



Curriculum
“Metal Forming & Processing Technician” Level 03



**National Vocational Certificate for
“Metal Forming & Processing Technician”
Level 03**



Competency Based Curriculum

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



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1. Introduction

a. *“Metal Forming & Processing Technician” Level 03*

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.



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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 Technician” Level 03** 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

1. Use system software
2. Use Application Software
3. Draft office documents
4. Perform web browsing and manage emails
5. Manage graphic user interface
6. Develop 2D drawings
7. Develop 3D drawings
8. Perform Drilling Operation
9. Perform Basic Grinding Operations
10. Perform Assembly Operations
11. Carry out Gas Welding Operations
12. Perform Brazing & Soldering Operation
13. Perform Green Sand Mold Casting
14. Perform CO2 Sand Mold Casting



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15. Perform Shearing, Bending and Punching Operations

16. Perform Forging Operations

17. Perform Extrusion Process

18. Perform Deep drawing operations

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

01 Computer Operator

02 Draughtsman

03 Machining Technician

04 Welding Technician

05. Metal Casting Technician

06 Metal Forming Technician

f. Trainee Entry level

The entry for National Vocational Certificate for “Metal Forming & Processing Technician” Level 03 would be Middle Certificate (8th Class) or “Metal Forming & Processing Assistant/Helper” Level 02

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:



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Total	-	600 hours
Theory	-	117 hours (19.5%)
Practical	-	483 hours (80.5%)
Proposed Course Duration	-	6 Months

k. Sequence of the Modules

Module 01 Use system software
Module 02 Use Application Software
Module 03 Draft office documents
Module 04 Perform web browsing and manage emails
Module 05 Manage graphic user interface on CAD Software
Module 06 Develop 2D drawings on CAD Software
Module 07 Develop 3D drawings on CAD Software
Module 08 Perform Drilling Operation
Module 09 Perform Basic Grinding Operations
Module 10 Perform Assembly Operations
Module 11 Carry out Gas Welding Operations
Module 12 Perform Brazing & Soldering Operation
Module 13 Perform Green Sand Mold Casting
Module 14 Perform CO2 Sand Mold Casting
Module 15 Perform Shearing, Bending and Punching Operations
Module 16 Perform Forging Operations
Module 17 Perform Extrusion Process
Module 18 Perform Deep drawing operations

2. Summary – Overview of the Curriculum

Module Title	Learning Units	Th.	Pr.	T.	Cr. Hrs
01 Use system software	LU.1 Install system software LU.2 Update / upgrade system software LU.3 Perform basic tasks of operating system	3	15	18	1.8
02 Use Application Software	LU.1 Install application Software LU.2 Update / upgrade application Software LU.3 Install and upgrade antivirus software LU.4 Perform virus scan LU.5 Un-install application softwares	3	18	21	2.1



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03 Draft office documents	LU.1	Prepare document on MS word	6	21	27	2.7
	LU.2	Prepare spreadsheet				
	LU.3	Prepare presentation				
	LU.4	Create backup of office documents record (internal/external)				
	LU.5	Convert files into different formats				
04 Perform web browsing and manage emails	LU.1	Perform browsing using different browsers	6	18	24	2.4
	LU.2	Download / upload data from the internet				
	LU.3	Create email account				
	LU.4	Sort emails				
	LU.5	Manage address book				
	LU.6	Archive emails				
	LU.7	Send and receive emails				
05 Manage graphic user interface on CAD Software	LU.1	Install software and Create New File	3	15	18	1.8
	LU.2	Create Basic Drawings				
06 Develop 2D drawings on CAD Software	LU.1	Develop 2D Objects	6	27	33	3.3
	LU.2	Prepare Final Set of 2D Drawings				
07 Develop 3D drawings on CAD Software	LU.1	Develop 3D Objects	6	27	33	3.3
	LU.2	Manipulate 3D objects using 3D Editing Tools				
	LU.3	Render 3D Model				
08 Perform Drilling Operation	LU.1	Carry out drilling	6	24	30	3
	LU.2	Carry out counter sinking and counter boring				
	LU.3	Carry out reaming				
	LU.4	Carry out tapping				
09 Perform Basic Grinding Operations	LU.1	Install Grinding wheel on the machine	6	27	33	3.3
	LU.2	Dress the Grinding Wheel				
	LU.3	Prepare single point cutting tool				
	LU.4	Perform surface Grinding				
10 Perform Assembly Operations	LU.1	Use assembly aids	9	27	36	3.6
	LU.2	Perform riveting operation				
	LU.3	Clamp work pieces using bolt and nuts				
	LU.4	Perform assembly operation through welding				
	LU.5	Perform assembly operation through seaming				
	LU.6	Perform assembly operations through adhesion				
11 Carry out Gas Welding Operations	LU.1	Set-up gas Welding Equipment	9	24	33	3.3
	LU.2	Arrange materials for welding				



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	LU.3 Prepare Base Material for Welding				
	LU.4 Perform Gas Welding				
12 Perform Brazing & Soldering Operation	LU.1 Perform Brazing Operation LU.2 Perform Soldering Operation	6	24	30	3
13 Perform Green Sand Mold Casting	LU.1 Perform pre-casting operations LU.2 Perform green sand mold casting process LU.3 Perform post casting operations	6	36	42	4.2
14 Perform CO2 Sand Mold Casting	LU.1 Prepare CO2 sand Mold for Casting LU.2 Perform pre-casting operations LU.3 Perform CO2 sand mold casting process LU.4 Perform post casting operations	6	36	42	4.2
15 Perform Shearing, Bending and Punching Operations	LU.1 Arrange the raw material LU.2 Arrange tools and equipment LU.3 Prepare the required tools and equipment LU.4 Prepare work piece as per drawing LU.5 Perform Shearing operation LU.6 Perform punching operation LU.7 Perform bending operation LU.8 Perform Deburring of product LU.9 Carryout inspection of the finished products	12	36	48	4.8
16 Perform Forging Operations	LU.1 Arrange the raw material LU.2 Calculate material requirement LU.3 Pre-heat the Job LU.4 Perform forging operation LU.5 Inspect the product	12	36	48	4.8
17 Perform Extrusion Process	LU.1 Prepare the raw material LU.2 Install the required die for direct/indirect extrusion. LU.3 Prepare for hot extrusion Process LU.4 Perform direct/indirect extrusion process. LU.5 Inspect the product	6	36	42	4.2
18 Perform Deep drawing operations	LU.1 Perform Annealing on raw material. LU.2 Arrange dies for deep drawing operation LU.3 Carry out deep drawing operation LU.4 Inspect the product dimension	6	36	42	4.2
	Total	117	483	600	60



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3. Modules

0715-MF&P 01 Module: Use system software

Objective: This module covers the knowledge and skills required to Install system software, Update /upgrade system software, Perform tasks using operating system

Duration: 18 Hours Theory: 3 Hours Practice: 15 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Install system software	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Prepare drive/partitions before OS installation. • Format mass storage on a PC/computer • Ensure that after formatting the mass storage device memory is empty when open. • Perform Partitioning of hard drive • Install operating system in the PC/computers by following instructional manual. • Trouble Shoot installation errors 	<ul style="list-style-type: none"> • Understanding the types of operating system(OS) • Formatting Procedure of storage drive • Installation process of OS • knowledge of Troubleshooting <p><u>Practical Activity</u> Install the operating system in the PC as per requirement</p>	<p>Theory-01Hrs. Practical-03 Hrs. Total- 04 Hrs.</p>	<ul style="list-style-type: none"> • Computer System • Internet Connection • Operating System (Windows, Linux) 	Class Room and Computer Lab



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LU2. Update / upgrade system software	Trainee will be able to: <ul style="list-style-type: none"> • Schedule operating system update • Run operating system update using internet • Download and run windows/application. 	<ul style="list-style-type: none"> • Identification of the operating system updates • Understanding of upgradation techniques • Knowledge about the methods of downloading applications <p><u>Practical Activity</u> Download and run windows/application</p>	<p>Theory-01 Hrs. Practical-06 Hrs. Total- 07 Hrs.</p>	<ul style="list-style-type: none"> • Computer System • Internet Connection • Operating System (Windows, Linux) 	<p>Class Room and Computer Lab</p>
LU3. Perform basic tasks of operating system	Trainee will be able to: <ul style="list-style-type: none"> • Create folders/directories • Open folders/directories and view files in desired format • Copy files, folder/directories to different location (Hard drive, external storage, cloud) • Move files, folder/ 	<ul style="list-style-type: none"> • Understanding of the Procedure to; • Create folder • Open Folders • Copy file • Paste file • Move Files • Rename Files 	<p>Theory-01 Hrs. Practical-06 Hrs. Total- 07 Hrs</p>	<ul style="list-style-type: none"> • Computer System • Internet Connection • Operating System (Windows, Linux) 	<p>Class Room and Computer Lab</p>



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	<p>directories to different location (Hard drive, external storage, cloud)</p> <ul style="list-style-type: none"> • Rename files and directories/folder • Search files / folder/directories against various search criterion (File name, date, text etc) • Explore task Manager to view running process/tasks • Configure desktop settings 	<ul style="list-style-type: none"> • Search file <p><u>Practical Activity</u></p> <p>Perform the following tasks</p> <ol style="list-style-type: none"> Create folder Open Folders Copy file Paste file Move Files Rename Files Search file 			
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0715-MF&P 02 Module: Use Application Software

Objective: This module covers the knowledge and skills required to Install application Software, Update / upgrade application Software, Install and upgrade antivirus software, Perform virus scan, Un-install application software

Duration: 21 Hours

Theory: 3 Hours

Practice: 18 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Install application Software	Trainee will be able to: <ul style="list-style-type: none"> Install application software in the PC/computers by following instructional manual. Trouble Shoot installation errors 	<ul style="list-style-type: none"> Understanding the Types of application software Understanding about troubleshooting Troubleshooting procedure <p><u>Practical Activity</u> Install application software as required</p>	Theory-01Hrs. Practical-03 Hrs. Total- 04 Hrs.	<ul style="list-style-type: none"> Computer System Internet Connection Application Software 	Class Room and Computer Lab
LU2. Update / upgrade application	Trainee will be able to: <ul style="list-style-type: none"> Check for the update Update/upgrade 	<ul style="list-style-type: none"> Knowledge of software updates 	Theory-0.5 Hrs. Practical-03 Hrs.	<ul style="list-style-type: none"> Computer System Internet 	Class Room and



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Software	application software	<u>Practical Activity</u> Perform periodic up gradation of application software	Total- 3.5 Hrs.	Connection <ul style="list-style-type: none"> • Application Software • Antivirus software 	Computer Lab
LU3. Install and upgrade antivirus software	Trainee will be able to: <ul style="list-style-type: none"> • Select appropriate antivirus software • Install antivirus software • Update/upgrade antivirus software. 	<ul style="list-style-type: none"> • Types of Antivirus software • Installation procedure of antivirus • Upgradation procedure of Antivirus software <u>Practical Activity</u> <ul style="list-style-type: none"> • Install and run antivirus software • uninstall antivirus software 	Theory-0.5 Hrs. Practical-03 Hrs. Total- 3.5 Hrs	<ul style="list-style-type: none"> • Computer System • Internet Connection • Application Software • Antivirus software 	Class Room and Computer Lab
LU4. Perform virus	Trainee will be able to: <ul style="list-style-type: none"> • Identification of virus 	<ul style="list-style-type: none"> • Identification of infected files on 	Theory-0.5 Hrs. Practical-03	<ul style="list-style-type: none"> • Computer System 	Class Room



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scan	<ul style="list-style-type: none"> Perform scanning of the hard disc to remove the virus Delete / quarantine the viruses 	<p>the system</p> <ul style="list-style-type: none"> Scanning procedure of system Removal process of detected virus <p><u>Practical Activity</u></p> <p>Perform virus scan and delete the infected files</p>	Hrs. Total- 3.5 Hrs	<ul style="list-style-type: none"> Internet Connection Application Software Antivirus software 	and Computer Lab
LU5. Un-install application software	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Uninstall the application software Ensure that the action is done from control panel. 	<p>Procedure for complete un-installation of application software</p> <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> Uninstall the desired application software 	Theory-0.5 Hrs. Practical-6 Hrs. Total- 6.5 Hrs	<ul style="list-style-type: none"> Computer System Internet Connection Application Software Antivirus software 	Class Room and Computer Lab



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0715-MF&P 03 Module: Draft office documents

Objective: This module covers the knowledge and skills required to Prepare document on word, Prepare spreadsheet, Prepare presentation, Prepare in-page files, Create backup of office record by maintaining integrity of files, Convert files into different formats.

Duration: 27 Hours

Theory: 6 Hours

Practice: 21 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare document on MS word	Trainee will be able to: <ul style="list-style-type: none"> Select the MS word program Create new document / open already existing word document Set page Layout Perform basic Formatting (text, paragraph, page) Perform insert command (picture, shapes, charts, tables, smart art, clip art, hyperlinks, page numbers, header/footers, 	<ul style="list-style-type: none"> Understanding of document creation in MS word Understanding of various MS word Features Understand the types of file templates in MS word Knowledge about printing of the document <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> Develop CV in MS word 	Theory-01Hrs. Practical-03 Hrs. Total- 04 Hrs.	<ul style="list-style-type: none"> Computer System Internet MS software Printer 	Class Room and Lab



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	bullets/numbering, columns) in the word document <ul style="list-style-type: none"> • Check the spellings in the word file through available dictionary • Save document • Print document 	and print it			
LU2. Prepare spreadsheet	Trainee will be able to: <ul style="list-style-type: none"> • Select the spreadsheet application • Create / open Spread Sheet • Set page Layout • Perform basic Formatting • Perform insert command (picture, charts, smart art, clip art, hyperlinks, page numbers, header/footers, bullets / numbering) in the spread sheet • Insert / use arithmetic functions/formulas • Save Spreadsheet • Print Spreadsheet 	<ul style="list-style-type: none"> • Description of spread sheets • Understanding about the necessary formulas • Use formulas and apply necessary formats • Knowledge about the different templates in MS Excel • Knowledge about printing of the document <p><u>Practical Activity</u> Create result Sheet in</p>	Theory-01Hrs. Practical-06 Hrs. Total- 07 Hrs.	<ul style="list-style-type: none"> • Computer System • Internet • MS software • Printer 	Class Room and Lab



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		MS Excel and print it.			
LU3. Prepare presentation	Trainee will be able to: <ul style="list-style-type: none"> • Select the MS PowerPoint (PPT) program • Create / open presentation • Set page Layout • Perform basic Formatting • Perform insert command (slides, picture, shapes, charts, tables, smart art, clip art, hyperlinks, page numbers, bullets/ numbering) in the presentation. • Select various template designs • Apply animation to slides • Check the spellings in the presentation through available dictionary 	<ul style="list-style-type: none"> • Type of presentation • Understanding of various MS PowerPoint Features • Characteristics of a good/effective presentation <p><u>Practical Activity</u> Make presentation using MS PowerPoint and run it.</p>	<p>Theory-02Hrs. Practical-06 Hrs. Total- 08 Hrs.</p>	<ul style="list-style-type: none"> • Computer System • Internet • MS software • Printer 	Class Room and Lab



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	<ul style="list-style-type: none"> • Run power point presentation (PPT) • Save power point presentation • Print power point presentation 				
LU4. Create backup of office documents record (internal/external)	Trainee will be able to: <ul style="list-style-type: none"> • Identify the external storage devices • Create backup on external storage 	<ul style="list-style-type: none"> • Identification of internal/external backup devices Knowledge of preparing backup on internal/external devices • Describe the procedure of internal/external backup <p><u>Practical Activity</u> Perform Backup (internal/external) of file</p>	Theory-01Hrs. Practical-03 Hrs. Total- 04 Hrs.	<ul style="list-style-type: none"> • Computer System • Internet • MS software • Printer 	
LU5. Convert files into different formats	Trainee will be able to: <ul style="list-style-type: none"> • Identify file conversion Procedure • Convert files into different formats 	<ul style="list-style-type: none"> • Knowledge of inter-conversion of file in different formats <p><u>Practical Activity</u> Convert word file into PDF</p>	Theory-01Hrs. Practical-03 Hrs. Total- 04 Hrs.	<ul style="list-style-type: none"> • Computer System • Internet • MS software 	



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0715-MF&P 04 Module: Perform web browsing and manage emails

Objective: This module covers the knowledge and skills required to Perform browsing using different browsers, Download / upload data from the internet, Create email account, Sort emails, Manage address book, Archive emails, Send and receive emails

Duration: 24 Hours Theory: 6 Hours Practice: 18Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1.Perform browsing using different browsers	Trainee will be able to: <ul style="list-style-type: none"> Perform the components of browsing as per given instructions. Perform surfing through different browsers to search the required data. 	<ul style="list-style-type: none"> understanding about various browsers Understanding about the surfing procedures Knowledge of different types of search engines <p><u>Practical Activity</u> Search out data related to the different metal process</p>	<p>Theory-01Hrs. Practical-03 Hrs. Total- 04 Hrs</p>	<ul style="list-style-type: none"> Computer System Internet Connection Web Browser Search Engines 	Classroom and Computer Lab



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LU2. Download / upload data from the internet	Trainee will be able to: <ul style="list-style-type: none"> • Explore different downloading tools • Search and download required information. • Upload required information on cloud. 	<ul style="list-style-type: none"> • understanding of different downloading/uploading tools • uploading/downloading procedure of data <p><u>Practical Activity</u> Perform uploading/downloading of the required data</p>	Theory-01Hrs. Practical-03 Hrs. Total- 04 Hrs	<ul style="list-style-type: none"> • Computer System • Internet Connection • Web Browser • Search Engines 	Classroom and Computer Lab
LU3. Create email account	Trainee will be able to: <ul style="list-style-type: none"> • Create email accounts on various platforms. • Identify and remove Errors while Email configuration • Configure email account on outlook. 	<ul style="list-style-type: none"> • Understanding the management of emails on various platforms. • Identification of Errors while configuring Email and remove it. <p><u>Practical Activity</u> Create email accounts on any platform</p>	Theory-01Hrs. Practical-03 Hrs. Total- 04 Hrs	<ul style="list-style-type: none"> • Computer System • Internet Connection • Web Browser • Search Engines 	Classroom and Computer Lab
LU4. Sort emails	Trainee will be able to: <ul style="list-style-type: none"> • Demonstrate sorting of emails on the PC • Perform successfully sorting of emails as 	<ul style="list-style-type: none"> • Demonstration of sorting of emails on the PC <p><u>Practical Activity</u> Perform sorting of emails</p>	Theory-0.5Hrs. Practical-1.5 Hrs. Total- 02 Hrs	<ul style="list-style-type: none"> • Computer System • Internet Connection • Web Browser • Search 	Classroom and Computer Lab



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	per instructions	as per instructions		Engines	
LU5. Manage address book	Trainee will be able to: <ul style="list-style-type: none"> Open address book. Demonstrate the method of managing the address book by adding some contacts, removing contacts, importing, exporting, sorting and updating 	<ul style="list-style-type: none"> Knowledge of the address book Understanding the management of the address book <u>Practical Activity</u> Perform the management of address book	Theory-01Hrs. Practical-03 Hrs. Total- 04 Hrs	<ul style="list-style-type: none"> Computer System Internet Connection Web Browser Search Engines 	Classroom and Computer Lab
LU6. Archive emails	Trainee will be able to: <ul style="list-style-type: none"> Perform the procedure of Archiving Emails Demonstrate practically the procedure of archiving emails, as per requirements 	<ul style="list-style-type: none"> Understanding the procedure of Archiving Emails <u>Practical Activity</u> Archive the desired Emails under particular label	Theory-01Hrs. Practical-03 Hrs. Total- 04 Hrs	<ul style="list-style-type: none"> Computer System Internet Connection Web Browser Search Engines 	Classroom and Computer Lab
LU7. Send and receive emails	Trainee will be able to: <ul style="list-style-type: none"> Compose emails using attachments Demonstrate the procedure to send an email. Print emails. 	<ul style="list-style-type: none"> Knowledge of different tools used in email <u>Practical Activity</u> Compose an email and send to the institute showing attachment of necessary documents.	Theory-0.5Hrs. Practical-1.5 Hrs. Total- 02 Hrs	<ul style="list-style-type: none"> Computer System Internet Connection Web Browser Search Engines 	Classroom and Computer Lab



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0715-MF&P 05 Module: Manage graphic user interface on CAD Software

Objective: This module covers the knowledge and skills required to install software, create new file and create basic drawing.

Duration: 18 Hours Theory: 3 Hours Practice: 15 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Install software and Create New File	Trainee will be able to: <ul style="list-style-type: none"> • Install latest software version • Create New Template • Save the File • Create Drawing • Select units as per requirements • Select drawing Limits 	<ul style="list-style-type: none"> • Knowledge of different design software • Installation of required version of design software <u>Practical Activity</u> Install design software and create a file as per given instructions.	Theory-01Hrs. Practical-06 Hrs. Total- 07 Hrs	<ul style="list-style-type: none"> • Computer • CAD Software • Internet 	Class Room and Computer Lab
LU2. Create Basic Drawings	Trainee will be able to: <ul style="list-style-type: none"> • Select Coordinate System as per requirements • Draw a rectangle using line command • Draw an ARC 	<ul style="list-style-type: none"> • Understanding different coordinate systems • Knowledge of the basic design tool (line ,Arc, Circle, Rectangle etc) 	Theory-02Hrs. Practical-09 Hrs. Total- 11 Hrs	<ul style="list-style-type: none"> • Computer • CAD Software • Internet 	Class Room and Computer Lab



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	<ul style="list-style-type: none">• Draw a circle with given requirements• Draw a circle with 3-P touching outer corner of Equilateral Triangle• Use the Erase Command	<u>Practical Activity</u> Draw inscribed circle as per given dimensions			
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0715-MF&P 06 Module: Develop 2D drawings on CAD Software

Objective: This module covers the knowledge and skills required to Develop and prepare 2D objects

Duration: 33 Hours Theory: 6 Hours Practice: 27 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Develop 2D Objects	Trainee will be able to: <ul style="list-style-type: none"> • Setup drawing interface for required specifications • Setup user interface settings for required specifications • Save AutoCAD drawing files in different file formats (DWG, PDF, and JPG). • Create 2D Objects with given measurements • Edit 2D Objects to meet set standards 	<ul style="list-style-type: none"> • Understanding drawing interface • Demonstration of setting of user interface • Knowledge of saving in AutoCAD drawing in different format <p><u>Practical Activity</u></p> <p>Draw a 2D object and save in different format</p>	Theory-03Hrs. Practical-12 Hrs. Total- 15 Hrs	<ul style="list-style-type: none"> • Computer • AutoCAD Soft ware • Internet • Printer 	Class Room and Computer Lab
LU2. Prepare Final Set of 2D Drawings	Trainee will be able to: <ul style="list-style-type: none"> • Use appropriate command and tools to develop 2D Drawing 	<ul style="list-style-type: none"> • Understanding the AutoCAD software commands and Tools 	Theory-03Hrs. Practical-15 Hrs. Total- 18 Hrs	<ul style="list-style-type: none"> • Computer • AutoCAD Soft ware 	Class Room and Computer



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	<ul style="list-style-type: none">• Develop 2D Drawing with given project specifications and measurements• Create title block layout as required• Plot drawing on scale according to required size and orientation	<p>required for 2D objects</p> <p><u>Practical Activity</u></p> <ul style="list-style-type: none">• Draw 2D Drawing as per given measurements		<ul style="list-style-type: none">• Internet• Printer	Lab
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0715-MF&P 07 Module: Develop 3D design on CAD Software

Objective: This module covers the knowledge and skills required to develop 3D objects, manipulate and Edit 3D objects and render 3D objects.

Duration: 33

Hours

Theory: 6

Hours

Practice: 27 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Develop 3D Objects	Trainee will be able to: <ul style="list-style-type: none"> Setup & save 3D drawing interface for required specifications. Setup 3D user interface settings for required specifications. Create 3D objects with given measurements. 	<ul style="list-style-type: none"> Knowledge of 3D drawing interface Demonstration of setting of 3D user interface <p><u>Practical Activity</u></p> <p>Develop 3D Drawing as per given measurements</p>	<p>Theory-02Hrs. Practical-09 Hrs. Total- 11 Hrs</p>	<ul style="list-style-type: none"> Computer AutoCAD Soft ware Internet Printer 	Class Room and Computer Lab
LU2. Manipulate 3D objects using 3D Editing Tools	Trainee will be able to: <ul style="list-style-type: none"> . Modify 3D objects in line with the requirements. Make customized 3D models according to the requirement of 	<ul style="list-style-type: none"> Knowledge of 3D editing tools Knowledge of conversion procedure <p><u>Practical Activity</u></p>	<p>Theory-02Hrs. Practical-09 Hrs. Total- 11 Hrs</p>	<ul style="list-style-type: none"> Computer AutoCAD Soft ware Internet 	Class Room and Computer Lab



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	<p>given job.</p> <ul style="list-style-type: none"> Convert 3D Face objects into a single mesh objects. 	Create 3D objects and convert it into a single mesh objects.			
LU3. Render 3D Model	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Apply material to required 3D Model as per given specification Apply lights to get the requisite scene of required 3D model Assign cameras to execute different views of required 3D Model. Render and print the 3D model according to required size & orientation. Apply texture to 3D model as per given specification. 	<ul style="list-style-type: none"> Knowledge of 3D Navigate control Understanding the use of. Material and light control <p><u>Practical Activity</u></p> <p>Perform rendering 3D model</p>	<p>Theory-02Hrs. Practical-09 Hrs. Total- 11 Hrs</p>	<ul style="list-style-type: none"> Computer AutoCAD Soft ware Internet 	<p>Class Room and Computer Lab</p>



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0715-MF&P 08 Module: Perform Drilling Operation

Objective: This module covers the knowledge and skills required to make holes using drilling machine, perform counter boring and counter sinking and perform reaming operation, perform tapping

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out drilling	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify the required tools and equipment as per job requirement Interpret the given drawing Select tool & clamping device according to the job requirement. Use the marking tool and measuring instruments as per job requirement. Clamp the work piece as per job requirement. Perform drilling as per standard procedures Perform post drilling operations 	<ul style="list-style-type: none"> Knowledge of safety standards Understanding the safe use of drilling machine Knowledge of drilling tools and clamping devices Knowledge of Alignment and stability during drilling. <p><u>Practical Activity</u></p> <p>Perform drilling operation using the required drill bit as per drawing</p>	<p>Theory-02Hrs. Practical-06 Hrs. Total- 08 Hrs</p>	<ul style="list-style-type: none"> Drilling Machines and accessories Machine Vice Marking Tools Measuring Tools Drill Sleeve and Socket Personal Protective Equipment 	Class Room and workshop



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	<ul style="list-style-type: none"> • Check quality of the component at suitable intervals. • Verify the final job with the given drawing 				
LU2. Carry out counter boring and counter sinking	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • 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 • Select counter sinking tool according to the drawing • Perform drilling operation as per drawing • Perform counter sinking and counter boring as per standard procedures 	<ul style="list-style-type: none"> • Knowledge of counter boring and counter sinking tools • Understanding the setting of drill machine • Knowledge of Alignment and stability during drilling. <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> • Perform counter boring and counter sinking operation using drilling machine 	<p>Theory-02Hrs. Practical-06 Hrs. Total- 8 Hrs</p>	<ul style="list-style-type: none"> • Drilling Machines and accessories • Machine Vice • Marking Tools • Counter sinking and counter boring tools. • Measuring Tools • Drill Sleeve and Socket • Personal Protective Equipment 	Class Room and workshop



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	<ul style="list-style-type: none"> Verify the final job with the given drawing 				
LU3. Carry out reaming	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> 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 job requirement Select reamer according to the job specification Perform drilling to produce hole according to the size of reamer Perform reaming as per job specification <p>Verify the final job with given drawing</p>	<ul style="list-style-type: none"> Knowledge of reaming operation Knowledge of Alignment and stability during drilling. <p><u>Practical Activity</u></p> <p>Perform reaming operation as per drawing</p>	<p>Theory-01Hrs. Practical-06 Hrs. Total- 7 Hrs</p>	<ul style="list-style-type: none"> Drilling Machines and accessories Machine Vice Marking Tools Reamer. Measuring Tools Drill Sleeve and Socket Personal Protective Equipment 	Class Room and workshop
LU4. Carry	Trainee will be able to:		Theory-01Hrs.	<ul style="list-style-type: none"> Drilling 	Class Room



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out Tapping	<ul style="list-style-type: none"> 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 job requirement Select tap according to the job specification Perform drilling to produce hole according to the tap size Perform tapping as per job specification <p>Verify the final job with given drawing</p>	<ul style="list-style-type: none"> Knowledge of tapping operation Knowledge of Alignment and stability during drilling. <p><u>Practical Activity</u></p> <p>Perform tapping operation as per drawing</p>	<p>Practical-06 Hrs. Total- 7 Hrs</p>	<p>Machines and accessories</p> <ul style="list-style-type: none"> Machine Vice Marking Tools Taps Measuring Tools Drill Sleeve and Socket Personal Protective Equipment 	and workshop
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0715-MF&P 09 Module: Perform Basic Grinding Operations

Objective: This module covers the knowledge and skills required to adjust grinding wheel, prepare single point cutting tool, dress the grinding wheel and perform angle grinding for finishing.

Duration: 33

Hours

Theory: 6

Hours

Practice: 27 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Install Grinding wheel on the machine	Trainee will be able to: <ul style="list-style-type: none"> Select the right tool for removing the safety guard of grinding wheel. Remove the safety guard of grinding wheel. Select the wheel type according to material/speed. Mount the wheel on the spindle. Balance the wheel. Put back the safety covers. Inspect the wheel for proper mounting and balancing. 	<ul style="list-style-type: none"> Knowledge of safety standards for using of grinding machine Installation techniques of grinding wheel on the machine Understanding of Types of grinding wheels as per material and speed Understanding the balancing of grinding wheel Importance of inspection of the wheel for mounting and balancing <p><u>Practical Activity</u></p>	<p>Theory-02Hrs. Practical-06 Hrs. Total- 08 Hrs</p>	<ul style="list-style-type: none"> Grinding Machine Grinding wheel Wheel balancing Equipment 	Class Room and workshop



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		Install grinding wheel as per job requirement			
LU2. Dress the grinding Wheel	Trainee will be able to: <ul style="list-style-type: none"> • Select dressing tools • Inspect that wheel is properly mounted. • Use proper dressing tool to remove the burring material from grinding wheel. • Inspect the grinding wheel after dressing 	<ul style="list-style-type: none"> • Knowledge of the dressing tools • Understanding the dressing of grinding wheel <p><u>Practical Activity</u> Perform dressing of grinding wheel using appropriate tools</p> <ul style="list-style-type: none"> • 	Theory-01Hrs. Practical-06 Hrs. Total- 07 Hrs	<ul style="list-style-type: none"> • Grinding Machine • Grinding wheel • Wheel dressers 	Class Room and workshop
LU3. Prepare single point cutting tool	Trainee will be able to: <ul style="list-style-type: none"> • Identify single point cutting tool geometry • Give the angle to the cutting tool according to cutting requirement. • Inspect the cutting tool 	<ul style="list-style-type: none"> • Knowledge of the material used for cutting tool • Understanding clamping/holding methods of work piece <p><u>Practical Activity</u> Make single point cutting tool with the help of</p>	Theory-02Hrs. Practical-09 Hrs. Total- 11 Hrs	<ul style="list-style-type: none"> • Pedestal grinder and its accessories 	Class Room and workshop



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		grinding Machine			
LU4. Perform surface grinding	Trainee will be able to: <ul style="list-style-type: none"> Inspect the job before grinding Perform job mounting and alignment on grinding machine Perform surface grinding operation as per job requirement 	<ul style="list-style-type: none"> Knowledge of safety precautions during handling of grinder Knowledge about job clamping and alignment devices Understanding of grinding machine settings <p><u>Practical Activity</u> Perform surface grinding on the job</p>	Theory-01Hrs. Practical-06 Hrs. Total- 07 Hrs	<ul style="list-style-type: none"> Surface grinding machine job holding and alignment devices inspection and measuring devices 	Class Room and workshop



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0715-MF&P 10 Module: Perform Assembly Operations

Objective: This module covers the knowledge and skills required to perform riveting operation, Clamp work pieces using bolt and nuts, use assembly aids, perform assembly operation through welding, perform assembly operation through seaming, perform assembly operations through adhesion.

Duration: 36

Hours

Theory: 9

Hours

Practice: 27 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Use assembly aids	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify the assembly aids according to the job requirements. Follow required procedure for lifting. Use required lifting equipment. Position the job accurately using positioning aids. <p>Apply the assembly aids.</p>	<ul style="list-style-type: none"> Understanding the assembly aids for manufacturing Knowledge of lifting equipment Understanding the procedure of lifting Knowledge of positioning aids <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> Apply the assembly aids to join different parts of a job to complete the final assembly 	<p>Theory-02Hrs. Practical-03 Hrs. Total- 05 Hrs</p>	<ul style="list-style-type: none"> 	Class Room and Lab



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<p>LU2. Perform riveting operation</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Select required tools for riveting. • Select the type and size of rivet. • Align the work pieces. • Clamp the work pieces firmly. • Insert/ set the rivet in to the bore hole • Clean the work piece / component from dirt and other contamination. 	<ul style="list-style-type: none"> • Knowledge of different joints (permanent and temporarily) • Knowledge of Types of rivets. • Identification of different clamping tools. • Explanation of conventional fastening methods. • Understanding the use of riveting tools <p><u>Practical Activity</u></p> <p>Join two plates by riveting operation to make a permanent joint.</p>	<p>Theory-02Hrs. Practical-03 Hrs. Total- 05 Hrs</p>	<ul style="list-style-type: none"> • Clamping Devices • Drilling and punching tools • Marking tool • Revit • Pinning hammer 	<p>Class Room and Lab</p>
<p>LU3. Clamp work pieces using bolt and nuts</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Select required tools for fastening the nut bolt. • Align the work pieces. • Align the holes in the 	<ul style="list-style-type: none"> • Knowledge of different joints (permanent and temporarily) • Explanation of different types of 	<p>Theory-02Hrs. Practical-03 Hrs. Total- 05 Hrs</p>	<ul style="list-style-type: none"> • Nuts and Bolts • Clamping Devices 	<p>Class Room and workshop</p>



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	<p>work pieces.</p> <ul style="list-style-type: none"> • Insert the bolt in the holes. • Screw the nut on the bolts using required tools. 	<p>nuts & bolts and their uses.</p> <ul style="list-style-type: none"> • Identification of different clamping tools. <p><u>Practical Activity</u></p> <p>Make a temporary joint of different Parts using nut and bolt.</p>			
<p>LU4. Perform assembly operation through welding</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Comply with health and safety rules regulations • Clean the tools / equipment and work pieces • Select welding type according to the job requirements. • Use tools and equipment as per requirement • Set the welding equipment according to 	<ul style="list-style-type: none"> • Knowledge of safety rules and regulation • Explanation of different types of welding • Selection of appropriate welding type as per requirement of job • Understanding clamping techniques <p><u>Practical Activity</u></p> <p>Carry out welding of two parts to make the required assembly</p>	<p>Theory-01Hrs. Practical-06 Hrs. Total- 07 Hrs</p>	<ul style="list-style-type: none"> • Welding Machine with accessories • Mechanical tool Kit 	<p>Classroom and workshop</p>



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	<p>given job.</p> <ul style="list-style-type: none"> Place the work pieces in required position. Perform welding operation as per standards. 				
<p>LU5. Perform assembly operation through seaming</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Select required method of seaming. Identify the required tools and equipment Set the machine according to the job requirements Carryout pre-cleaning of tools / equipments and work pieces from dirt, foreign object and contaminations. Make the groves at the joining edges as required. Interlock the two sheets as per standards. Apply pressure to make the Seam. 	<ul style="list-style-type: none"> Knowledge of seaming operation Identification of relevant tools and equipment Understanding the procedure to perform seaming operation by applying pressure <p><u>Practical Activity</u></p> <p>Assemble different parts of a job by using seaming technique</p>	<p>Theory-01Hrs. Practical-06 Hrs. Total- 07 Hrs</p>	<ul style="list-style-type: none"> Seaming Machine and accessories Mechanical tool Kit 	<p>Class Room and workshop</p>



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<p>LU6. Perform assembly operations through adhesion</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Select the adhesive according to the work piece requirements. • Use required PPEs with respect to adhesives. • Clean and dry the surfaces with proper detergents (Degreasing). • Abrade the surfaces with wire brush and emery cloth etc. • Degrease the surfaces again. • Apply the adhesive to both surfaces according to the company procedure for particular adhesive. • Compress the surfaces firmly. • Check the joint for proper adhesiveness. • Remove the excess adhesive. 	<ul style="list-style-type: none"> • Knowledge of safety rules and regulations • Explanation of different types of adhesives • Selection of right adhesive for the required workpiece • Understanding the procedure to join two parts by adhesives <p><u>Practical Activity</u></p> <p>Assemble two parts/plates by using appropriate adhesive as per job requirement</p>	<p>Theory-01Hrs. Practical-06 Hrs. Total- 07 Hrs</p>	<ul style="list-style-type: none"> • Mechanical tool Kit • Adhesive material and equipment used for adhesion 	<p>Class Room and Lab</p>
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0715-MF&P 11 Module: Carry out Gas Welding Operation

Objective: This module covers the knowledge and skills required setup gas welding Equipment, arrange materials for welding, prepare base material for welding, perform Gas Welding

Duration: 33

Hours

Theory: 9

Hours

Practice: 24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Set-up gas Welding Equipment	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Select the required size of the gas nozzle Adjust pressures of both gas cylinders (Acetylene and Oxygen) with the help of regulator Set gas welding torch as per SOPs Adjust Acetylene gas knob of welding torch to make Carburizing flame Make Neutral flame by adjusting uniform quantity of both gases Make Oxidizing flame by increasing oxygen gas quantity 	<ul style="list-style-type: none"> Knowledge of gas welding Selection of gas nozzles Adjustment of both gas cylinders' pressure <p><u>Practical Activity</u></p> <p>Make different flames (Carburizing, Oxidizing and Neutral) by adjusting gas pressure of Acetylene and Oxygen</p>	<p>Theory-03Hrs. Practical-03 Hrs. Total- 06 Hrs</p>	<ul style="list-style-type: none"> Oxygen gas cylinder Acetylene gas cylinder Pressure regulators Cylinder key Welding torch Rubber house pipe Flash back arrester Spark lighter Steel wire 	Class Room and welding Lab



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				brush <ul style="list-style-type: none"> • Work bench • Bench vice • Hammer • Tri-square 	
LU2. Arrange materials for welding	Trainee will be able to: <ul style="list-style-type: none"> • Arrange material as per job requirements • Arrange marking tools as per job requirements • Mark the area to be cut as per drawing/job requirements • Arrange relevant welding consumables as per job requirement 	<ul style="list-style-type: none"> • Knowledge of materials to be used in gas welding • Understanding the welding consumables • Understanding about the Use of marking tools <p><u>Practical Activity</u></p> <p>Mark the area on the job using marking tools for subsequent gas welding operation</p>	Theory-02Hrs. Practical-03 Hrs. Total- 05 Hrs	<ul style="list-style-type: none"> • Tri-square • Scriber • Vernier caliper • Hammer • Disk grinder • Pin grinder 	Class Room and welding Lab
LU3. Prepare Base Material for Welding	Trainee will be able to: <ul style="list-style-type: none"> • Arrange cutting tools and equipment as per job requirement • Set-up cutting equipment as per 	<ul style="list-style-type: none"> • Identification of tools and equipment used to prepare the required job for welding • Knowledge of procedure to prepare the job as per 	Theory-02Hrs. Practical-09 Hrs. Total- 11 Hrs	<ul style="list-style-type: none"> • Oxygen gas cylinder • Acetylene gas cylinder 	Class Room and welding Lab



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	<p>manufacturer's instructions/job requirements</p> <ul style="list-style-type: none"> • Cut the base material as per job specification and dimensions provided in the drawing • Prepare edge(s) of the base materials as per drawing • Check dimensions of the prepared edge(s) as per drawing with the help of measuring tools • Use tools and chemicals for material cleaning • Clean the edge(s) of the base material as per job requirements 	<p>manufacturer's instructions</p> <p><u>Practical Activity</u></p> <p>Make a base material ready for welding as per drawing</p>		<ul style="list-style-type: none"> • Steel wire brush • Work bench • Hammer • Tri-square • Hand hacksaw • Scriber • Flat File 	
LU4. Perform Gas Welding	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Arrange Work piece as per drawing • Perform straightening of work piece with the help of hammer and anvil • Perform grinding of work piece to prepare the 	<ul style="list-style-type: none"> • interpretation of drawing • Understand the procedure to set the workpiece for welding • Preparation of required flame for welding • Knowledge of post 	<p>Theory-02Hrs. Practical-09 Hrs. Total- 11 Hrs</p>	<ul style="list-style-type: none"> • Oxygen gas cylinder • Acetylene gas cylinder • Pressure regulators • Cylinder key • Welding torch 	<p>Class Room and welding Lab</p>



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	<p>edges flat and parallel to each other</p> <ul style="list-style-type: none"> • Adjust the flame of welding torch as per requirement • Place the work piece on working table • Perform welding operation to make Tee Joint / Lap Joint / Butt Joint as per specifications. • Complete the welding bead as per standard • Perform visual inspection of the job as per standard 	<p>welding inspection and defects</p> <p><u>Practical Activity</u> Join two mechanical parts by using gas welding technique</p>		<ul style="list-style-type: none"> • Rubber house pipe • Flash back arrester • Spark lighter • Steel wire brush • Work bench • Bench vice • Hammer • Tri-square • Hand hacksaw • Scriber • Vernier caliper • Flat File • Pedestal grinder • Disk grinder • Pin grinder • Metal Filler rod • Welding flux 	
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0715-MF&P 12 Module: Perform Brazing & Soldering Operation

Objective: This module covers the knowledge and skills required to setup Perform brazing Operation, Perform Soldering Operation

Duration: 30

Hours

Theory: 6

Hours

Practice:

24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Brazing Operation	Trainee will be able to: <ul style="list-style-type: none"> Arrange Work piece as per drawing Perform cutting of work piece as per the requirement Perform file work if required Arrange filler wire as per requirement Perform Brazing operation as per standard Perform visual inspection of the job as per standard 	<ul style="list-style-type: none"> Knowledge of brazing operation and its application/use Understand the procedure to prepare the workpiece for brazing operation Selection of filler wire for the brazing operation <p><u>Practical Activity</u></p> <p>Carry out the brazing operation on the workpiece as per requirement</p>	<p>Theory-03Hrs. Practical-09 Hrs.</p> <p style="text-align: right;">Total- 15 Hrs</p>	<ul style="list-style-type: none"> Oxygen gas cylinder Acetylene gas cylinder Pressure regulators Cylinder key Brazing nozzle Brazing Flux Filler rod 	Class Room and workshop
LU2. Perform	Trainee will be able to: <ul style="list-style-type: none"> Identify soldering 	<ul style="list-style-type: none"> Knowledge of soldering operation 	<p>Theory-03Hrs. Practical-12</p>	<ul style="list-style-type: none"> Work bench 	Class Room and



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m Soldering Operation	<p>tools/equipment/material as per requirement</p> <ul style="list-style-type: none"> • Arrange soldering tools/equipment/material as per requirement • Perform cleaning of the metal work piece • Adjust work pieces as per job requirement • Carry out the Melting of the Solder (filler metal) • Apply Solder on the work piece • Perform post soldering cleaning • Perform visual inspection of the job 	<p>and its use</p> <ul style="list-style-type: none"> • Identification of tools and equipment • Understanding of procedure to perform the soldering operation • Identification of filler metal • Knowledge of post soldering inspection for any defect <p><u>Practical Activity</u></p> <p>Join two parts by using soldering operation as per requirement</p>	<p>Hrs. Total- 15 Hrs</p>	<ul style="list-style-type: none"> • Bench vice • Solder gun • Solder wire 	<p>workshop</p>
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0715-MF&P 13 Module: Perform Green Sand Mold Casting

Objective: This module covers the knowledge and skills required to Perform pre-casting operations, perform green sand mold casting process and perform post casting operations

Duration: 42 Hours

Theory: 6 Hours

Practice: 36 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform pre-casting operations	Trainee will be able to: <ul style="list-style-type: none"> Identify tools/equipment as per requirement for sand casting Arrange sand casting molds as per requirement Arrange raw material for melting operations Set casting parameters as per SOPs Check the melting equipment availability as per requirement Check the tilting operation of casting ladles 	<ul style="list-style-type: none"> Knowledge of casting operation Identification of relevant tools and equipment Preparation of molds as per requirement Selection of material for casting <p><u>Practical Activity</u></p> <p>Prepare a pattern and a sand mold for casting</p>	Theory-02Hrs. Practical-12 Hrs. Total- 14 Hrs	<ul style="list-style-type: none"> Silica Sand Sand Mold Melting Furnace and accessories Crucible ring 	Class Room and workshop
LU2. Perform Green	Trainee will be able to: <ul style="list-style-type: none"> Carryout pouring with the 	<ul style="list-style-type: none"> Understanding the procedure to carry out 	Theory-02Hrs. Practical-12	<ul style="list-style-type: none"> Silica Sand Sand Mold 	Class Room and



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<p>sand mold casting process</p>	<p>defined work standards and specifications</p> <ul style="list-style-type: none"> • Regulate the speed of the molten metal into sand molds through gating system • Monitor casting temperature by observing the readings on various panels/ meters to prevent deviation from desired specifications • Prevent metal spillage in the work area • Take preventive actions to avoid parting leak, gas evolution and interrupted pouring • Maintain maximum limit of melt in down sprue during pouring as per the process mentioned in the work instructions/ SOPs • Remove the sand molds with metal cast as per SOPs 	<p>green sand mold casting operation</p> <ul style="list-style-type: none"> • Knowledge of precautions used in the process to prevent casting defects • Identification of equipment used in melting process <p><u>Practical Activity</u></p> <p>Carry out the casting operation by pouring the molten metal in the mold</p>	<p>Hrs.</p> <p style="text-align: center;">Total- 14 Hrs</p>	<ul style="list-style-type: none"> • Melting Furnace and accessories • Crucible ring • Tongs • Pouring Ladles • Transfer ladles • Ladle Pre-Heater • Overhead Chain Conveyor 	<p>workshop</p>
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<p style="text-align: center;">LU3. Perform post casting operations</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Analyze any irregularity in the casting process to take preventive steps in next casting Check the in-line composition/ soundness of the casting Inspect the conformance of final metal casting as per specification given in work order Send the casting for further processing in terms of chipping, fettling, wedge cutting etc. 	<ul style="list-style-type: none"> Knowledge of post casting defects Understanding the visual inspection of the casting material Knowledge of post casting operations <p><u>Practical Activity</u></p> <p>Carry out post casting operations (Machining, chipping, wedge cutting etc.) after detailed inspection of the cast</p>	<p>Theory-02Hrs. Practical-12 Hrs. Total- 14 Hrs</p>	<ul style="list-style-type: none"> Files Bench vice Lath machine Grinder Wire brush 	<p style="text-align: center;">Class Room and workshop</p>
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0715-MF&P 14 Module: Perform CO₂ Sand Mold Casting

Objective: This module covers the knowledge and skills required to Prepare CO₂ sand Mold for Casting, Perform pre-casting operations, perform CO₂ sand mold casting process and perform post casting operations

Duration: 42 Hours

Theory: 6 Hours

Practice: 36 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare CO ₂ sand Mold for Casting	Trainee will be able to: <ul style="list-style-type: none"> Carry out mixing of silica sand (clean, dry and free from clay) by weight of sodium silicate Perform mixing of mixture with liquid base binder in the muller Put mixture into the core-boxes by conventional methods Perform Ramming of the mould Carry out hardening of mold with CO₂ Perform assembling of mold Force CO₂ into the mold at required pressure 	<ul style="list-style-type: none"> Knowledge about the preparation of required sand and addition of binder Preparation of mold for the required job Knowledge about hardening of mold with CO₂ by applying pressure <p><u>Practical Activity</u></p> <p>Prepare a sand molding and apply CO₂ with required pressure for hardening</p>	<p>Theory-02Hrs. Practical-09 Hrs.</p> <p style="text-align: right;">Total- 11 Hrs</p>	<ul style="list-style-type: none"> Silica Sand CO₂ cylinders CO₂ Pipe with nozzles Sodium silicate binders 	Class Room and workshop



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<p>LU2. Perform pre-casting operations</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Arrange CO2 sand molds as per requirement • Arrange raw material for melting operations • Set casting parameters as per SOPs • Check the melting equipment availability as per requirement • Check the tilting operation of casting ladles 	<ul style="list-style-type: none"> • Identification of CO₂ sand mold • Identification of melting equipment • Selection of raw material for melting <p><u>Practical Activity</u></p> <p>Perform the required pre-casting operations</p>	<p>Theory-02Hrs. Practical-09 Hrs. Total- 11 Hrs</p>	<ul style="list-style-type: none"> • Silica Sand • CO2 cylinders • CO2 Pipe with nozzles • Sodium silicate binders • CO2 Sand Mold • Melting Furnace and accessories 	<p>Class Room and workshop</p>
<p>LU3. Perform CO2 sand mold casting process</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Carryout pouring with the defined work standards and specifications • Regulate the speed of the molten metal into CO2 sand molds as per SOPs • Prevent metal spillage in the work area 	<ul style="list-style-type: none"> • Knowledge about the pouring procedure • Knowledge of the procedure to carry out the CO₂ sand casting • Understanding the precautionary measures during the casting process to avoid any hazards 	<p>Theory-01Hrs. Practical-09 Hrs. Total- 10 Hrs</p>	<ul style="list-style-type: none"> • Silica Sand • CO2 cylinders • CO2 Pipe with nozzles • Sodium silicate binders 	<p>Class Room and workshop</p>



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	<ul style="list-style-type: none"> Take preventive actions to avoid parting leak, gas evolution and interrupted pouring Maintain maximum limit of melt in down sprue during pouring as per the process mentioned in the work instructions/ SOPs Remove the CO2 sand molds with metal cast at a designated place to discard used sand 	<p><u>Practical Activity</u></p> <p>Carry out CO₂ sand casting to prepare the required job as per instructions</p>		<ul style="list-style-type: none"> CO2 Sand Mold Melting Furnace and accessories Crucible ring Tongs Pouring Ladles Transfer ladles Ladle Pre-Heater Overhead Chain Conveyer 	
LU4. Perform post casting operations	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Analyze any irregularity in the casting process to take preventive steps in next casting Check the in-line composition/ soundness 	<ul style="list-style-type: none"> Knowledge of casting defects Knowledge about the remedies of casting defects Understanding about the procedure of inspecting the final 	<p>Theory-01Hrs. Practical-09 Hrs. Total- 10 Hrs</p>	<ul style="list-style-type: none"> Files Bench vice Lath machine Grinder Wire brush 	Class Room and workshop



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	<p>of the casting</p> <ul style="list-style-type: none">• Inspect the conformance of final metal casting as per specification given in work order• Send the casting for further processing in terms of chipping, fettling, wedge cutting etc.	<p>casting</p> <p><u>Practical Activity</u> Carry out the post casting operation (chipping, Machining, wedge cutting etc.)</p>			
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0715-MF&P 15 Module: Perform Shearing, Bending and Punching Operations

Objective: This module covers the knowledge and skills required to arrange the raw material, arrange tools and equipment, prepare the required tools and equipment, prepare work piece as per drawing, perform Shearing operation, perform punching operation, perform bending operation, Perform Deburring of product and carryout inspection of the finished products.

Duration: 48 Hours

Theory: 12 Hours

Practice: 36Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU:1 Arrange the raw material	Trainee will be able to: <ul style="list-style-type: none"> Select the raw material according to job requirements. Select form/shape of raw material on near net Shape principle 	<ul style="list-style-type: none"> Knowledge of raw material required for the desired process Identification of the required raw material used for required process <p><u>Practical Activity</u></p> <p>Choose the required raw material for the desired forming operation</p>	Theory 01-Hrs. Practical 03-Hrs. Total- 04 Hrs.	<ul style="list-style-type: none"> Raw Materials Layout tools Fire extinguishers Check sheets PPEs 	Classroom and workshop
LU:2 Arrange tools and equipment	Trainee will be able to: <ul style="list-style-type: none"> Identify standard techniques as per safety procedures Select forming tools and equipment based on 	<ul style="list-style-type: none"> Knowledge of safety rules and regulations for forming process identification of forming tools and equipment selection of required 	Theory 01-Hrs. Practical 03-Hrs. Total-04 Hrs.	<ul style="list-style-type: none"> Raw Materials Layout tools Fire extinguishers 	Classroom and workshop



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	<ul style="list-style-type: none"> manufacturers specification Select the desired Die according to the job requirement. Select the Punch according to the job requirement. 	<p>die and punch as per shape of the job</p> <p><u>Practical Activity</u></p> <p>Select the required forming tools and equipment including die and punch as per job specifications</p>		<ul style="list-style-type: none"> Check sheets PPEs Punches Dies Blank Holder 	
LU:3 Prepare the required tools and equipment	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Measure the strip dimensions for given operation Set parameters of forming machine (Pressure, Time, Temperature etc) according to job specifications Energize the machine as per SOPs Prepare the metal stock as per SOPs. Set number of Dies according to requirement. Set Punch according to 	<ul style="list-style-type: none"> Understanding of parameters of forming machine to be set Actuation of forming machine <p><u>Practical Activity</u></p> <p>Set the die and punch in the forming machine as per job requirement</p>	<p>Theory 01-Hrs. Practical 03-Hrs. Total-04 Hrs.</p>	<ul style="list-style-type: none"> Raw Materials Layout tools Fire extinguishers Check sheets PPEs Punches Dies Blank Holder 	Classroom and workshop



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	the job requirement				
LU:4 Prepare work piece as per drawing	Trainee will be able to: <ul style="list-style-type: none"> • Interpret job's drawing • Perform measurement for marking on job as per drawings/ specifications • Apply Dimensional data and shape according to the given task • Clamp the work piece using PPEs as per job requirement 	<ul style="list-style-type: none"> • Interpretation of drawing • Marking on job as per drawing • Knowledge of clamping and its devices <p><u>Practical Activity</u></p> <p>Set the workpiece in the clamping device as per standard procedure</p>	<p>Theory 01-Hrs. Practical-03 Hrs.</p> <p style="text-align: center;">Total-04 Hrs.</p>	<ul style="list-style-type: none"> • Raw Materials • Layout tools • Fire extinguishers • Check sheets • PPEs • Punches • Dies • Blank Holder 	Classroom and workshop
LU:5 Perform Shearing operation	Trainee will be able to: <ul style="list-style-type: none"> • Energize Shearing Machine as per SOPs • Load continuous feed of stock as per production requirements. • Operate Shearing machine as per SOP • Unload finished product as per SOP • Maintain production record of work • Verify product 	<ul style="list-style-type: none"> • Knowledge about the shearing operations • Shearing machine and its accessories • Understanding about the operation of shearing machine <p><u>Practical Activity</u></p> <p>Carry out shearing operation as per drawing/instructions</p>	<p>Theory 02-Hrs. Practical 06-Hrs.</p> <p style="text-align: center;">Total-08 Hrs.</p>	<ul style="list-style-type: none"> • Shearing Machines and its accessories • Raw Materials • Layout tools • Fire extinguishers • Check sheets 	Classroom and workshop



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	deviations and report			<ul style="list-style-type: none"> • PPEs • Punches • Dies • Blank Holder 	
LU:6 Perform punching operation	Trainee will be able to: <ul style="list-style-type: none"> • Energize Punching Machine as per SOPs • Select Punch (Steel, Carbide etc) as per requirement • Select the Die cutout in the shape of requirement • Assemble sheet metal stock, Punch and Die. • Position sheet metal stock between the Punch and Die inside the punch press • Press Punch downward at high speed through the Sheet and Die • Remove the slug that is punched out of the sheet 	<ul style="list-style-type: none"> • Knowledge of punching operation • Selection of die and punch as per job requirement • Understanding about the product deviation <p><u>Practical Activity</u></p> <p>Perform punching operation on the sheet metal as per drawing/instructions</p>	<p>Theory-02Hrs. Practical-06Hrs. Total- 08 Hrs.</p>	<ul style="list-style-type: none"> • Punching Machines and its accessories • Raw Materials • Layout tools • Fire extinguishers • Check sheets • PPEs • Punches • Dies • Blank Holder 	Classroom and workshop



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	<ul style="list-style-type: none"> • Maintain production record of work • Verify product deviations and report 				
LU:7 Perform bending operation	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Energize Bending Machine as per SOPs • Select tool as per job requirement (production quantity, sheet metal material and degree of bending etc) • Select Die for Bending operation as per requirement. • Position the sheet over the Die and held in place by the back gauge • Energize press brake to perform Bending operation • Apply force to the sheet with the help of press Die • Maintain production record of work 	<ul style="list-style-type: none"> • Knowledge of bending Operation • Knowledge about the bending machine • Understanding the procedure to carry out bending process <p><u>Practical Activity</u></p> <p>Perform bending operation on the sheet metal as per drawing/ instructions</p>	<p>Theory-02Hrs. Practical-06Hrs. Total- 08 Hrs.</p>	<ul style="list-style-type: none"> • Bending Machines and its accessories • Raw Materials • Layout tools • Fire extinguishers • Check sheets • PPEs • Punches • Dies • Blank Holder 	Classroom and workshop



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	<ul style="list-style-type: none"> Verify product deviations and report 				
LU:8 Perform Debarring of product	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Insert deburring blade into product Apply a small amount of pressure between the blade and interior wall Perform rotation of blade around the interior wall of the tube while applying pressure Use a deburring machine to grind the burr off in case of Mechanical deburring Use combustive gases to generate thermal energy and essentially scald the burrs out of the metal in Thermal deburring Use a solution of salt or glycol to conduct energy through the burrs in Electrochemical deburring. 	<ul style="list-style-type: none"> Knowledge of deburring Understanding the procedure of debarring Explanation of different Types of deburring; <ul style="list-style-type: none"> i) Manual ii) Mechanical iii) Thermal iv) Electrochemical <p><u>Practical Activity</u></p> <p>Carry mechanical deburring by using machine as per specification</p>	<p>Theory-01Hrs. Practical 03-Hrs. Total-04 Hrs.</p>	<ul style="list-style-type: none"> deburring machine Mechanical deburring machine Electrochemical deburring equipment Thermal deburring machine 	Classroom and workshop



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LU:9 Carryout inspection of the finished products	Trainee will be able to: <ul style="list-style-type: none"> Follow standard procedure of inspection Measure the work piece for conformance to specification Carryout product repair (if required) Inspect products after rework or repair Record the deviations, if any, according to SOPs 	<ul style="list-style-type: none"> understanding of the inspection procedure of the finished product knowledge of standard specifications Repairing methods of the product after inspection <p><u>Practical Activity</u></p> <p>Perform a detailed inspection of the product after forming operation and carry out repair work if required</p>	<p>Theory 01-Hrs. Practical-03 Hrs. Total-04 Hrs.</p>	Inspection Tools	Classroom and workshop
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0715-MF&P 16 Module: Perform Forging Operations

Objective: This module covers the knowledge and skills required to Arrange the raw material, Calculate material requirement, Pre-heat the Job, Perform forging operation, Inspect the product

Duration: 48 Hours Theory: 12 Hours Practice: 36 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU:1 Arrange the raw material	Trainee will be able to: <ul style="list-style-type: none"> Select the raw material according to job requirements. Select form/shape of raw material on near net Shape principle. 	<ul style="list-style-type: none"> Knowledge of the raw material for forging operation <u>Practical Activity</u> Choose the raw material for forging operation	Theory 02-Hrs. Practical-06 Hrs. Total- 08Hrs.	<ul style="list-style-type: none"> Raw material 	Classroom and workshop
LU:2 Calculate material's requirement	Trainee will be able to: <ul style="list-style-type: none"> Interpret Engineering Drawing / Job sheet of the product. Determine the dimensions of the finish product. Measure the stock 	<ul style="list-style-type: none"> Interpretation of drawing as per job sheet Calculation of the continuous stock available <u>Practical Activity</u> Calculate the volume of	Theory-03Hrs. Practical-06Hrs. Total- 09 Hrs.	<ul style="list-style-type: none"> Steel rule Measuring tape Try square 	Classroom and workshop



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	dimensions & weight. <ul style="list-style-type: none"> Calculate Material volume as per job requirements. 	the material required for the job			
LU:3 Pre-heat the Job	Trainee will be able to: <ul style="list-style-type: none"> Select the heating equipment as per Job requirement. Energize the heating equipment as per SOPs Focus the heat on job specified area. Heat-up the work piece to the specified working Temperature range. 	<ul style="list-style-type: none"> Knowledge of pre-heating process Identification of heating equipment Knowledge of heating equipment to energize <u>Practical Activity</u> Perform heating of the job to required temperature using the specified heating equipment	Theory-03Hrs. Practical-09Hrs. Total- 12 Hrs.	<ul style="list-style-type: none"> Heating furnaces Clamping devices Tongs 	Classroom and workshop
LU:4 Perform forging operation	Trainee will be able to: <ul style="list-style-type: none"> Arrange forging tools as per requirement according to open or closed Die Forging. Perform safe handling of tools Maintain allowances for 	<ul style="list-style-type: none"> Knowledge about the forging operation Identification of forging tools Knowledge of the safety rules and regulation for forging operation 	Theory-02Hrs. Practical-09Hrs. Total- 11Hrs.	<ul style="list-style-type: none"> Forging machine and accessories Anvil 	Classroom and workshop



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	<p>material shrinkage and oxidation</p> <ul style="list-style-type: none"> • Apply the force several times to get the desired shape of the Job. • Perform finishing operation as per requirement. 	<p><u>Practical Activity</u></p> <p>Carry out forging operation as per given instruction</p>			
LU:5 Inspect the product	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Check all dimensions of the product • Perform measurements and calculations of the product. • Report the error, if any, in the final product. • Recommend corrective action(s) as per required specifications. • 	<ul style="list-style-type: none"> • Knowledge of the inspection process • Understand design of the product <p><u>Practical Activity</u></p> <p>Perform detailed inspection of the final product of forging operation and take corrective action (if required)</p>	<p>Theory 02-Hrs. Practical- 06Hrs. Total- 08 Hrs.</p>	<ul style="list-style-type: none"> • Inspect on tools • Steel rule • Measuring tape Try square 	Classroom and workshop



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0715-MF&P 17 Module: Perform Extrusion Process

Objective: This module covers the knowledge and skills required to Prepare the raw material, Install the required die for direct/indirect extrusion, Preparation for hot extrusion Process, Perform direct/Indirect extrusion process and Inspect the product.

Duration: 42

Hours

Theory: 6

Hours

Practice:

36 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU:1 Prepare the raw material	Trainee will be able to: <ul style="list-style-type: none"> Select the raw materials for extrusion as per requirement. Identify lubricants and additives required in extrusion operations. Identify the suitability of a material for extrusion depends on: the temperature range over which extrusion is possible 	<ul style="list-style-type: none"> Knowledge about the extrusion process Knowledge of the raw material for extrusion Knowledge of the lubricant and additives <p><u>Practical Activity</u></p> <p>Choose the raw material for extrusion process</p>	<p>Theory 02-Hrs. Practical 06-Hrs. Total- 08 Hrs.</p>	<ul style="list-style-type: none"> Raw material Raw mateRa 	Class room and workshop
LU:2 Install the required	Trainee will be able to:	<ul style="list-style-type: none"> Knowledge about the extrusion types 	<p>Theory 01-Hrs. Practical-06</p>	<ul style="list-style-type: none"> Extrusion machine and 	Class room and workshop



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die for direct/indirect extrusion	<ul style="list-style-type: none"> Place the suitable die on machine with lifting equipment. Clamp the die as per requirement Align the die on machine. Operate machine manually and match the upper and lower dies Perform the trial of die to verify the operation. Identify risk associated with job. Use required PPEs. 	<ul style="list-style-type: none"> Identification of die as per required job Understanding the procedure to carryout extrusion process <p><u>Practical Activity</u></p> <p>install the die and perform required setting for extrusion process</p>	<p>Hrs.</p> <p>Total-07 Hrs.</p>	<p>accessories</p> <ul style="list-style-type: none"> Dies Measuring tools PPEs Lubricants Raw materials 	
LU:3 Prepare for hot extrusion Process	<p>Trainee will be able to:</p> <p>Identify the temperature as per requirement.</p> <ul style="list-style-type: none"> Control the temperature of Die, Container and Billet as per standard operating procedure Preheating the die prior to extrusion 	<ul style="list-style-type: none"> Identification of heating equipment with control temperature Knowledge about the hot extrusion process <p><u>Practical Activity</u></p> <p>Carry out preheating of the die before extrusion</p>	<p>Theory-01Hrs.</p> <p>Practical-09Hrs.</p> <p>Total- 10 Hrs.</p>	<ul style="list-style-type: none"> Extrusion machine and accessories Dies Measuring tools PPEs Lubricants Raw materials 	Class room and workshop



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	<ul style="list-style-type: none"> Set required temperature for die 				
LU:4 Perform direct/Indirect extrusion process.	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Select device required for given metal extrusion process. Follow instructions to carry out extrusion processing Check the dies are installed as per job requirement. Set the pressure as per requirement. Carry out simple preventive maintenance for metal extrusion equipment. Report the problems if any during metal extrusion processing Remove burs if applicable. 	<ul style="list-style-type: none"> knowledge of extrusion devices Understanding the procedure of extrusion process <p><u>Practical Activity</u></p> <ul style="list-style-type: none"> Carry out indirect extrusion Carry out the direct extrusion 	<p>Theory-Hrs01. Practical-09 Hrs. Total- 10 Hrs.</p>	<ul style="list-style-type: none"> Extrusion machine and accessories Dies Measuring tools PPEs Lubricants Raw materials 	Class room and workshop
LU:5 Inspect the product	<p>Trainee will be able to:</p>	<ul style="list-style-type: none"> Knowledge of the inspection process 	<p>Theory-01Hrs. Practical-06Hrs.</p>	<p>Inspection tools</p>	Class room and workshop



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	<ul style="list-style-type: none">• Check all dimensions of the product• Perform measurements and calculations of the product.• Report the error, if any, in the final product.• Recommend corrective action(s) as per required specifications	<ul style="list-style-type: none">• Understanding design of the product <p><u>Practical Activity</u></p> <p>Perform detailed inspection of the final product of extrusion process and take corrective action (if any)</p>	Total- 07 Hrs.		
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0715-MF&P 18 Module: Perform Deep drawing operations

Objective: This module covers the knowledge and skills required to perform Annealing on raw material, Arrange dies for deep drawing operation, Perform deep drawing operation and Inspect the product dimension

Duration: 42 Hours

Theory: 6 Hours

Practice: 36 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU:1 Perform Annealing on raw material.	Trainee will be able to: <ul style="list-style-type: none"> Handle the work piece as per SOP Place the work piece in the heating furnace Set standard soaking time of the heat treatment cycle as per requirements Control the temperature of the furnace as per requirements Turn off the furnace once the required temperature and soaking time is achieved. 	<ul style="list-style-type: none"> Knowledge of the furnaces Identification of the furnace and its type Understanding the procedure of the annealing process <p><u>Practical Activity</u></p> <p>Carry out the annealing process of the material as per instruction</p>	<p>Theory 02-Hrs. Practical-09 Hrs. Total- Hrs.11</p>	<ul style="list-style-type: none"> Raw Material Heat treatment Equipment 	Class room and workshop



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	<ul style="list-style-type: none"> Cool the workpiece in the furnace. Remove the workpiece from the furnace once the temperature drops to room temperature. 				
LU:2 Arrange dies for deep drawing operation	Trainee will be able to: <ul style="list-style-type: none"> Measure the size of the work piece Select suitable die for drawing operation Check the surface and other working requirements of dies Carryout measurements of dies according to desired final size 	<ul style="list-style-type: none"> Knowledge of the deep drawing operation Calculation of job size Selection of appropriate die for deep drawing operation <p><u>Practical Activity</u></p> <p>arrange die and perform its inspection as per requirements</p>	Theory-02Hrs. Practical-09Hrs. Total- 11Hrs.	<ul style="list-style-type: none"> Deep Drawing Machine and accessories Raw Material Measuring tools Dies Cutting tools 	Class room and workshop
LU:3 Carry out deep drawing operation	Trainee will be able to: <ul style="list-style-type: none"> Check the working condition of drawing machine Prepare the drawing 	<ul style="list-style-type: none"> Identification of deep drawing machine Preparation of machine Understanding the 	Theory 01-Hrs. Practical 09-Hrs. Total-10 Hrs.	<ul style="list-style-type: none"> Deep Drawing Machine and accessories Raw Material 	Class room and workshop



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	<p>machine for working</p> <ul style="list-style-type: none"> • Calculate maximum draw force for given job • Placed the workpiece in the dies. • Operate the machine for drawing • Set constant speed to maintain uniformity • Remove the final drawn product from drawing machine • Allow the final drawn product to cool • Follow safety rules during drawing operation. 	<p>procedure to carry out deep drawing operation</p> <p><u>Practical Activity</u></p> <p>Perform deep drawing operation as per requirement</p>		<ul style="list-style-type: none"> • Measuring tools • Dies • Cutting tools 	
LU:4 Inspect the product dimension	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Measure the final size of the product • Compare the final dimensions with required final size • Record the data 	<ul style="list-style-type: none"> • Knowledge of the inspection process • Understanding design of the product <p><u>Practical Activity</u></p> <p>Perform detailed inspection of the final product of deep drawing operation and take</p>	<p>Theory 01-Hrs. Practical 09-Hrs. Total- 10 Hrs.</p>	<p>Inspection tools</p>	<p>Class room and workshop</p>



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		corrective action (if required)			
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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



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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