould • Perform cleaning and remove 	<p>Total: 38hrs</p> <p>Theory: 08hrs</p> <p>Practical: 30hrs</p>	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring tools • CNC milling machine 	<ul style="list-style-type: none"> • Class Room • Workshop

	SOPs.	corrosion from different parts <ul style="list-style-type: none"> Re-assemble all the parts of die/mould and ensure their operational functionality 			
LU2: Perform inspection of faulty product	The trainee will be able to: <ol style="list-style-type: none"> Select tools required for the inspection of product Perform inspection of product as per SOPs Prepare inspection report and list down the possible causes of the defects as per SOPs 	<ul style="list-style-type: none"> Moulding defects and causes Defects of press working Dies Basic structure of press tools <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Perform inspection of the faulty product of die/mould Prepare detailed defect report and point out possible causes of defect 	Total: 38hrs Theory: 08hrs Practical: 30hrs	<ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Cotton rags PPEs' White board Multimedia Internet Computer system Measuring tools CNC milling machine 	<ul style="list-style-type: none"> Class Room Workshop

LU3: Perform Remedial action	The trainee will be able to: 1. Perform analysis of all causes to find out real source of defect as per SOPs 2. Perform remedial action to remove the fault as per SOPs	<ul style="list-style-type: none"> • Common defects and possible causes of Die/Mould parts • Explain corrective actions: <ul style="list-style-type: none"> ○ Machining processes ○ Welding processes ○ Heat treatment processes etc. • Mould re-assembling and matching techniques <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Perform defect analysis procedure and find out root cause of defect • Perform maintenance procedure in order to rectify the fault 	Total: 64hrs Theory: 13hrs Practical: 51hrs	<ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Cotton rags • PPEs' • White board • Multimedia • Internet • Computer system • Measuring tools • CNC milling machine 	<ul style="list-style-type: none"> • Class Room • Workshop
-------------------------------------	--	--	---	--	--

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 store merchandizing, handling documents
- 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 handle documents, what are the benefits of organizing store merchandising
- Paper-based tests, such as multiple choice or short answer questions on communication at work place policy and procedures, handling documents, organizing store merchandizing
- 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 store merchandising

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 store merchandiser 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 store merchandizing 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 11 modules:

- **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
- **Module 11:** 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.	Scanner	1
5.	Hardness Testers	1
6.	Universal testing machine(UTM)	1
7.	Impact Testing Machines	1
8.	Lathe machine with accessories	5
9.	Lathe Tools(Facing, Threading, Knurling, Parting off, Forming etc)	10each
10.	Drilling machine with accessories	5
11.	Drilling tools (twist drill, center drill, counter boring tool , reamer, taps etc)	10 each
12.	Milling Machine with accessories	5
13.	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
14.	Surface Grinding Machine with accessories and consumables	2
15.	Cylindrical Grinding Machine with accessories and consumables	2
16.	Pedestal Grinder with accessories and consumables	2
17.	Tool and cutter Grinder with accessories and consumables	2
18.	Shaper Machine with accessories	2

19.	Planar Machine with accessories	1
20.	Steel Rules	10
21.	Tri Square	10
22.	Inside Vernier Caliper	10
23.	Odd leg Vernier Caliper	10
24.	Trammel Vernier Caliper	10
25.	Outside Vernier Caliper	10
26.	Vernier Depth gauge	5
27.	Vernier Bevel protractor	5
28.	Thread gauges	5
29.	Screw pitch gauges	5
30.	Fillet gauges	5
31.	Feeler gauges	5
32.	Vernier Height gauge	5
33.	Dial indicators with magnetic stand	5
34.	Vernier Micrometer	5
35.	Inside Micrometer	5
36.	Outside Micrometer	10
37.	Depth Micrometer	5
38.	Snap Gauge set	2
39.	Dial Bore Gauge	5

40.	Set of Adjustable Wrench	5
41.	Set of Spanners (Open end, Ring)	5 each
42.	Pipe wrench	2
43.	Pipe Dies	2
44.	L-key sets	5
45.	Nose pliers	5
46.	Grip pliers	5
47.	Straight peen Hammer	5
48.	Ball peen Hammer	5
49.	Mallets Hammer	5
50.	Claw Hammer	5
51.	Long nose Tong	5
52.	Short nose tong	5
53.	Flat Chisel	5
54.	Scraper of different shapes	5 each
55.	Scriber	10
56.	Hand hacksaw	25
57.	Chipping hammer	10
58.	Oxy acetylene welding torch	10
59.	Tip cleaners	5
60.	Oxy acetylene welding cylinder set(oxygen, C ₂ H ₂)	5

61.	Oxy acetylene welding table	5
62.	Welding gloves	10 set
63.	Face screen	10
64.	Goggles	10
65.	Electric arc welding transformer	5
66.	Electric arc welding pliers	5
67.	Disc grinder 4 inch	5
68.	Disc cutter	5
69.	Electric arc welding table	5
70.	Welding electrode of different size & grade	10 packs
71.	3D scanner	1
72.	3D printer	1
73.	Rockwell Hardness tester	1
74.	Brinell Hardness tester	1
75.	Vicker Hardness tester	1
76.	Mould polishing stones(Mesh no 240 to 1200)	10 each
77.	Sand papers of different grade(Mesh no 180 to 2000)	10 each
78.	Diamond Paste tubes of different grades (Micron 2500 to 5000)	2 each
79.	Ceramics stones of different grades (Mesh no 300 to 1200)	5 each
80.	Diamond hand file set	5 set
81.	Riffle hand file set	5

82.	Needle hand file set	5
83.	Round hand file	5
84.	Half round hand file	5
85.	Triangular hand file	5
86.	Square hand file	5
87.	Flat hand file	5
88.	Ultra sonic Polishing box	2
89.	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

Credit values

The credit value of the National Certificate Level 4 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
Module 1: Establish and maintain the occupational Health and safety system	30	03
Module 2: Perform Advance communication	30	03
Module 3: Perform CAD/CAM Operations	200	20
Module 4: Perform Electric Discharge Machining (EDM) Sinker Operations	150	15
Module 5: Perform (EDM) Wire Cut Operations	150	15
Module6: Analyse Workplace Policies and Procedures	30	30
Module7: Perform Heat Treatment	90	09

Competency Standard	Estimate of hours	Credit
Module8: Perform CNC Milling/Machining Centre Operations	240	24
Module9: Perform Advance Grinding Operations	140	14
Module10: Perform Die and Mould Maintenance	140	14

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
8. Engr. Salman Khalid	AD, PITAC, Lahore

Name	Designation
9. Engr.Tashiq Semab Amin	Dy Manager, HIT, Taxila
10. Engr. Abdul Waqar	CAD CAM designer, Shan Group Engineering Wing, Peshawar
11. Engr. Liaqat Ali Jamhroo	Director Academics, STEVTA
12. Mr. Aman Ullah Ch	Sr. Research Officer, PBTE, Lahore
13. Syed Mansoor Ahmad	Assistant Manager, NVQF Registry Incharge, SBTE, Karachi
14. Mr. Mushtaq Ahmad	Director, Monitoring, PTEVTA, Lahore
15. Engr. Aijaz Ahmad Zia	DACUM Expert, Lahore