National Vocational Certificate for "Metal Forming & Processing Assistant/Helper"

Level 02

Competency Based Curriculum

National Vocational and Technical Training Commission (NAVTTC), Government of Pakistan

Table of Contents

1. Introduction 3

a. "Metal Forming & Processing Assistant/Helper" Level 02 3
b. Purpose of the Training Program 4
c. Overall Objectives of Training Program 4
d. Competencies to be gained after completion of course 4
e. Possible available Job opportunities available immediately and later in the future 5
f. Trainee Entry level 5
g. Minimum Qualification of Trainer 5
h. Recommended Trainer: Trainee Ratio 5
i. Medium of Instruction i.e. Language of Instruction 5
j. Duration of the Course 5
k. Sequence of the Modules 6

2. Summary – Overview of the Curriculum 6

3. Modules 9

0715-MF&P 01 Module: Observe Basic Occupational Safety & Health Practices 9
0715-MF&P 02 Module: Maintain Occupational Safety & Health at Site 12
0715-MF&P 03 Module: Draw the Lettering and geometrical Shapes 15
0715-MF&P 04 Module: Construct different Engineering Curves 19
0715-MF&P 05 Module: Construct multi-view drawings 23
0715-MF&P 06 Module: Perform Bench Works 26
0715-MF&P 07 Module: Perform cutting on Power Hack Saw 29
0715-MF&P 08 Module: Interpret Welding/Fabrication Requirements 31
0715-MF&P 09 Module: Perform Pre-welding operations 33
0715-MF&P 10 Module: Identify Metal forming operations 36
0715-MF&P 11 Module: Perform Preparation for Metal Processing 43
0715-MF&P 12 Module: Carryout Housekeeping Jobs 46
0715-MF&P 13 Module: Perform General Maintenance 48

4. Supportive Notes 50

5. List of Tools, Machinery and Equipment 50

6. List of Consumable Supplies 50

7. Members of the Curriculum Development Committee 50

1. Introduction

a. *"Metal Forming & Processing Assistant/Helper" Level 02*

The Metal Forming & Processing industries are an essential part of our society that processes metals in order to manufacture machine components, machinery, instruments and tools needed by industries as well as by other sectors of the economy.

The products and components created by the different metal shaping techniques are used in creating everything from scaffolding and heavy machinery, to designing and creating microprocessors and artificial intelligence.

When it comes to metal forming, there are several processes to choose from, with each offering its own list of benefits and detriments, each suited to certain applications and for different types of metals.

That includes:

- Knowing the principles of common forming processes and their typical applications
- Identifying the key factors in the product to be made which will guide the forming process selection
- Applying basic metallurgy to the situation so as to make an appropriate recommendation.

Keeping in view of the above, the competency based national vocational qualifications have been developed by NAVTTC to train the unskilled human resource on the technical and entrepreneurial skills.

Training Course is based on competency standards which are defined by the industry and the traditional role of a trainer changes and shifts towards the facilitation of training. A trainer encourages and assists trainees to learn for themselves. Trainees are likely to work in groups (pairs) and all doing something different. Some are doing practical tasks in the workshop, some writing, some not even in the classroom or workshop but in another part of the building using special equipment. As trainees learn at different pace they might be at different stages in their learning, thus learning must be tailored to suit individual needs.

b. *Purpose of the Training Program*

The purpose of this training program is to set the highly professional standards for **Metal Forming & Processing Level 02 - 05** in order to compete local and international job market requirements. The specific objectives of developing these qualifications are as under:

- Empower the youth with locally and globally required employable skills
- Produce competitive **Metal Forming & Processing Skilled Personnel**
- Improve the quality and effectiveness of the training and assessment for **Metal Forming & Processing Industry**

c. *Overall Objectives of Training Program*

The main objectives of the National Vocational Certificate for **"Metal Forming & Processing Assistant/Helper" Level 02** are as follows:

- Improve the professional competence of the personnel
- Capacitate the local community and trainers in modern CBT training, methodologies and processes as envisaged under NVQF
- Provide flexible pathways and progressions in the Metal sector
- Enable the trainees to perform their duties in efficient manner
- Establish a standardized and sustainable system of training for Metal Forming & Processing work across globe

d. *Competencies to be gained after completion of course*

01	Observe Basic Occupational Safety & Health Practices
02	Maintain Occupational Safety & Health at Site
03	Draw the lettering and Geometrical Shapes
04	Construct different Engineering Curves
05	Construct multi-view drawings
06	Perform Bench Works
07	Perform cutting on Power Hack Saw
08	Interpret Welding/Fabrication Requirements
09	Perform Pre-welding operations
10	Identify Metal forming operations
11	Perform Preparation for Metal Processing
12	Carryout Housekeeping Jobs
13	Perform General Maintenance

e. *Possible available Job opportunities available immediately and later in the future*

01	Health and Safety Officer
02	Drawing Assistant
03	Machining Assistant
04	Welding Assistant
05.	Metal forming Assistant
06	Maintenance Assistant

f. *Trainee Entry level*

The entry for National Vocational Certificate for "Metal Forming & Processing Assistant/Helper" Level 02 would be Middle Certificate (8th Class).

g. *Minimum Qualification of Trainer*

Must be a holder of DAE in Metallurgy / Mechanical Technology with at least 2 years relevant experience

OR

BSc Engineering Technology (Metallurgy/Mechanical), B.E Metallurgy/Mechanical, BSc Metallurgy/Mechanical Engineering

h. *Recommended Trainer: Trainee Ratio*

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

i. *Medium of Instruction i.e. Language of Instruction*

Instructions will be in Urdu/ English/ Local language.

j. *Duration of the Course*

The distribution of contact hours is given below:

Total	-	612 hours
Theory	-	123 hours (20%)
Practical	-	489 hours (80%)
Proposed Course Duration	-	6 Months

k. *Sequence of the Modules*

Module 01	Observe Basic Occupational Safety & Health Practices
Module 02	Maintain Occupational Safety & Health at Site
Module 03	Draw the lettering and Geometrical Shapes
Module 04	Construct different Engineering Curves
Module 05	Construct multi-view drawings
Module 06	Perform Bench Works
Module 07	Perform cutting on Power Hack Saw
Module 08	Interpret Welding/Fabrication Requirements
Module 09	Perform Pre-welding operations
Module 10	Identify Metal forming operations
Module 11	Perform Preparation for Metal Processing
Module 12	Carryout Housekeeping Jobs
Module 13	Perform General Maintenance

2. Summary – Overview of the Curriculum

Module Title	Learning Units	Th.	Pr.	T.	Cr. Hrs
01 Observe Basic Occupational Safety & Health Practices	LU.1 Use PPEs LU.2 Clean the workplace LU.3 Adhere to emergency procedures LU.4 Identify hazards and risk at Workplace LU.5 Follow machine's operating guidelines	9	36	45	4.5
02 Maintain Occupational Safety & Health at Site	LU.1 Maintain safe work condition at site LU.2 Perform fire fighting LU.3 Carry out first aid treatment LU.4 Perform electrical work safely at workplace	9	36	45	4.5
03 Draw the Lettering and Geometrical shapes	LU.1 Draw horizontal, vertical and inclined lines. LU.2 Draw Upper case and Lower-Case lettering LU.3 Draw Different type of technical drawing Lines LU.4 Draw circles, half circles, radius with compass LU.5 Construct different geometrical shapes	6	21	27	2.7
04 Construct different	LU.1 Construct inscribe and	9	36	45	4.5

Engineering Curves		circumscribe figures.				
	LU.2	Construct Tangents of circles (Inside & Outside)				
	LU.3	Construct Ellipse				
	LU.4	Construct a parabola curve				
	LU.5	Construct a hyperbola curve				
	LU.6	Construct a Archimedean Spiral curve				
05 Construct multi-view drawings	LU.1	Sketch Orthographic projection in 1st angle of Projection	15	60	75	7.5
	LU.2	Sketch Orthographic projection 3rd angle of Projection				
	LU.3	Sketch Isometric Drawing				
	LU.4	Construct multi view drawing of General Bearing				
	LU.5	Construct development drawing				
06 Perform Bench Works	LU.1	Carryout Sawing	12	48	60	6
	LU.2	Carryout Filing				
	LU.3	Carryout Chipping				
07 Perform cutting on Power Hack Saw	LU.1	Cut material by using power hacksaw	6	24	30	3
	LU.2	Carry out Sawing at different angles with disc cutter				
08 Interpret Welding/Fabrication Requirements	LU.1	Interpret Fabrication Drawings	6	24	30	3
	LU.2	Interpret Welding Symbols				
	LU.3	Recognize Material Specifications				
09 Perform Pre-welding operations	LU.1	Prepare work pieces to be welded	12	48	60	6
	LU.2	Prepare welding machines and torches				
	LU.3	Perform Tacking				
10 Identify Metal forming operations	LU.1	Identify Injection and Extrusion Process	12	48	60	6
	LU.2	Explore Rolling Operation				
	LU.3	Explore Wire Drawing Operation				
	LU.4	Explore Deep Drawing Operation				
	LU.5	Explore Forging Operations				
	LU.6	Explore Casting Operation				
	LU.7	Explore Sheet Metal Operations				
11 Perform Preparation for Metal Processing	LU.1	Arrange raw materials for metal processing	9	36	45	4.5
	LU.2	Prepare tools and equipment for metal processing				
	LU.3	Prepare the machine for metal processing				
	LU.4	Maintain coordination with relevant departments				
12 Carryout Housekeeping Jobs	LU.1	Perform cleaning of workstation	6	24	30	3
	LU.2	Perform Cleaning of Equipments				

13 Perform General Maintenance	LU.1 Perform Preventive Maintenance of tools and equipment LU.2 Perform Corrective Maintenance of tools and equipment	12	48	60	6
	Total	**123**	**489**	**612**	**61.2**

3. Modules

0715-MF&P 01 Module: Observe Basic Occupational Safety & Health Practices

Objective: This module covers the knowledge and skills required to Use PPEs, Clean the workplace, Adhere to emergency procedures, Perform risk assessment at Workplace, Follow machine's operating guidelines

Duration: 45 Hours **Theory: 9 Hours** **Practice: 36 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Use PPEs	**Trainee will be able to:** • Arrange PPEs as per job requirement • Check PPEs for smooth function • Wear PPEs as per nature of job • Inspect personal protective equipment to maintain in a good order for reuse. • Store PPEs at designated place after use	• Identification of Personal Protective Equipment (PPE) • Knowledge about the Usage of PPEs • Importance of PPEs • Understanding of Safety signs, symbols and labels. **Practical Activity** • Wear PPEs according to the given task requirements.	Theory-2Hrs. Practical-9 Hrs. Total- 11 Hrs.	• Personal Protective Equipment	Class Room and Lab
LU2. Clean the workplace	**Trainee will be able to:** • Inspect the workplace for friendly working condition.	• Inspection of the workplace for friendly working condition	Theory-2 Hrs. Practical-9 Hrs. Total- 11 Hrs.	• Personal Protective Equipment	Class Room and Lab

	• Remove any unwanted material from workplace • Clean tools on a regular basis before stacking • Store tools and equipment at designated place • Perform housekeeping duties according to standard operating procedure.	• Understanding Cleaning procedure of tools. • Understanding the procedure of Stacking of tool and equipment. • Description of Standard operating procedure to maintain a safe working environment. **Practical Activity** Perform Cleaning and Stacking of given equipment as per SOPs			
LU3. Adhere to emergency procedures	**Trainee will be able to:** • Follow OSH Rules/Regulations as per company policy • Use emergency equipment (like First aid box, Fire Alarm,) available in accordance with workplace policies and procedures. • Response to emergency as per SOPs	• Understanding of OSH Rules/Regulations as per company policy. • Usage of emergency equipment (First aid box, Fire Alarm, Fire Extinguisher etc.) **Practical Activity** Perform emergency drill to ensure safe exit from the work place.	Theory-2Hrs. Practical-6 Hrs. Total- 08 Hrs	• Personal Protective Equipment • First aid box, • Fire Extinguishers	
LU4. Identify hazards and risk	**Trainee will be able to:** • Identify hazards to maintain a healthy and safe working	• Identification of Hazards at workplace. • Understanding of	Theory-2Hrs. Practical-6 Hrs. Total- 08 Hrs		

at Workplace	environment. • Enlist the possible hazards at workplace. • Enlist the possible risk at workplace. • Follow workplace procedures and work instructions to control risks at workplace.	Workplace procedures for working in hazardous areas • Knowledge of Risk assessment matrix. • Understanding of Workplace procedures and work instructions to control risks at workplace. **Practical Activity** Prepare the list of hazards and risk at work place			
LU5. Follow machine's operating guidelines	**Trainee will be able to:** • Follow machine's operating procedure • Practice regulations & guidelines specific to Machine operations • Practice common safety procedures while using machines	• Describe Common safety procedures while using machines • Understanding Machine operating procedures and safety guidelines. • Describe safe handling procedures of machines	Theory-1 Hrs. Practical-6 Hrs. Total- 07 Hrs	• Manuals of machines	

0715-MF&P 02 Module: Maintain Occupational Safety & Health at Site

Objective: This module covers the knowledge and skills required to maintain safe work condition at site, emergency response activity at crushing plant site. Your underpinning knowledge will be sufficient to provide you the basis for your work

Duration: 45 Hours **Theory: 09 Hours** **Practice: 36 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Maintain safe work condition at site	**Trainee will be able to:** • Recognize the safety signs and symbols • Identify Potential hazards at work site • Erect barricades hoardings, signage's in the hazardous areas • Identify the risk of slip, trip and fall at work place • Perform fall protection measures as per job requirements • Maintain housekeeping at the workplace • Label and store chemicals as per Material Safety Data Sheet (MSDS)`	• Understanding of Relevant Occupational Health and Safety legislation • Codes of practice and their relevance to organization operations • Knowledge about the housekeeping procedure • Labeling and storing procedure of hazardous chemicals **<u>Practical Activity</u>** • Perform the activity to remove slip, trip and fall hazards at workplace	Theory-2 Hrs. Practical-9 Hrs. Total- 11 Hrs.	• Fall protection and other applicable PPEs • Site emergency response plan • Fire extinguishers • Fire blankets • Respirators • Masks • Fire hoses • First aid kit, Stretchers	Class Room and Lab

LU2. Perform fire fighting	**Trainee will be able to:** • Identify source of fire. • Identify classes of fire. • Raise fire alarms • Select suitable fire extinguishers • Check expiry of fire extinguisher • Check wind direction • Locate emergency exits • Perform PASS (Pull, aim, squeeze and sweep) on fire Extinguisher	• Describe Types of Fire • Describe Types of Fire Extinguisher • Understanding about the fire alarm systems • Inspection of Fire Extinguishers. (Expiry date and Pressure gauge) **Practical Activity** Practice of Using fire Extinguisher as per SOPs	Theory-3 Hrs. Practical-9 Hrs. Total- 12 Hrs.	• Fall protection and other applicable PPEs • Site emergency response plan • Fire extinguishers • Fire blankets • Respirators • Masks • Fire hoses • First aid kit, Stretchers	Class Room and Lab
LU3. Carry out first aid treatment	**Trainee will be able to:** • Follow COVID-19 SOP's • Identify basic elements for first aid kit • Maintain a fully stacked first aid kit • Check expiry date of medicines • Perform mock first aid treatment for minor injuries	• Identification of basic elements for first aid kit • Define Minor and major Injuries. • Define COVID-19 SOP's **Practical Activity** Perform mock first aid treatment for minor injuries	Theory-2 Hrs. Practical-9 Hrs. Total- 11 Hrs.	• Fall protection and other applicable PPEs • Site emergency response plan • Fire extinguishers • Fire blankets • Respirators • Masks • Fire hoses • First aid kit, Stretchers	
LU4. Perform electrical work	**Trainee will be able to:** • Check the connectivity of	• Define single phase and three phase power	Theory-2 Hrs. Practical-9 Hrs.	• Fall protection and other	

safely at workplace	earthing with power equipment • Check leads and cable for any visual damage before use. • Tag damaged lead, cable and connection points and report to the supervisor.	supply • Types of cables • Types of insulating materials • Testing procedure of cable joints for insulation • Description of earthing • Knowledge about the Standard Safety procedure related to the electrical work **Practical Activity** Tag damaged leads, cable joints and report to the supervisor.	Total- 11 Hrs.	applicable PPEs • Site emergency response plan • Fire extinguishers • Fire blankets • Respirators • Masks • Fire hoses • First aid kit, Stretchers	

0715-MF&P 03 Module: Draw the Lettering and geometrical Shapes

Objective: This module covers the knowledge and skills required to Draw horizontal, vertical and inclined lines, Draw Upper case and Lower-Case lettering, Draw Different type of technical drawing Lines, Draw circles, half circles, radius with compass, Construct different geometrical shapes

Duration: 27 Hours **Theory: 06 Hours** **Practice: 21 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Draw horizontal, vertical and inclined lines.	**Trainee will be able to:** • Prepare Drawing sheet. • Select the tools. • Draw Boundaries lines as per standards. • Make title bar • Divide the sheets in different equal parts. • Draw lines at 30, 45, 60,90and 120 angles. • Draw parallel-lines • Draw perpendicular & bisects line • Draw equal division of lines	• Importance of Technical Drawing. • Identification of technical Drawing tools (Set Square, T-Square, Compass, divider, etc.) • Type of Drawing Sheets according to size • Drawing Pencil, their grading, sharpening and using techniques. • Importance of lines • Common Types of lines and correct line weightage. • Application of lines. • Sketching techniques	Theory-1 Hrs. Practical-03 Hrs. Total- 04 Hrs.	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils	Class Room and Drawing Hall

		of straight lines in different directions. **Practical Activity** Draw horizontal, vertical and inclined lines on drawing sheet.			
LU2. Draw Upper case and Lower-Case lettering	Trainee will be able to: • Prepare drawing sheet as per requirement. • Select the required drawing tools. • Select proper pencil for lettering with holding techniques. • Make title block • Draw upper and lower lines for lettering according to standards. • Draw lettering with different styles like vertical, gothic, single stroke, double stroke italic.	• Understand different type of lettering with different styles (vertical, italic, gothic, single stroke, double stroke,etc.) **Practical Activity** • Draw the following types of lettering i) single stroke (vertical and italic) ii) double stroke (vertical and italic)	Theory-1 Hrs. Practical-6 Hrs. Total- 07 Hrs	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils.	Class Room and Drawing Hall
LU3. Draw Different type of technical drawing Lines	**Trainee will be able to:** • Prepare Drawing sheet. • Select the Drawing tools as per job requirement. • Make title bar • Divide the sheets in different equal parts.	• Symbols of engineering terminology • Usage of technical Drawing tools • Application of Technical drawing	Theory-1 Hrs. Practical-3 Hrs. Total- 04 Hrs	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square.	Class Room and Drawing Hall

	• Draw Center lines, • Draw Object, border line. • Draw Hidden line. • Draw Section line. • Draw Leader line. • Draw Dimension line. • Draw Extension line. • Draw phantom line. • Draw cutting plane line.	• Common Types of lines and correct line weightage. • Techniques of sketching straight lines, Center lines, Section line. **Practical Activity** • Draw Object line, Center Lines, and Hidden lines.		• Different scale Pencils.	
LU4. Draw circles, half circles, radius with compass	**Trainee will be able to:** • Prepare Drawing sheet. • Select the Drawing tools as per job requirement. • Make title bar • Divide the sheets in different equal parts. • Draw circles and half circles with different diameters	• Knowledge of geometrical Shapes. • Definition of Circle. • Understanding about part of circle. • Uses of Compass. • Measuring Units. **Practical Activity** Draw circles, half circles, radius with compass according to given dimension.	Theory-1 Hrs. Practical-3 Hrs. Total- 4 Hrs	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. • Compass.	Class Room and Drawing Hall
LU5. Construct **LU.5** Construct different geometrical	**Trainee will be able to:** • Prepare Drawing sheet. • Select the tools. • Make title block • Divide the sheets in	• Knowledge of basic geometrical Shapes (Square, Rectangular and triangle, etc) • Procedure to draw	Theory-2 Hrs. Practical-6 Hrs. Total- 8 Hrs	• Graph and drawing sheet. • Drawing board/table. • T-Square	Class Room and Drawing Hall

Shapes	different equal parts. • Draw Square and Rectangular shapes as per given dimension • Draw Equilateral Triangle, Isosceles triangle, Scalene Triangle, Right angle Triangle, Obtuse Triangle, Acute Triangle.	basic geometrical shapes • Identification of drawing tools/materials used for geometrical shapes **Practical Activity** • Draw the following I. Equilateral Triangle, II. Isosceles triangle, , III. Obtuse Triangle, IV. Acute Triangle		• Set Square. • Different scale Pencils • Templates. • Compass.	

0715-MF&P 04 Module: Construct different Engineering Curves

Objective: This module covers the knowledge and skills required to Construct inscribe and circumscribe figures, Construct Tangents of circles (Inside & Outside), Construct Ellipse, Construct a parabola curve, Construct a hyperbola curve, Construct a Archimedean Spiral curve.

Duration: 45 Hours **Theory: 09 Hours** **Practice: 36 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Construct inscribe and circumscribe figures.	**Trainee will be able to:** • Prepare drawing sheet. • Select the tools. • Make title block • Divide the sheets in different equal parts. • Draw triangle, square, pentagon, hexagon and octagon according to dimension.	• Techniques of sketching straight lines in different directions • Definition of Triangles, Quadrilateral and Polygons • Describe circular arc using different line method • Types of Geometric Shape (hexagon and octagon,etc) **Practical Activity** Draw inscribed and circumscribed figures as per given job.	Theory-1Hrs. Practical-6 Hrs. Total- 7 Hrs.	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. • Compass • Geometry Box	Class Room and Lab
LU2. Construct Tangents of	**Trainee will be able to:** • Prepare Drawing sheet.	• Describe circular arc using different line	Theory-1Hrs. Practical-6 Hrs.	• Graph and drawing sheet.	Class Room

circles (Inside & Outside)	• Select the tools. • Make title bar • Divide the sheets in different equal parts. • Draw Tangents Inside of a circle When the centre of the circle is known. • Draw Tangents Inside of a circle When the centre of the circle is unknown • Draw Tangents outside of a circle When the centre of the circle is known • Draw Tangents outside of a circle When the centre of the circle is unknown	method • Methods of drawing Tangents & Normal **Practical Activity** Draw Tangents outside of a circle When the Center of the circle is unknown	Total- 07 Hrs.	• Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. Compass • Geometry Box	and Lab
LU3. Construct Ellipse	**Trainee will be able to:** • Prepare Drawing sheet. • Select the tools. • Make title bar • Divide the sheets in different equal parts. • Draw an Ellipse by Concentric Circle. • Draw an Ellipse by Rectangle Method • Draw an Ellipse by Oblong Method • Draw an Ellipse by Arcs of Circle Method	• Definition of ellipse • Knowledge of different type of ellipse • Describe different methods of sketching ellipse. **Practical Activity** • Draw an Ellipse by the following Methods I. Basic Locus Method II. Oblong Method	Theory-2Hrs. Practical-6 Hrs. Total- 08 Hrs.	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. • Compass • Geometry Box	

	• Draw an Ellipse by Rhombus Method. • Draw an Ellipse by Basic Locus Method	III. Rhombus Method IV. Arcs of Circle Method			
LU4. Construct a parabola curve	**Trainee will be able to:** • Prepare Drawing sheet. • Select the tools. • Draw Boundaries lines as per standards. • Make title bar • Divide the sheets in different equal parts. • Draw a parabola curve by Rectangle • Draw a parabola curve by Method of Tangents(Triangle Method) • Draw a parabola curve by Basic Locus Method	• Definition of parabola • Knowledge of different type of parabola Describe different methods of sketching parabola **Practical Activity** • Draw a parabola by the following Methods I. Basic Locus Method II. Triangle Method III. Rectangle Method	Theory-2Hrs. Practical-6 Hrs. Total- 08 Hrs.	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. • Compass • Geometry Box	
LU5. Construct a hyperbola curve	**Trainee will be able to:** • Prepare Drawing sheet. • Select the tools. • Draw Boundaries lines as per standards. • Make title bar • Divide the sheets in different equal parts. • Draw a hyperbola curve.	• Definition of Hyperbola • Knowledge of different type of Hyperbola Describe different methods of sketching Hyperbola **Practical Activity** • Draw a Hyperbola curve	Theory-2Hrs. Practical-6 Hrs. Total- 08 Hrs.	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. • Compass	

				• Geometry Box	
LU6. Construct a Archimedean Spiral curve	**Trainee will be able to:** • Prepare Drawing sheet. • Select the tools. • Draw Boundaries lines as per standards. • Make title bar • Divide the sheets in different equal parts. • Draw spiral curve.	• Discribe Archimedean Spiral curve • Procedure of drawing Archimedean Spiral curve. **Practical Activity** Draw Archimedean Spiral curve	Theory-1Hrs. Practical-6 Hrs. Total- 07 Hrs.	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. • Compass • Geometry Box	

0715-MF&P 05 Module: Construct multi-view drawings

Objective: This module covers the knowledge and skills required to Sketch Orthographic projection 1st angle, Sketch Orthographic projection 3rd angle, Sketch Isometric Drawing, Construct multi view drawing of General Bearing, Construct Development drawing

Duration: 75 Hours **Theory: 15 Hours** **Practice: 60 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Sketch Orthographic projection in 1st angle of Projection	**Trainee will be able to:** • Prepare drawing sheet. • Select the tools. • Make title block • Divide the sheets in different equal parts. • Draw front view, Side View and top View 1st angle projection	• Knowledge of Orthographic projection. • Describe Shifting of dimensions from one view to other • Understanding of 1st angle Orthographic projection **Practical Activity** Draw front view, top view and side view of the object in first angle projection method	Theory-3Hrs. Practical-12 Hrs. Total- 15 Hrs.	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. • Compass • Geometry Box	Class Room and Lab
LU2. Sketch Orthographic projection 3rd angle of	• Prepare drawing sheet. • Select the tools. • Make title block • Divide the sheets in	• Understanding of 3rd angle Orthographic projection	Theory-3Hrs. Practical-12 Hrs. Total- 15 Hrs .	• Graph and drawing sheet. • Drawing board/table.	Class Room and Lab

Projection	different equal parts. • Draw front view, Side View and top View 3rd angle projection	**Practical Activity** Draw front view, top view and side view of the object in 3rd angle projection method		• T-Square • Set Square. • Different scale Pencils • Templates. • Compass • Geometry Box	
LU3. Sketch Isometric Drawing	**Trainee will be able to:** • Prepare Drawing sheet. • Select the tools. • Make title bar • Divide the sheets in different equal parts. • Draw the isometric drawing from orthographic view of a part	• Understanding of Isometric Drawing • Application of Isometric drawing • Understand difference between orthographic projection and Isometric projection. **Practical Activity** Draw isometric view as per given job	Theory-3Hrs. Practical-12 Hrs. Total- 15 Hrs	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. • Compass • Geometry Box	
LU4. Construct multi view drawing of General Bearing	**Trainee will be able to:** • Prepare Drawing sheet. • Select the tools. • Draw Boundaries lines as per standards. • Make title bar • Divide the sheets in different equal parts. • Draw Multiview drawing of general bearing	• Define general bearing • Understanding about the function of general bearing • Define Multi view drawing of bearing. **Practical Activity** • Draw top view, front view and side view of general bearing	Theory-3Hrs. Practical-12 Hrs. Total- 15 Hrs	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. • Compass • Geometry Box	

LU5. Construct development drawing	**Trainee will be able to:** • Interpret development drawing • Draw Development drawing of right cone section • Draw development drawing of truncated cylinder	• Knowledge of auxiliary views • Introduction of development drawing • Application of development drawing • Understanding about the development of conic section • Understanding about the development of cylindrical section **Practical Activity:** Draw sheet of development drawing for given truncated cylinder	Theory-3Hrs. Practical-12 Hrs. Total- 15 Hrs	• Graph and drawing sheet. • Drawing board/table. • T-Square • Set Square. • Different scale Pencils • Templates. • Compass • Geometry Box	

0715-MF&P 06 Module: Perform Bench Works

Objective: This module covers the knowledge and skills required to Carry out Sawing, Filing, chipping according to instructions.

Duration: 60 Hours **Theory: 12 Hours** **Practice: 48 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out Sawing	**Trainee will be able to:** • Identify the required tools and equipment as per job requirement • Interpret the given drawing • Mark layout of job as per drawing using required marking tool • Perform clamping of the work piece according to the instructions • Select type/size of the blade according to the material and fix in hacksaw frame • Perform sawing according to the instructions • Check quality of the component at suitable intervals • Verify the final job with the	• Interpretation of technical drawings • Knowledge about types of Measuring & marking tools • Types of hacksaws and its parts • Techniques of Sawing operations with hand hacksaw • Types of hand hacksaw blades and its use. **<u>Practical Activity</u>** • Perform Sawing Operation with hand hacksaw	Theory-04Hrs. Practical-18 Hrs. Total- 22 Hrs.	• P Workbench • Bench vice • Tri-square • Hand hacksaw with blade • Scriber • Measuring tools • Marking Tools	Class Room and Lab

	given drawing				
LU2. Carry out Filing	**Trainee will be able to:** • Identify the required tools and equipment as per job requirement • Interpret the given drawing • Select marking tool and mark layout of job as per drawing • Select clamping device and clamp the work piece as per standard • Select the type of file according to the material & profile • Perform filing as per standard procedures • Check quality of the component at suitable intervals. • Verify the final job with the given drawing	• Types of files • Types of work holding devices • Method of Filling **Practical Activity** Perform filling operation as per job	Theory-04Hrs. Practical-15 Hrs. Total- 19 Hrs .	• Workbench • Bench vice • Tri-square • Hand hacksaw with blade • Files • Measuring tools • Marking Tools •	Class Room and Lab
LU3. Carry out Chipping	**Trainee will be able to:** • Identify the required tools and equipment as per job requirement • Interpret the given drawing • Select tool & clamping device according to the job requirement.	• Types of Measuring tools • Types of Marking tools • Types of chipping tools • Define clamping devices • Understanding about the clamping	Theory-04Hrs. Practical-15 Hrs. Total-19 Hrs	• Workbench • Bench vice • Tri-square • Hand hacksaw with blade • Measuring tools • Marking Tools • Flat File	

	• Use the marking tool and measuring instruments as per job requirement. • Clamp the work piece as per job requirement. • Perform chipping as per standard procedures • Check quality of the component at suitable intervals. • Verify the final job with the given drawing	techniques • Understanding of chipping procedure • Interpretation of technical drawing and selection of required tools as pr job requirement **Practical Activity** Perform chipping operation as specified		• Vernier caliper • Punching tools • Chipping tools	

0715-MF&P 07 Module: Perform cutting on Power Hack Saw

Objective: This module covers the knowledge and skills required to Cut material by using power hacksaw, Carry out Sawing at different angles with disc cutter

Duration: 30 Hours **Theory: 06 Hours** **Practice: 24 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Cut material by using power hacksaw	**Trainee will be able to:** • Mark the job according to given drawing • Select appropriate blade according to job requirement • Set blade in frame of hacksaw as per procedure • Ensure the work piece is clamped firmly and properly • Adopt methods and techniques for sawing that is appropriate to job requirement • Follow marked line during sawing to ensure accuracy.	• Identification and use of Personal Protective Equipment (PPE). • Types of power hacksaw. • Types of power hacksaw Blade **<u>Practical Activity</u>** • Adjust hacksaw blade in the frame and cut the material according to given dimension.	Theory-3 Hrs. Practical-12 Hrs. Total- 15 Hrs.	• Personal Protective Equipment • File Set • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Power Hacksaw	Class Room and Lab

LU2. Carry out Sawing at different angles with disc cutter	• Mark the job according to given drawing • Select appropriate disc according to job requirement • Set Disc in metal disc cutter as per procedure. • Ensure the disc tightness • Ensure the work piece is clamped firmly and properly • Adopt methods and techniques for disc cutting that is appropriate to job requirement • Follow marked line during sawing to ensure accuracy.	• Types of disc cutter • Types of coolant • Clamping Devices **<u>Practical Activity</u>** Adjust Circular saw blade in the frame and cut the material according to given dimension.	Theory-3 Hrs. Practical-12 Hrs. Total- 15 Hrs .	• Personal Protective Equipment • File Set • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Circular saw	Class Room and Lab

0715-MF&P 08 Module: Interpret Welding/Fabrication Requirements

Objective: This module covers the knowledge and skills required to Read and Understand Interpret Fabrication Drawings, Interpret Welding Symbols, Recognize Material Specifications

Duration: 30 Hours **Theory: 06 Hours** **Practice: 24 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Interpret Fabrication Drawings	**Trainee will be able to:** • Identify welding symbols used in engineering drawings. • Identify different types of welding joints. • Interpret welding requirements according to welding symbols given in the engineering drawings	• Basic elements of engineering drawing • Types of Welding • Welding Joints **Practical Activity** • Identify different types of welding joints In given drawing.	Theory-02Hrs. Practical-06 Hrs. Total- 08 Hrs.	• Welding symbols chart	Class Room and Lab
LU2. Interpret Welding Symbols	• Understand basic and supplementary welding symbols used in fabrication drawings • Understand and differentiate between types of welds and joints • Identify welding requirements according to welding symbols given in	• Welding Symbols **Practical Activity** Identify welding requirements according to welding symbols given in the fabrication drawings	Theory-02Hrs. Practical-09 Hrs. Total- 11 Hrs .	• Welding symbols chart • Charts Of welding joints	Class Room and Lab

	the fabrication drawings				
LU3. Recognize Material Specifications	**Trainee will be able to:** • Identify material specifications according to fabrication drawing • Identify bill of material (BOM) according to fabrication drawing	• Basic elements of engineering drawing • Types of Welding • Welding Joints • Welding Symbols • Dimensioning techniques • Types of Materials (Metallic and No Metallic)	Theory-02Hrs. Practical-09 Hrs. Total- 11 Hrs	• .Raw Material	

0715-MF&P 09 Module: Perform Pre-welding operations

Objective: This module covers the knowledge and skills required to Prepare work pieces to be welded, Prepare welding machines and torches, Perform Tacking

Duration: 60 Hours **Theory: 12 Hours** **Practice: 48 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare work pieces to be welded	**Trainee will be able to:** • Select Work piece as per drawing • Mark layout of job as per drawing • Perform pre-cleaning of the work piece • Carryout the Straightening of given job as per requirement. • Carry out the beveling of given job as per requirement	. • Definition of welding • Layout tools and procedure • Pre cleaning operation **Practical Activity** Carry out straightening and beveling operation.	Theory-04Hrs. Practical-18 Hrs. Total- 22 Hrs.	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Measure Tool	Class Room and Lab

				• Marking Tool	
LU2. Prepare welding machines and torches	• Interpret welding / engineering drawings • Select the welding machine as per job specification • Select the welding torch as per job specification • Setup the machine for welding as per job requirement • Make essential connections for specific welding procedures being undertaken • Identify welding consumables as per job requirement • Arrange the work piece as per required welding position. • Use safety equipment related to specific tasks	• Types of welding machine (AC transformers, DC Generators, Rectifiers) • types of tools required for welding operation • Types of welding Torch • Consumable used in Welding operation. • Regulators for high-low gas pressure regulators **Practical Activity** Select Torch and prepare welding machine for operation.	Theory-04Hrs. Practical-15 Hrs. Total- 19 Hrs .	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Measure Tool • Marking Tool • Welding Plant	Class Room and Lab
LU3. Perform Tacking	**Trainee will be able to:** • Interpret dimensional tolerances according to fabrication drawing • Assemble and tack weld	• Types of Tolerance • Types of joints **Practical Activity** Assemble and tack weld	Theory-04Hrs. Practical-15 Hrs. Total- 19 Hrs	• Personal Protective Equipment • File Set • Hand Hacksaw	

	parts according to fabrication drawing	parts according to fabrication drawing		Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Measure Tool • Marking Tool • Welding Plant • Raw Material	

0715-MF&P 10 Module: Identify Metal forming operations

Objective: This module covers the knowledge and skills required toIdentify Injection and Extrusion process, Explore Rolling Operation, Explore Wire Drawing Operation, Explore Deep Drawing Operation, Explore Forging operations, Explore Casting operation, Explore sheet metal operations

Duration: 60 Hours **Theory: 12 Hours** **Practice: 48 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Identify Injection and Extrusion process	**Trainee will be able to:** • Interpret drawings as per requirement • Identify the required tools used in the given process • Arrange types of dies as per requirement • Identify required material for given process • Arrange the required material as per given job • Identify inspection techniques for given process	• Understanding of Basic engineering drawing • Identification Tools and equipment required for forming operations • Material required for the process • Understanding Material behavior in metal forming processes • Explain temperature in metal forming • Explain strain rate sensitivity • Explain friction and lubrication in metal	Theory-1Hrs. Practical-6 Hrs. Total- 07 Hrs.	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set	Class Room and Lab

		forming • Types of Injection and extrusion process. • Types of dies and die materials according to standard requirements **Practical Activity** • Enlist the requirements for Injection and Extrusion process.		• Dies • Injection and Extrusion Machine	
LU2. Explore Rolling Operation	• Interpret drawings as per requirement • Identify the required tools used in the rolling process • Identify the engineering materials for rolling operation • Select the required rolling mill as per job requirement • Identify the operational parameters of rolling process • Identify inspection tools for rolling operation • Identify inspection techniques for rolling process	• Understanding of Basic engineering drawing • Describe basic safety practices regarding rolling process • Types of rolling machines and rolls • Describe Inspection techniques used for rolling operation **Practical Activity** Enlist the requirements for Rolling Operation	Theory-2Hrs. Practical-9 Hrs. Total- 11 Hrs .	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set	Class Room and Lab

				• Dies • Injection and Extrusion Machine	
LU3. Explore Wire Drawing Operation	**Trainee will be able to:** • Interpret drawings as per requirement • Identify the required tools used in the drawing process • Arrange raw material as per job requirement • Identify operational parameters (pre-heat treatment, draw force etc.) for drawing operation. • Arrange required die for drawing operation. • Identify inspection techniques for drawing process	• Understanding of Basic engineering drawing • Identification of Tools and equipment required for wire operations • Material required for the process • Understanding of Material behavior in wire drawing processes • Describe Temperature range for Wire Drawing Operation • Explain strain rate sensitivity • Explain friction and lubrication for Wire Drawing Operation • Types of Wire Drawing Operation. • Types of dies and die materials according to	Theory-1Hrs. Practical-6 Hrs. Total- 07 Hrs	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Dies • Injection and Extrusion Machine • Wire drawing	

		standard requirements **<u>Practical Activity</u>** Enlist the requirements for Wire Drawing Operation.		machine	
LU4. Explore Deep Drawing Operation	**Trainee will be able to:** • Interpret drawings as per requirement • Identify the required tools used in the deep drawing process • Arrange raw material as per job requirement • Identify operational parameters (pre-heat treatment, draw force etc.) for deep drawing operation. • Select the type of die for deep drawing operation • Identify inspection techniques for deep drawing process	• Understanding of Basic engineering drawing • Identification of Tools and equipment required for Deep Drawing Operation • Material required for the process • Understanding of Material behavior in Deep Drawing Operation. • Explain temperature for Deep Drawing Operation • Explain strain rate sensitivity • Explain friction and lubrication for Deep Drawing Operation. • Describe Deep Drawing Operation and its types • Types of dies and die	Theory-2Hrs. Practical-6 Hrs. Total- 08 Hrs	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Dies • Injection and Extrusion Machine • Deep drawing	

		materials according to standard requirements **Practical Activity** Enlist the requirements Deep Drawing Operation		machine	
LU5. Explore Forging operations	**Trainee will be able to:** • Interpret drawings as per requirement • Identify the required tools used in the forging process • Arrange engineering raw material for forging operation • Identify operational parameters for forging operation. • Identify the handling of tools for forging process • Identify post-heat treatment techniques.	• Identification Tools and equipment required for Forging operations • Material required for the process • Understanding material behavior in Forging operations • Describe Range of temperature for Forging operations • Types of Forging operations • Types of Hammers used in forging operation. **Practical Activity** Enlist the requirements for Forging operations.	Theory-2Hrs. Practical-6 Hrs. Total- 08 Hrs	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Dies • Furnaces • Anvil	
LU6. Explore Casting	**Trainee will be able to:** • Maintain safe work	• Identification of Tools and equipment	Theory-2Hrs. Practical-9 Hrs.	• Personal Protective	

operation	environment with molten metals handling • Interpret engineering drawings as per requirement • Identify the required tools used in the casting process • Identify desired melting furnace as per casting material • Arrange raw material for sampling • Arrange molds as per job requirement • Identify inspection techniques for casting process	required for Casting operation. • Material required for the process • Understanding of Material behavior in Casting operation. • Describe temperature Rane for Casting operation. • Describe Casting operation and its types • Casting operation materials according to standard requirements • Describe Induction furnace melting and refractories suitable for steelmaking **Practical Activity** Enlist the requirements for Casting operation	Total- 11 Hrs	Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Molds • Furnaces	
LU7. Explore sheet metal operations	**Trainee will be able to:** • Identify the required tools used in the given process • Arrange tools and equipment used in given operations. • Arrange raw materials for	• Identification of Tools and equipment required for sheet metal operations. • Material required for the process • Understanding the	Theory-2Hrs. Practical-6 Hrs. Total- 08 Hrs	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set	

	given operation • Identify inspection techniques for given process	Material behavior in sheet metal operations • Explain temperature for sheet metal operations • Explain strain rate sensitivity • Explain friction and lubrication for sheet metal operations. • Describe Sheet metal operations and its types • Describe Types of dies and die materials according to standard requirements **Practical Activity** Enlist the requirements for Casting operation		• Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Dies • Sheet metal bending machines	

0715-MF&P 11 Module: Perform Preparation for Metal Processing

Objective: This module covers the knowledge and skills required to arrange raw materials for metal processing, prepare tools and equipment for metal processing, prepare the machine for metal processing and maintain coordination with other departments.

Duration: 45 Hours **Theory: 09 Hours** **Practice:36 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Arrange raw materials for metal processing	**Trainee will be able to:** • Interpret the drawings as per specific metal processing requirement • Identify material specifications according to metal processing drawing • Arrange the grains and powder required for injection molding and extrusion process as per the given specification. • Arrange the sheet required for sheet metal working operations • Arrange the sheet required for rolling operations • Prepare the work piece required for machining	• Understanding of Basic engineering drawing • Describe types of Injection molding Machine • Identification of raw materials required for Metal processes. • Understanding the grain size and powder required for injection molding and extrusion process as per the given specification. • Types of raw materials required for forming processes.	Theory-3. Hrs. Practical-9 Hrs. Total- 12 Hrs.	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set	Class Room and Lab

	operations	**Practical Activity** Prepare the Raw Material required for machining operations.		• Raw Material	
LU2. Prepare tools and equipment for metal processing	**Trainee will be able to:** • Identify the Hand tools, Power Tools, Cutting Tools, Marking and Measuring Tools required for each forming operations • Arrange the required tools for forming operation as per job requirement • Clean tools and equipment after use • Store the tools and equipment at the designated place.	• Identification of Hand tools, Power Tools, Cutting Tools, Marking and Measuring Tools required for each forming operations • Understand the Usage of Hand tools, Power Tools, Cutting Tools, Marking and Measuring Tools **Practical Activity** Arrange the required tools for metal processing as per job requirement	Theory-2. Hrs. Practical-9 Hrs. Total- 11 Hrs .	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Raw Material	Class Room and Lab
LU3. Prepare the machine for metal processing	**Trainee will be able to:** • Check the machine for proper working condition • Fix the work piece on machine as per job	• Describe Feed and speed of cutting machine. • Understand Adjustment techniques of Machine	Theory-2. Hrs. Practical-9 Hrs. Total- 11 Hrs	• Personal Protective Equipment • File Set • Hand Hacksaw	

	requirement • Set the cutting tool on machine as per job requirement • Adjust cutting condition of machine as per job need • Adjust the feed and speed required for the given job	Parameters. • Types of Clamping Devices **<u>Practical Activity</u>** Adjust Feed and speed of the machine as per job requirement		Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set • Raw Material • Machine for metal processing	
LU4. Maintain coordination with relevant departments	**Trainee will be able to:** • Collaborate with relevant departments before the job execution • Remove hurdles for inter-departmental collaboration in case of continuous production • Maintain collaborative culture at workplace	• Understand Purpose of Collaboration with relevant departments before the job execution • importance of team work	Theory-2. Hrs. Practical-9 Hrs. Total- 11 Hrs		

0715-MF&P 12 Module: Carryout Housekeeping Jobs

Objective: This module covers the knowledge and skills required to Perform cleaning of workstation, Perform Cleaning of Equipment

Duration: 30 Hours **Theory: 6 Hours** **Practice: 24 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform cleaning of workstation	**Trainee will be able to:** • Prepare checklist for routine cleanliness of the workstation • Follow specific guidelines and checklists to conduct housekeeping of workstation • Clean the work area under process and create safe working environment	• Understanding of Guidelines and checklists for housekeeping of machines & tools • Importance of routine cleaning of workplace • Storing of tools and equipment at designated places **<u>Practical Activity</u>** • Perform cleaning of workstation as per instructions	Theory-3Hrs. Practical-12 Hrs. Total- 15 Hrs.	• Personal Protective Equipment	Class Room and Lab
LU2. Perform Cleaning of Equipment's	**Trainee will be able to:** • Prepare list of the tools/equipment/consumables (lubricants etc.) and machinery used in the shop • Apply the methods and	• Understanding Guidelines and checklists for housekeeping of equipment • Describe Importance	Theory-3Hrs. Practical-12 Hrs. Total- 15 Hrs .	• Personal Protective Equipment	Class Room and Lab

	techniques for cleanliness and maintenance of machines & tools as per checklist • Perform greasing of all moving parts as per checklist • Store the tools & material in designated place	of equipment cleaning **Practical Activity** Perform Cleaning of tools and machine as per given instructions			

0715-MF&P 13 Module: Perform General Maintenance

Objective: This module covers the knowledge and skills required to Perform Preventive Maintenance of tools and equipment, Perform Corrective Maintenance of tools and equipment

Duration: 60 Hours **Theory: 12 Hours** **Practice: 48 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Preventive Maintenance of tools and equipment	**Trainee will be able to:** • Interpret routine maintenance schedule • Prepare oiling and greasing schedule chart (daily/weekly as per machine requirement) • Maintain machine history record - date of installation, condition, oiling and maintenance • Inspect and assess the general condition of an assigned machine on regular basis • Observe expected problems and carry out routine maintenance as per given instructions and schedules	• Definition of inventory • knowledge about the types of maintenance (preventive, periodic, corrective etc.) • Importance of storing tools and material in specific place, oiling, greasing of machine • Identification of faulty/damaged/ worn out parts • Importance of Record keeping of maintenance activity • Methods of report writing **<u>Practical Activity</u>** Carry out Preventive/schedule	Theory-06 Hrs. Practical-24 Hrs. Total- 30 Hrs.	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square • Chisel Set	Class Room and Lab

		maintenance as per given instructions			
LU2. Perform Corrective Maintenance of tools and equipment	**Trainee will be able to:** • Check functions or working of tools / equipment • Identify faulty/damaged/ worn out parts. • Repair/replace the faulty/damage parts • Rectify safety hazards on all bench-work tools & machines • Report faults and problems of the machines, if not controllable, to the person concerned • Verify smooth functioning of tool/ equipment through dry run.	• Understanding Importance of storing tools and material in specific place, oiling, greasing of machine • Identification of faulty/damaged/ worn out parts • Describe Importance of Record keeping • Report the faulty tools **<u>Practical Activity</u>** Perform dry run of the equipment to ensure smooth functioning & safety	Theory-06 Hrs. Practical-24 Hrs. Total- 30 Hrs .	• Personal Protective Equipment • File Set • Hand Hacksaw Frame • Allen Key Set • Hammer Set • Mallet Set • Combination Plier • Adjustable Screw & Pipe Wrenches • Ratchet Wrench • Steel Ruler • Scriber • Try Square	Class Room and Lab

4. Supportive Notes

Assessment Text, Critical Aspects, Assessment Conditions, Resources required for Assessments

5. List of Tools, Machinery and Equipment

Sr. No.	Name of Item / Equipment / Tools	Quantity

6. List of Consumable Supplies

Sr. No.	Name of Consumable Supplies	Quantity

7. Members of the Curriculum Development Committee

The following members participated in the curriculum development process of the **Metal Forming & Processing Level 02 - 05** at PITAC, Lahore.
Date: 29th November – 03rd December 2021

S#	Name	Designation	Organization
1.	Engr. Salman Khalid Chaudhary	Assistant Director (Technical) Metallurgy	PITAC, Lahore
2.	Engr. Sohail Naseer	Assistant Professor	GSPCT, Gujrat

3.	Engr. Ahsan Shahbaz	Manager	PSS, Lahore
4.	Engr. Rashid Bashir	Senior Instructor	Pak Swiss Training Center, Lahore
5.	Engr. Farooq Iftikhar	Senior Engineer	PCSIR, Lahore
6.	Engr. Umer Farooq	Instructor Mechanical	GSPCT, Gujrat
7.	Engr. Adil Qadeer	Lecturer	UOL, Lahore
8.	Engr. Muhammad Arshad	Chief Instructor	PSTC, Lahore
9.	Engr. Nadeem Shahid	Vice Principal/Director	PCT, Lahore
10.	Engr. Fazal Rehman	Principal	GCT, Swabi
11.	Mr. Mushtaq Ahmed	Director M&E	P-TEVTA
12.	Engr. Liaqat Jamro	Director Academics	S-TEVTA
13.	Engr. Muhammad Umar	Project Engineer	OQE, Islamabad
14.	Engr. Abdul Maqsood	DACUM Facilitator, Principal	GPI Mardan
15.	Engr. Muhammad Yasir	Deputy Director	NAVTTC HQ, Islamabad