

Curriculum
For
**“Technician in Metallurgy
and Metal Casting”**
(Level -2)

24th to 28st May



**National Vocational & Technical
Training Commission**

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Introduction

Definition/ Description of the training programme for *Metallurgy and Cast metal technology*

Purpose of the training programme

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

Overall objectives of training programme

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

Competencies to be gained after completion of course

Possible available job opportunities available immediately and later in the future

Trainee entry level

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

Minimum qualification of trainer

Teaching staff should have at least three years' experience in the role of metallurgy and metal casting industry. They should also hold or be working towards a formal teaching qualification.

Other formal qualifications in this industry would be useful in addition to the above.

Recommended trainer: trainee ratio

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

Medium of instruction i.e. language of instruction

Instruction will be Urdu and English.

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

This curriculum comprises 26 modules. The recommended delivery time is 600 hours. Delivery of the course could therefore be full time, 5 days a week. Training providers are at liberty to develop other models of delivery, including part-time and evening delivery.

Module	Theory ¹ Days/hours	Workplace ² Days/hours	Total hours
Module 1: Perform Basic Manual Drawing	4	24	28
Module 2: Construct different Engineering Curves.	6	30	36
Module 3: Construct multi-view drawings	6	30	36
Module 4: Perform metal/bench work	2	12	14
Module 5: Perform cutting on Metal Circular/Power Heck Saw	2	6	8
Module6: Perform Grinding operation	2	9	11
Module7: Perform Basic Lathe Machine Operations	4	21	25
Module8: Perform Drilling Machine Operations	2	9	11
Module9: Perform Shaper, Planar and Slotter Machining Operations	2	18	20
Module10: Perform Milling Operations	3	18	21
Module11: Carry out inspection and receiving of raw material	9	21	24
Module12: Perform Raw Material Sampling	9	21	28
Module13: Operate general wood working machines	9	15	24
Module14: Manufacture Wooden Pattern	6	15	21

¹ Learning Module hours in training provider premises

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

Module15: Manufacture Polymer Pattern	4	15	19
Module16: Maintain tools and equipment	3	3	6
Module17: Prepare sand mold for casting	10	24	34
Module18: Perform core making	5	21	26
Module19: Maintain Safe Work Environment	4	9	13
Module20: Perform Sand Casting	8	21	29
Module21: Perform Gravity Die Casting	7	21	28
Module22: Fettle and trim metal casting	2	9	11
Module23: Perform surface cleaning by sand blasting	4	12	16
Module24: Perform shot blasting	5	15	20
Module25: Perform cutting and grinding operations	3	9	12
Module26: Perform basic welding operations	6	15	21

The full structure of the course is as follow:

Sequence of the Modules

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

The distribution table is shown below:

Modules

Module 1: Perform Basic Manual Drawing

Objective of the module: The aim of this module is to cover the skills and knowledge required to draw single stroke capital vertical and capital inclined lettering, horizontal, vertical and inclined lines, circles, half circles, radius, center lines, curves, crossing of lines and construction of parallel-lines.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Draw single stroke capital vertical and inclined lettering.	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare drawing sheet. 2. Select the geometry tools. 3. Use proper pencil for lettering with holding techniques. 4. Draw boundary lines as per standards. 5. Make title block 6. Draw upper and lower lines for lettering according to standards. 7. Start writing vertical lettering with different 	<ol style="list-style-type: none"> 1. Importance of Technical Drawing. 2. Symbols of engineering terminology. 3. Uses of technical Drawing tools 4. Type of Drawing 5. Application of Technical drawing 6. Drawing Pencil, their grading, sharpening and using techniques. 7. Style of letters. 8. General rules for lettering 	Total: 7hrs Theory: 5 hrs Practical: 2 hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	Class room Drawing Hall

	style like gothic, italic and free hand lettering.				
LU2. Draw horizontal, vertical and inclined lines.	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in different equal parts. 6. Draw lines at 30, 45, 60,90and 120 angles. 	<ol style="list-style-type: none"> 1. Importance of Technical Drawing. 2. Symbols of engineering terminology. 3. Uses of technical Drawing tools 4. Type of Drawing 5. Application of Technical drawing 6. Drawing Pencil, their grading, sharpening and using techniques. 7. Style of letters. 8. General rules for lettering 9. Basic lines 10. Importance of lines 11. Common Types of lines and correct line weightage. 12. Application of lines. 	Total: 7hrs Theory: 5hrs Practical: 2 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templates. • Compass. • 	Class room Drawing Hall
LU3. Draw circles, half circles, radius with compass	<ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in 	<ol style="list-style-type: none"> 1. Introduction to geometry 2. Introduction to sketching techniques. 	Total 7 hrs Theory: 5hrs Practical: 2hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia 	Class room Drawing Hall

	different equal parts. 6. Make different diameters circles and half circles.			<ul style="list-style-type: none"> • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	
LU4. Draw Lines	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in different equal parts. 6. Draw Center lines, 7. Draw parallel-lines 8. Draw perpendicular & bisects line 9. Draw equal division of lines 10. Make different angle curves. 	<ol style="list-style-type: none"> 1. Importance of lines 2. Common Types of lines and correct line weightage. 3. Application of lines. 4. Introduction to geometry 5. Introduction to sketching techniques. 6. Techniques of sketching straight lines in different directions. 	Total: 9hrs Theory: 5 hrs Practical: 4 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	Class room Drawing Hall

	11. Draw crossing line				
LU5. Draw round corners, circles elements, quadrilaterals inside and outside circle	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title block 5. Divide the sheets in different equal parts. 6. Make different dia circles. 7. Make inside and outside different types of diagrams that touch the circles at the tangent points. 	<ol style="list-style-type: none"> 1. Application of lines. 2. Introduction to geometry 3. Introduction to sketching techniques. 4. Techniques of sketching straight lines in different directions. 5. Define Polygons. 		Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	Class room Drawing Hall

LU6. Construct different triangles	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title block 5. Divide the sheets in different equal parts. 6. Draw Equilateral Triangle, Isosceles triangle, Scalene Triangle, Right Triangle, Obtuse Triangle, Acute Triangle 	<ol style="list-style-type: none"> 1. Different types of triangles. 2. Difference between, triangles, rectangles, circles, polygon. 3. Different angles. 		Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	Class room Drawing Hall
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Module 02: Construct different Engineering Curves

Objective of the module: The aim of this module is to cover the skills and knowledge required to Construct inscribe and circumscribe figures, Construct a pentagon, Hexagon and Octagon by circumscribe method, Construct a pentagon, Hexagon and Octagon by inscribe method, Construct a Tangents of circles (Inside & Outside) When the centre of the given circle is known and when the circle of centre is not known, Construct an Ellipse by Concentric Circle Method, Rectangle Method, Oblong Method, Arcs of Circle Method, Rhombus Method and Basic Locus Method.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Construct inscribe and circumscribe figures.	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare drawing sheet. 2. Select the tools. 3. Draw boundaries lines as per standards. 4. Make title block 5. Divide the sheets in different equal parts. 6. Draw triangle, square, pentagon, hexagon and octagon according to dimension. 	<ol style="list-style-type: none"> 1. Techniques of sketching straight lines in different directions 2. Define Triangles, Quadrilateral and Polygons 3. Describe circular arc using different line method 4. Describe circular arc 5. Types of Geometric Shape 	Total: 7hrs Theory: 5 hrs Practical: 2 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	Class room Drawing Hall
LU2. Construct Tangents of circles (Inside & Outside)	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 	<ol style="list-style-type: none"> 1. Types of Geometric Shape 2. Two-dimensional shapes 3. Three-dimensional shapes 4. Types of Geometric Shape 	Total: 7hrs Theory: 5hrs Practical: 2 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board 	Class room Drawing Hall

	<ol style="list-style-type: none"> 4. Make title bar 5. Divide the sheets in different equal parts. 6. Draw Tangents Inside of a circle When the centre of the circle is known. 7. Draw Tangents Inside of a circle When the centre of the circle is unknown 8. Draw Tangents outside of a circle When the centre of the circle is known 9. Draw Tangents outside of a circle When the centre of the circle is unknown 			<ul style="list-style-type: none"> • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. • 	
LU3. Construct Ellipse	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries 	<ol style="list-style-type: none"> 1. Regular Polyhedrons 2. Methods of drawing Tangents & Normal 3. Describe ellipse 	<p>Total 7 hrs</p> <p>Theory: 5hrs</p> <p>Practical: 2hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <p>Non Consumable</p> <ul style="list-style-type: none"> • White board 	<p>Class room</p> <p>Drawing Hall</p>

	<p>lines as per standards.</p> <ol style="list-style-type: none"> 4. Make title bar 5. Divide the sheets in different equal parts. 6. Draw an Ellipse by Concentric Circle. 7. Draw an Ellipse by Rectangle Method 8. Draw an Ellipse by Oblong Method 9. Draw an Ellipse by Arcs of Circle Method 10. Draw an Ellipse by Rhombus Method. 11. Draw an Ellipse by Basic Locus Method 			<ul style="list-style-type: none"> • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	
LU4. Construct a parabola curve	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Prepare drawing sheet. 2. Select the geometry tools. 3. Draw Boundary lines as per standards. 	<ol style="list-style-type: none"> 1. Describe parabola 2. Describe different methods of parabola 	<p>Total: 9hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 4 hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • Multimedia 	<p>Class room</p> <p>Drawing Hall</p>

	<ol style="list-style-type: none"> 4. Make title block 5. Divide the sheets in different equal parts. 6. Draw a parabola curve by Rectangle 7. Draw a parabola curve by Method of Tangents(Triangle Method) 8. Draw a parabola curve by Basic Locus Method 			<ul style="list-style-type: none"> • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	
LU5. Construct a hyperbola curve	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in different equal parts. 6. Draw a hyperbola curve. 	<ol style="list-style-type: none"> 1. Describe different methods of parabola 2. Describe hyperbola curve 3. Describe different methods of hyperbola curve. 		<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	<p>Class room</p> <p>Drawing Hall</p>

LU6. Construct a Archimedean Spiral curve	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in different equal parts. 6. Draw spiral curve. 	<ol style="list-style-type: none"> 1. Describe different methods of hyperbola curve. 2. Describe spiral curve 3. Describe involute curve 4. Describe cycloid 5. Describe epicycloids 6. Describe hypocycloid 		Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	Class room Drawing Hall
LU7. Construct involute curve	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per 	<ol style="list-style-type: none"> 1. Describe different methods of hyperbola curve. 2. Describe spiral curve 3. Describe involute curve 4. Describe cycloid 5. Describe epicycloids 6. Describe hypocycloid 		Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board 	Class room Drawing Hall

	standards. 4. Make title bar 5. Divide the sheets in different equal parts. 6. Draw involute curve by square 7. Draw involute curve by rectangle 8. Draw involute curve by hexagon 9. Draw involute curve by circle.			<ul style="list-style-type: none"> • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	
LU8. Construct of cycloid, epicycloid, and hypocycloid	The trainee will be able to: 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in different equal parts. 6. Draw the generating circle and the base line equal to the	1. Describe different methods of hyperbola curve. 2. Describe spiral curve 3. Describe involute curve 4. Describe cycloid 5. Describe epicycloids 6. Describe hypocycloid		Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	Class room Drawing Hall

	circumference of the generating circle 7. Divide the circle and the base line in to equal number of parts 8. Complete the cycloid, epicycloids, and hypocycloid				
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Module 03: Construct multi-view drawings

Objective of the module: The aim of this module to covers the skills and knowledge required to Sketch Orthographic projection 1st angle, Sketch Orthographic projection 3rd angle, Sketch Oblique Drawing, Construct multi view drawing of Simple Bearing, Construct multi view drawing of Open Bearing, Sketch prism, Sketch cone and Draw pyramid.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Sketch Orthographic projection in 1 st angle of Projection	The trainee will be able to: 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar	1. Orthographic projection 1 st angle. 2. Orthographic projection 3rd angle. 3. Oblique Drawing. 4. Multi view drawing. 5. Prism, Cone and pyramid	Total: 7hrs Theory: 5 hrs Practical: 2 hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia 	Class room Drawing Hall

	<ol style="list-style-type: none"> 5. Divide the sheets in equal parts. 6. Draw plan view 7. Draw front view 8. Draw side view 			<ul style="list-style-type: none"> • Internet • Drawing board/table. • T-Square • Set Square. • Templates. • Compass. 	
LU2. Sketch Orthographic projection 3rd angle of Projection	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in equal parts. 6. Draw plan view 7. Draw front view 8. Draw side view 	<ol style="list-style-type: none"> 1. Orthographic projection 1st angle. 2. Orthographic projection 3rd angle. 3. Oblique Drawing. 4. Multi view drawing. 5. Prism, Cone and pyramid 	Total: 7hrs Theory: 5hrs Practical: 2 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templates. • Compass. 	Class room Drawing Hall
LU3. Sketch Oblique Drawing	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 	<ol style="list-style-type: none"> 1. Orthographic projection 1st angle. 2. Orthographic projection 3rd angle. 3. Oblique Drawing. 4. Multi view drawing. 5. Prism, Cone and pyramid 	Total 7 hrs Theory: 5hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners 	Class room Drawing Hall

	<ol style="list-style-type: none"> 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in equal parts 6. Draw the front or side view of the object. 		Practical: 2hrs	Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	
LU4. Construct multi view drawing of Simple Bearing.	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in equal parts. 6. Draw plan view of simple bearing 7. Draw front view of simple bearing 8. Draw side view of 	<ol style="list-style-type: none"> 1. Orthographic projection 1st angle. 2. Orthographic projection 3rd angle. 3. Oblique Drawing. 4. Multi view drawing of Simple Bearing. 5. Prism, Cone and pyramid 	Total: 9hrs Theory: 5 hrs Practical: 4 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	Class room Drawing Hall

	simple bearing				
LU5. Construct multi view drawing of Open Bearing	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in equal parts. 6. Draw plan view of open bearing 7. Draw front view of open bearing 8. Draw side view of open bearing 	<ol style="list-style-type: none"> 1. Orthographic projection 1st angle. 2. Orthographic projection 3rd angle. 3. Oblique Drawing. 4. Multi view drawing of Simple Bearing. 5. Prism, Cone and pyramid 		Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templates. • Compass. 	Class room Drawing Hall
LU6. Sketch prism	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 	<ol style="list-style-type: none"> 1. Orthographic projection 1st angle. 2. Orthographic projection 3rd angle. 3. Oblique Drawing. 4. Multi view drawing. 		Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers 	

	<ol style="list-style-type: none"> 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in equal parts. 6. Sketch prism 	5. Prism, Cone and pyramid		<ul style="list-style-type: none"> • Sharpeners <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templates. • Compass. 	
LU7. Sketch cone	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in equal parts. 6. Start with a horizontal oval 7. draw the two sides of a triangle which meets at a common 	<ol style="list-style-type: none"> 1. Orthographic projection 1st angle. 2. Orthographic projection 3rd angle. 3. Oblique Drawing. 4. Multi view drawing. 5. Prism, Cone and pyramid 		<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templates. • Compass. 	Class room Drawing Hall

	point				
LU8. Draw pyramid	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare Drawing sheet. 2. Select the tools. 3. Draw Boundaries lines as per standards. 4. Make title bar 5. Divide the sheets in equal parts. 6. Sketch pyramid 	<ol style="list-style-type: none"> 1. Orthographic projection 1st angle. 2. Orthographic projection 3rd angle. 3. Oblique Drawing. 4. Multi view drawing. 5. Prism, Cone and pyramid 		Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Drawing board/table. • T-Square • Set Square. • Templets. • Compass. 	Class room Drawing Hall

Basic Machining Operator

Module 04: Perform metal/bench work

Objective of the module: The aim of this module is designed to cover the skills and knowledge required to develop name plate manually, carry out sawing, prepare inside calliper, prepare bottle opener, prepare dovetail joint, prepare tri square (small size), ,cut threads on work piece, prepare funnel, prepare drawer handle, cut pipe threads and prepare spanner (small size).

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Develop Name Plate manually	The trainee will be able to: 1. Select marking tools 2. Hold the sheet in vice. 3. Cut sheet as per drawing 4. Perform surface finishing with file 5. Level the surface with tri-square 6. Mark the plate as per name requirements 7. Punch the marked area 8. Perform finishing with sand paper	1. Basic measurement 2. Marking /cutting tools 3. Types of Files	Total: 7hrs Theory: 5 hrs Practical: 2 hrs	<div>Consumable</div> <ul style="list-style-type: none"> Raw Material for job, Hacksaw blades, Tap and Die <div>Non Consumable</div> <ul style="list-style-type: none"> Work bench Bench vices Hammer Tri-square Hand hacksaw Scriber Vernier caliper Flat File Number/alphabet punch Round file 	Class room Mechanical Workshop

				<ul style="list-style-type: none"> • Metal working chisel • Punching tools • Tap set • Tap handle • Pipe vice 	
LU2. Prepare Dovetail Joint	The trainee will be able to: <ol style="list-style-type: none"> 1. Select marking tools 2. Cut sheet as per drawing 3. Perform surface finishing with file 4. Level the surface of both work pieces with tri-square 5. Mark both work pieces according to drawing 6. Create outer notch on work piece using flat file and hacksaw 7. Create inner notch using hacksaw and chisel 8. Compare both 	<ol style="list-style-type: none"> 1. Types of fits. 2. Types of Chisels. 3. Clamping Devices 4. 	Total: 7hrs Theory: 5hrs Practical: 2 hrs	Consumable <ul style="list-style-type: none"> • Raw Material for job, • Hacksaw blades, Non Consumable <ul style="list-style-type: none"> • Work bench • Bench vices • Hammer • Tri-square • Hand hacksaw • Scriber • Vernier caliper • Flat File • Number/alphabet punch • Round file • Metal working chisel • Punching tools 	Class room Mechanical Workshop

	pieces by inserting outer notch into inner notch 9. Perform finishing with sand paper			<ul style="list-style-type: none"> • Tap set • Tap handle • Pipe vice 	
LU3. Prepare Bottle Opener	The trainee will be able to: <ol style="list-style-type: none"> 1. Select marking tools 2. Cut sheet as per drawing 3. P3. Perform surface finishing with file 4. Level the surface with tri-square 5. Mark radius as per drawing 6. Develop radius as per drawing 7. Make the notch with round file 8. Perform finishing with sand paper 	<ol style="list-style-type: none"> 1. Use of round file 2. File Types 3. Cutting Tools 	Total 7 hrs Theory: 5hrs Practical: 2hrs	Consumable <ul style="list-style-type: none"> • Raw Material for job, • Hacksaw blades, Non Consumable <ul style="list-style-type: none"> • Work bench • Bench vices • Hammer • Tri-square • Hand hacksaw • Scriber • Vernier caliper • Flat File • Number/alphabet punch • Round file • Metal working chisel • Punching tools • Tap set 	Class room Mechanical Workshop

				<ul style="list-style-type: none"> • Tap handle Pipe vice	
LU4. Cut Threads on Work Piece with tap and die	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify different kind of taps & die according to requirement 2. Identify the work piece clamping method. 3. Apply tap and die alignment. 4. Apply lubricants while threading. 5. Avoid unwanted engraving and slips. 6. Identify proper threading procedure 	<ol style="list-style-type: none"> 1. Taps & die 2. calculation for drill size for internal threading. 3. Threading by die and taps 4. 	Total: 9hrs Theory: 5 hrs Practical: 4 hrs	Consumable <ul style="list-style-type: none"> • Raw Material for job, • Hacksaw blades, Non Consumable <ul style="list-style-type: none"> • Work bench • Bench vices • Hammer • Tri-square • Hand hacksaw • Scriber • Vernier caliper • Flat File • Number/alphabet punch • Round file • Metal working chisel • Punching tools • Tap set • Tap handle • Pipe vice 	Class room Mechanical Workshop

<p>LU5. Cut Pipe Threads</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select marking tools 2. Cut pipe as per drawing 3. Select die as per pipe size 4. Set die into die holder 5. Select relevant vice for pipe clamping 6. Perform pipe threading using appropriate method 7. Perform finishing with sand paper 	<ol style="list-style-type: none"> 1. Clamping of work piece. 2. Thread Cutting 3. Types Of Threading 	<p>Consumable</p> <ul style="list-style-type: none"> • Raw Material for job, • Hacksaw blades, <p>Non Consumable</p> <ul style="list-style-type: none"> • Work bench • Bench vices • Hammer • Tri-square • Hand hacksaw • Scriber • Vernier caliper • Flat File • Number/alphabet punch • Round file • Metal working chisel • Punching tools • Tap set • Tap handle • Pipe vice 	<p>Class room</p> <p>Mechanical Workshop</p>
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<p>LU6. Prepare spanner (small size)</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select marking tools 2. Cut sheet as per drawing 3. Perform surface finishing with file 4. P4. Level the surface with tri-square 5. Mark radius as per drawing 6. Develop radius as per drawing 7. Make the notch with round file 8. Perform finishing with sand paper 	<ol style="list-style-type: none"> 1. Standard bolts 2. Finishing 3. Types Of Round Files 4. 	<p>Consumable</p> <ul style="list-style-type: none"> • Raw Material for job, • Hacksaw blades, <p>Non Consumable</p> <ul style="list-style-type: none"> • Work bench • Bench vices • Hammer • Tri-square • Hand hacksaw • Scriber • Vernier caliper • Flat File • Number/alphabet punch • Round file • Metal working chisel • Punching tools • Tap set • Tap handle • Pipe vice 	<p>Class room</p> <p>Mechanical Workshop</p>
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<p>LU7. Prepare Funnel</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select marking tools 2. Cut sheet as per drawing 3. Perform surface finishing with file 4. Mark the sheet according to drawing 5. Cut the sheet with hand shear 6. Create radius of funnel using appropriate tools 7. Perform flat lock seam bend using bench vice 8. Perform finishing with sand paper 	<ol style="list-style-type: none"> 1. use of hand shear 2. Files 3. Marking 4. Cutting 5. Rolling 6. Bending 	<p>Consumable</p> <ul style="list-style-type: none"> • Raw Material for job, • Hacksaw blades, <p>Non Consumable</p> <ul style="list-style-type: none"> • Work bench • Bench vices • Hammer • Tri-square • Hand hacksaw • Scriber • Vernier caliper • Flat File • Number/alphabet punch • Round file • Metal working chisel • Punching tools • Tap set • Tap handle • Pipe vice 	<p>Class room</p> <p>Mechanical Workshop</p>
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Modules

Module 02: Perform cutting on Metal Circular and Power Hack Saw

Objective of the module: The aim of this module to covers the skills and knowledge required to Carry out Sawing and Carry out Sawing at different angles.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Cut material by using power hacksaw	The trainee will be able to: <ol style="list-style-type: none"> 1. Mark the job according to given drawing 2. Select appropriate blade according to job requirement 3. Set blade in frame of hacksaw as per procedure 4. Ensure the work piece is clamped firmly and properly 5. Adopt methods and techniques for sawing that is appropriate to job requirement 	<ol style="list-style-type: none"> 1. Basic measurement 2. Types of hacksaw frames 3. Basic measuring /Marking /cutting tools 4. Clamping/holding methods 5. Define methods and techniques of sawing 	Total: 7hrs Theory: 5 hrs Practical: 2 hrs	<ul style="list-style-type: none"> • Work bench • Bench vice • Tri-square • Hand hacksaw with blade • Scriber • Flat File • Vernier caliper 	Class room Mechanical Workshop

	6. Follow marked line during sawing to ensure accuracy.				
LU2. Carry out Sawing at different angles	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Mark the job according to given drawing 2. Select appropriate blade according to job requirement 3. Set blade in frame of metal circular saw as per procedure. 4. Ensure the blade tightness and rotating side. 5. Ensure the work piece is clamped firmly and properly 6. Adopt methods and techniques for sawing that is appropriate to job requirement 7. Follow marked line 	<ol style="list-style-type: none"> 1. Basic measurement 2. Types of hacksaw frames 3. Basic measuring /Marking /cutting tools 4. Clamping/holding methods 5. Define methods and techniques of sawing 	<p>Total: 7hrs</p> <p>Theory: 5hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> • Work bench • Bench vice • Tri-square • Hand hacksaw with blade • Scriber • Flat File • Vernier caliper • 	<p>Class room</p> <p>Mechanical Workshop</p>

	during sawing to ensure accuracy.				
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Modules

Module 03: Perform Grinding operation

Objective of the module: The aim of this module to covers the skills and knowledge required to perform off-hand grinding and Sharp single point cutting tool on grinding.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform off-hand grinding	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select the proper size and shape of grinding wheel. 2. Hold the work piece firmly against the rotating wheel by placing it on the tool rest. 3. Use coolant at intervals to avoid over heating of the job. 4. Adopt technique and methods which are safe. 	<ol style="list-style-type: none"> 1. Different grinding machines. 2. Type, size and shape of wheels and abrasive. 3. Technique of holding work piece against rotating wheel. 4. Importance of using coolant. 5. Methods and techniques for off-hand grinding. 6. Standing position during grinding. 7. Specific safety precautions and guidelines. 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> • Grinding Machine • Personal Protective Equipment • Wheel Dresser stand • Dresser • Steel Bar 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>5. Produce component according to work operations.</p> <p>6. Observe personal and workplace safety..</p>				
<p>LU2. Sharp single point cutting tool on grinding</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select the proper size and shape of grinding wheel. 2. Hold the work piece firmly against the rotating wheel by placing it on the tool rest. 3. Use coolant at intervals to avoid over heating of the job. 4. Adopt technique and methods which are safe. 5. Sharp the tool according to work requirements. 	<ol style="list-style-type: none"> 1. Single Point Cutting Tool 2. Multi Point Cutting Tool 3. Importance of using coolant. 4. Methods and techniques for off-hand grinding. 5. Standing position during grinding. <p>Specific safety precautions and guidelines</p>	<p>Total: 7hrs</p> <p>Theory: 5hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> • Grinding Machine • Personal Protective Equipment • Wheel Dresser stand • Dresser • Steel Bar • 	<p>Class room</p> <p>Mechanical Workshop</p>

	6. Observe personal and workplace safety.				
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Module 04: Perform Basic Lathe Machine Operations

Objective of the module: The aim of this module to covers the skills and knowledge required to Perform cantering operations, perform facing Operations, perform turning operations, Perform drilling or boring operations, Perform step turning operations, Perform knurling Operations, Taper turning by tail stock off-set method, Taper turning by plain taper turning attachment, Taper turning by telescopic taper turning attachment and Perform Internal and External threading Operations.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform facing Operations	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select facing tools according to job requirement. 2. Mount and set the required work-holding devices, work piece and cutting tools. 3. Follow the correct specifications for the part or component to 	<ol style="list-style-type: none"> 1. Safety precautions involved in work. 2. Types Of Lathe Machine 3. Methods and techniques of adjusting operating parameters of machine tool. 4. Speed and feed of Lathe Machine. 5. Use of holding and cutting tools 6. Reading and interpreting work specifications, drawings and sketches. 7. Facing 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> • Lathe Machine • Cutting Tools • Measuring Tools • Personal Protective Equipment • Files • Vernier Caliper • Threading Tools • Threading Tools • Lathe Attachments 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>be produced.</p> <ol style="list-style-type: none"> 4. Select safe procedures and tools to accomplish the work. 5. Adjust the operating parameters (e.g. speed and feed) of machine tool to achieve the work specification. 6. Ensure all safety mechanisms are in place. 				
<p>LU2. Perform turning Operations</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Obtain and follow work specifications, drawings or sketches to accomplish the work. 2. Set up and adjust the machine as per work specifications and procedures. 3. Perform turning operation as per 	<ol style="list-style-type: none"> 1. Speed and feed of Lathe Machine. 2. Use of holding and cutting tools. 3. Reading and interpreting work specifications, drawings and sketches. 4. Turning Types 5. Method and technique of setting up and adjusting the lathe machine 6. Techniques to check quality of component produced 7. Procedure of shutting down of machine and equipment after closure of activities. 8. Safety precautions and procedures need to be observed during work. 	<p>Total: 7hrs</p> <p>Theory: 5hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> • Lathe Machine • Cutting Tools • Measuring Tools • Personal Protective Equipment • Files • Vernier Caliper • Threading Tools • Threading Tools • Lathe Attachments 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>requirement</p> <ol style="list-style-type: none"> 4. Ensure the components produced have the required quality and within the specified dimensional accuracy. 5. Shut down the machine and equipment on conclusion of the machining activities. 				
<p>LU3. Perform center drilling, drilling and boring operations</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Obtain and follow work specifications, drawings or sketches to accomplish the work. 2. Set up and adjust the machine as per work specifications and procedures. 3. Perform turning operation as per 	<ol style="list-style-type: none"> 1. Types of drilling and boring tools and their function. 2. Procedure of mounting and setting up of work-holding devices, work pieces and cutting tools. 3. Drilling Operation 4. Boring procedures 5. Safety precautions and procedures. 	<p>Total 7 hrs</p> <p>Theory: 5hrs</p> <p>Practical: 2hrs</p>	<ul style="list-style-type: none"> • Lathe Machine • Cutting Tools • Measuring Tools • Personal Protective Equipment • Files • Vernier Caliper • Threading Tools • Threading Tools • Lathe Attachments 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>requirement</p> <p>4. Ensure the components produced have the required quality and within the specified dimensional accuracy.</p> <p>5. Shut down the machine and equipment on conclusion of the machining activities.</p>				
<p>LU4. Perform step turning operations</p>	<p>The trainee will be able to:</p> <p>1. Mount and set the required work-holding devices, work piece and cutting tools.</p> <p>2. Select and adjust appropriate speeds and feeds of turning machine.</p> <p>3. Produce a component which</p>	<p>1. Speed and feed of Lathe Machine.</p> <p>2. Use of holding and cutting tools</p> <p>3. Reading and interpreting work specifications, drawings and sketches.</p> <p>4. Turning Types</p> <p>5. Method and technique of setting up and adjusting the lathe machine</p> <p>6. Techniques to check quality of component produced</p> <p>7. Procedure of shutting down of machine and equipment after closure of activities.</p> <p>8. Safety precautions and procedures</p>	<p>Total: 9hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 4 hrs</p>	<ul style="list-style-type: none"> • Lathe Machine • Cutting Tools • Measuring Tools • Personal Protective Equipment • Files • Vernier Caliper • Threading Tools • Threading Tools • Lathe Attachments 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>matches the work specifications using appropriate methods and techniques.</p> <p>4. Check quality of the component produced at different intervals.</p> <p>5. Follow safety precautions to ensure safe work and to avoid any injury.</p>	<p>need to be observed during work.</p>			
<p>LU5.</p> <p>Perform knurling Operations</p>	<p>The trainee will be able to:</p> <p>1. Select the knurling tool according to drawing.</p> <p>2. Set the tool and work piece in the machine according to procedure.</p> <p>3. Adapt methods and techniques to produce proper knurling on work piece.</p>	<p>1. Types of knurling tools</p> <p>2. Types of knurling.</p> <p>3. Methods of knurling.</p> <p>4. Importance of using coolants during knurling.</p>		<ul style="list-style-type: none"> • Lathe Machine • Cutting Tools • Measuring Tools • Personal Protective Equipment • Files • Vernier Caliper • Threading Tools • Threading Tools • Lathe Attachments 	<p>Class room</p> <p>Mechanical Workshop</p>

	<ol style="list-style-type: none"> 4. Select and adjust appropriate speeds and feeds of lathe machine. 5. Use coolants during knurling to achieve smooth impression on work piece. 6. Observe personal and workplace safety. 				
LU6. Perform taper turning by compound rest method	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Obtain and follow work specifications, drawings or sketches to accomplish the work. 2. Set up and adjust the machine as per work specifications and procedures. 3. Calculate and set tilting angle of compound rest as per drawing 	<ol style="list-style-type: none"> 1. Speed and feed of Lathe Machine. 2. Use of holding and cutting tools 3. Reading and interpreting work specifications, drawings and sketches. 4. Turning Types 5. Method and technique of setting up and adjusting the lathe machine 6. Techniques to check quality of component produced 7. Procedure of shutting down of machine and equipment after closure of activities. 8. Safety precautions and procedures need to be observed during work. 9. Taper Turning Method 		<ul style="list-style-type: none"> • Lathe Machine • Cutting Tools • Measuring Tools • Personal Protective Equipment • Files • Vernier Caliper • Threading Tools • Threading Tools Lathe Attachments 	Class room Mechanical Workshop

	<p>requirement</p> <ol style="list-style-type: none"> 4. Perform taper turning operation 5. Ensure the components produced have the required quality and within the specified dimensional accuracy. 6. Shut down the machine and equipment on conclusion of the machining activities. 	10. Calculation of tapers.			
LU7. Perform taper turning by tail stock off-set method	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Clamp out loosen tailstock. 2. Offset tailstock-required amount. 3. Centre cutting tool. 4. Setup cutting tool for parallel turning. 5. Starting at small diameter take 	<ol style="list-style-type: none"> 1. Turning Types 2. Method and technique of setting up and adjusting the lathe machine 3. Techniques to check quality of component produced 4. Procedure of shutting down of machine and equipment after closure of activities. 5. Safety precautions and procedures need to be observed during work. 6. Taper Turning Method 		<ul style="list-style-type: none"> • Lathe Machine • Cutting Tools • Measuring Tools • Personal Protective Equipment • Files • Vernier Caliper • Threading Tools • Threading Tools • Lathe Attachments 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>excessive cuts until the taper is .05 to .06 in oversize.</p> <p>6. Check taper for accuracy using a taper ring gauge.</p> <p>7. Finish turn the taper to size and fit required</p>	7. Calculation of tapers.			
<p>LU8. Perform taper turning by plain taper turning attachment</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Remove the binding screw that cross slide to cross feed screw nut. 2. Tighten the lock screw and set cutting tool on center. 3. Set workpiece in lathe and mark length of taper. 4. Use binding screw to connect sliding block to side of taper attachment. 5. Select depth of feed 	<ol style="list-style-type: none"> 1. Turning Types 2. Method and technique of setting up and adjusting the lathe machine 3. Techniques to check quality of component produced 4. Procedure of shutting down of machine and equipment after closure of activities. 5. Safety precautions and procedures need to be observed during work. 6. Taper Turning Method 7. Calculation of tapers. 		<ul style="list-style-type: none"> • Lathe Machine • Cutting Tools • Measuring Tools • Personal Protective Equipment • Files • Vernier Caliper • Threading Tools • Threading Tools • Lathe Attachments 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>cut by compound rest feed handle.</p> <p>6. Take a light cut and recheck taper fit.</p> <p>7. Finish turn and fit the taper to gauge.</p>				
<p>LU9. Perform internal and external threading operations</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Mount and set the required work-holding devices, work piece and cutting tools. 2. Select and adjust appropriate speeds and feeds of turning machine. 3. Produce a component, which matches the work specifications using appropriate methods and techniques. 4. Check quality of the component produced at different intervals. 	<ol style="list-style-type: none"> 1. Threading Types 2. Threading Tool 3. Method of Threading 4. Threading Gauge 5. Drilling Operation on Lathe Machine 6. Calculation For threading 		<ul style="list-style-type: none"> • Lathe Machine • Cutting Tools • Measuring Tools • Personal Protective Equipment • Files • Vernier Caliper • Threading Tools • Threading Tools • Lathe Attachments 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>5. Use Proper cutting tool with required dimensions.</p> <p>6. Follow safety precautions to ensure safe work and to avoid any injury.</p>				
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Module 05: Perform Drilling Machine Operations

Objective of the module: The aim of this module to covers the skills and knowledge required to produce holes using drilling machine, Perform counter boring and counter sinking and perform machine reaming.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<p>LU1. Produce holes using drilling machine</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Observe personal and work place safety. 2. Set up drilling machine for producing holes according to job requirement. 	<ol style="list-style-type: none"> 1. Procedure of setting up of drilling machine. 2. Drilling Operation 3. Types Of Drills 4. Drill Size 5. Safety Precautions for operating Drilling Machine 6. Speed and feed of drilling machine 7. Coolants in drilling operations 8. Techniques for positioning the work- 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> • Drilling Machines • Drill chuck with Key • Machine Vice • Marking Tools • Measuring Tools • Drill Sleeve and Socket • Personal Protective Equipment • Counter drill 	<p>Class room</p> <p>Mechanical Workshop</p>

	<ol style="list-style-type: none"> 3. Manipulate the machine tool controls safely and correctly in line with operational procedures. 4. Produce components to the required quality and within the specified dimensional accuracy. 5. Carry out quality sampling checks at suitable intervals. 6. Shut down the equipment to a safe condition on conclusion of the machining activities. 	piece in the drill to ensure proper alignment and stability during drilling.		<ul style="list-style-type: none"> • Cutting oil 	
LU2. Perform counter boring and counter sinking	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select relevant tools according to the information given in engineering drawings and job 	<ol style="list-style-type: none"> 1. Safety precautions during boring and sinking operations. 2. Boring Operation 	<p>Total: 7hrs</p> <p>Theory: 5hrs</p> <p>Practical:</p>	<ul style="list-style-type: none"> • Drilling Machines • Drill chuck with Key • Machine Vice • Marking Tools • Measuring Tools • Drill Sleeve 	Class room Mechanical Workshop

	<p>specifications.</p> <p>2. Ensure tooling is correct in terms of size, shape, type, and grade for the work.</p> <p>3. Position the work-piece in the drill in such a way that it is aligned, secured and stable during drilling.</p> <p>4. Adjust speeds and feeds of drill in accordance with the size, type, and hardness of work-piece material, so that the drill performs optimum cutting without damage to work-piece.</p>		2 hrs	<p>and Socket</p> <ul style="list-style-type: none"> • Personal Protective Equipment • Counter drill • Cutting oil • 	
LU3. Perform machine Reaming	The trainee will be able to:	<p>1. Selecting reamer according to hole size</p> <p>2. Types of reamers (straight teeth or helical teeth).</p>	<p>Total</p> <p>7 hrs</p> <p>Theory:</p>	<ul style="list-style-type: none"> • Drilling Machines • Drill chuck with Key • Machine Vice 	Class room Mechanical Workshop

	<ol style="list-style-type: none"> 1. Observe personal and workplace safety. 2. Clamp work-piece in the vice properly. 3. Select reamer according to hole size and drawing requirements 4. Set reamer in the drill chuck according to procedure. 5. Use lubricants during reaming for smooth cutting. 6. Ensure proper alignment of the reamer during operations. 	<ol style="list-style-type: none"> 3. Method of setting reamer in the drill chuck. 4. Importance of alignment of the reamer during operations. 5. Clamping Devices 	<p>5hrs</p> <p>Practical:</p> <p>2hrs</p>	<ul style="list-style-type: none"> • Marking Tools • Measuring Tools • Drill Sleeve and Socket • Personal Protective Equipment • Counter drill • Cutting oil 	
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Module 06: Perform Shaper, Planar and Slotter Machining Operations

Objective of the module: The aim of this module to covers the skills and knowledge required to produce a squared shape work piece, Produce V shaped work piece, machining a Rack Gear, T-slot Machining, Machining Irregular Surfaces, Machining External Keyways and Machining internal Keyways

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Produce a squared shape work piece	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify safety hazards related with shaping operations and take appropriate steps to avoid any injury or accident. 2. Dial the machine vice according to job requirement. 3. Select point cutting tool and set machine as per requirements. 4. Mount cutting tool and work piece in the machine. 5. Check quality of the component at suitable intervals. 6. Shut down the machine at safe 	<ol style="list-style-type: none"> 1. safety hazards related with the shaper machine operations. 2. Types of Shaper Machine. 3. Types Planar Machine 4. Types of Slotter Machine 5. Difference Between Shaper Planar and Slotter Machine 6. Dial indicator 7. Measuring Tools 8. Cutting Tools 9. Tri Square 10. Bevel protector. <p>Speed and Feed for Shaper, Planar And Slotter Machine.</p>	Total: 7hrs Theory: 5 hrs Practical: 2 hrs	<ul style="list-style-type: none"> • Shaper, Planar or Slotter • Machine Vice • Tri square • Vernier Caliper • Dial indicator with magnet stand • Point cutting tools • Personal Protective Equipment • Bevel protector 	Class room Mechanical Workshop

	position after finishing the work				
LU2. Produce V shaped work piece	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Identify safety hazards related with shaping operations and take appropriate steps to avoid any injury or accident. 2. Dial the machine vice according to job requirement. 3. Select point cutting tool and set machine according to job requirements. 4. Mount cutting tool and work piece in the machine. 5. Check quality of the component at suitable intervals. 6. Shut down the machine in safe position after finishing the work 	<ol style="list-style-type: none"> 1. Safety hazards related with the shaper machine operations. 2. Types of Shaper Machine. 3. Types Planar Machine 4. Types of Slotter Machine 5. Difference Between Shaper Planar and Slotter Machine 6. Dial indicator 7. Measuring Tools 8. Cutting Tools 9. Tri Square 10. Bevel protector. 11. 12. V-Shape cutting procedure. 	<p>Total: 7hrs</p> <p>Theory: 5hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> • Shaper, Planar or Slotter • Machine Vice • Tri square • Vernier Calliper • Dial indicator with magnet stand • Point cutting tools • Personal Protective Equipment • Bevel protector • 	<p>Class room</p> <p>Mechanical Workshop</p>

<p>LU3. Machining a Rack Gear</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Identify safety hazards related with shaping operations and take appropriate steps to avoid any injury or accident. 2. Dial the machine vice according to job requirement. 3. Select point cutting tool and set machine according to job requirements. 4. Mount cutting tool and work piece in the machine. 5. Set the job/Tool Movement According to specified speed 6. Check quality of the component at suitable intervals. 	<ol style="list-style-type: none"> 1. Safety hazards related with the shaper machine operations. 2. Types of Shaper Machine. 3. Types Planar Machine 4. Types of Slotter Machine 5. Difference Between Shaper Planar and Slotter Machine 6. Dial indicator 7. Measuring Tools 8. Cutting Tools 9. Tri Square 10. Bevel protector. 11. Gears Types 12. Rack And Pinion 	<p>Total 7 hrs</p> <p>Theory: 5hrs</p> <p>Practical: 2hrs</p>	<ul style="list-style-type: none"> • Shaper, Planar or Slotter • Machine Vice • Tri square • Vernier Calliper • Dial indicator with magnet stand • Point cutting tools • Personal Protective Equipment • Bevel protector 	<p>Class room Mechanical Workshop</p>
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	7. Shut down the machine in safe position after finishing the work				
LU4. T-slot Machining	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Identify safety hazards related with shaping operations and take appropriate steps to avoid any injury or accident. 2. Dial the machine vice according to job requirement. 3. Select point cutting tool and set machine according to job requirements. 4. Mount cutting tool and work piece in the machine. 5. Check quality of the component at suitable intervals. 6. Shut down the 	<ol style="list-style-type: none"> 1. Safety hazards related with the shaper machine operations. 2. Types of Shaper Machine. 3. Types Planar Machine 4. Types of Slotter Machine 5. Difference Between Shaper Planar and Slotter Machine 6. Dial indicator 7. Measuring Tools 8. Cutting Tools 9. Tri Square 10. Bevel protector. <p>T-Slot</p>	<p>Total: 9hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 4 hrs</p>	<ul style="list-style-type: none"> • Shaper, Planar or Slotter • Machine Vice • Tri square • Vernier Calliper • Dial indicator with magnet stand • Point cutting tools • Personal Protective Equipment • Bevel protector 	Class room Mechanical Workshop

	machine in safe position after finishing the work				
LU5. Machining Irregular Surfaces	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Identify safety hazards related with shaping operations and take appropriate steps to avoid any injury or accident. 2. Dial the machine vice according to job requirement. 3. Select point cutting tool and set machine according to job requirements. 4. Mount cutting tool and work piece in the machine. 5. Use Different feed and speed of cutting and different points 	<ol style="list-style-type: none"> 1. Safety hazards related with the shaper machine operations. 2. Types of Shaper Machine. 3. Types Planar Machine 4. Types of Slotter Machine 5. Difference Between Shaper Planar and Slotter Machine 6. Dial indicator 7. Measuring Tools 8. Cutting Tools 9. Tri Square 10. Bevel protector. 		<ul style="list-style-type: none"> • Shaper, Planar or Slotter • Machine Vice • Tri square • Vernier Calliper • Dial indicator with magnet stand • Point cutting tools • Personal Protective Equipment • Bevel protector 	Class room Mechanical Workshop

	<p>according to given drawing</p> <p>6. Check quality of the component at suitable intervals.</p> <p>7. P6. Shut down the machine in safe position after finishing the work</p>				
<p>LU6. Machining External Keyways</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Identify safety hazards related with shaping operations and take appropriate steps to avoid any injury or accident. 2. Dial the machine vice according to job requirement. 3. Select point cutting tool and set machine according to job requirements. 4. Mount cutting tool and work piece in 	<ol style="list-style-type: none"> 1. Safety hazards related with the shaper machine operations. 2. Types of Shaper Machine. 3. Types Planar Machine 4. Types of Slotter Machine 5. Difference Between Shaper Planar and Slotter Machine 6. Dial indicator 7. Measuring Tools 8. Cutting Tools 9. Tri Square 10. Bevel protector. <p>Keyways</p>		<ul style="list-style-type: none"> • Shaper, Planar or Slotter • Machine Vice • Tri square • Vernier Calliper • Dial indicator with magnet stand • Point cutting tools • Personal Protective Equipment • Bevel protector 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>the machine.</p> <p>5. Check quality of the component at suitable intervals.</p> <p>6. Shut down the machine in safe position after finishing the work</p>				
LU7. Machining internal Keyways	<p>The trainee will be able to:</p> <p>1. Identify safety hazards related with shaping operations and take appropriate steps to avoid any injury or accident.</p> <p>2. Dial the machine vice according to job requirement.</p> <p>3. Select point cutting tool and set machine according to job requirements.</p> <p>4. Mount cutting tool and work piece in</p>	<p>1. Safety hazards related with the shaper machine operations.</p> <p>2. Types of Shaper Machine.</p> <p>3. Types Planar Machine</p> <p>4. Types of Slotter Machine</p> <p>5. Difference Between Shaper Planar and Slotter Machine</p> <p>6. Dial indicator</p> <p>7. Measuring Tools</p> <p>8. Cutting Tools</p> <p>9. Tri Square</p> <p>10. Bevel protector.</p> <p>Keyways</p>		<ul style="list-style-type: none"> • Shaper, Planar or Slotter • Machine Vice • Tri square • Vernier Calliper • Dial indicator with magnet stand • Point cutting tools • Personal Protective Equipment • Bevel protector 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>the machine.</p> <p>5. Check quality of the component at suitable intervals.</p> <p>6. Shut down the machine in safe position after finishing the work</p>				
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Module 07: Perform Milling Operations

Objective of the module: The aim of this module to covers the the skills and knowledge required to Prepare Blank for Generating the Gear, Select Tools and Equipment for Gear Cutting, Produce a square shaped work piece, Generate spur gear (Direct Indexing) On Milling Machine, Generate spur gear (Differential Indexing) On Milling Machine, Generate Helical Gear On Milling Machine, Perform slotting or grooving on work piece, Perform drilling or boring using milling machine, Milling a T slot, Bevel gear cutting on milling machine, Practice of spur rack cutting and Practice of helical rack cutting.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
Cu1. Produce a square shaped work piece	<p>The trainee will be able to:</p> <p>1. Identify safety hazards related with milling operations and take appropriate steps to avoid any injury or accident.</p>	<p>1. Milling Operations</p> <p>2. Milling tools</p> <p>3. Dial indicator</p> <p>4. Filing</p> <p>5. Finishing</p> <p>6. Arbor</p> <p>7. Feed</p> <p>8. Speed</p>	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> • Milling Machine • Milling Cutters • Milling Attachments 	<p>Class room</p> <p>Mechanical Workshop</p>

	<ol style="list-style-type: none"> 2. Dial the machine vice according to job requirement. 3. Select cutters and set machine as per requirements. 4. Mount cutters and work piece in the machine. 5. Produce a part matching the process plan and the part print specifications. 6. Check quality of the component at suitable intervals. 7. Shut down the machine at safe position after finishing the work 				
Cu2. Perform slotting or grooving on work piece	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Identify safety hazards related with milling operations and 	<ol style="list-style-type: none"> 1. Slotting 2. Cutters 3. Milling Operations 	<p>Total: 7hrs</p> <p>Theory: 5hrs</p>	<ul style="list-style-type: none"> • Milling Machine • Gear Cutters • Milling Attachments • Indexing Head. • Measuring Tools 	Class room Mechanical Workshop

	<p>take appropriate steps to avoid any injury or accident.</p> <ol style="list-style-type: none"> 2. Set the work piece in machine vice according to procedure. 3. Select the appropriate cutter as per specifications. 4. Adjust the milling cutter for slotting and grooving. 5. Determine the touching point of the work piece. 6. Produce slotting or grooving on the workpiece to the required quality. 7. Check quality of the component at suitable intervals. 8. Shut down the machine at safe 		<p>Practical:</p> <p>2 hrs</p>	<ul style="list-style-type: none"> • Computer system • PPEs (Safety glasses, Ear muffs/ear plugs, Protective Gloves, Cap, Safety shoes etc.) 	
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	position after finishing the work. 9. Observe personal and workplace safety at all time.				
Cu3. Perform drilling or boring using milling machine	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify safety hazards related with milling operations and take appropriate steps to avoid any injury or accident. 2. Select drill or boring tools according to drawings. 3. Mount and set the required work-holding devices, work piece and cutting tools. 4. Adjust the RPM of machine according to the standard 	<ol style="list-style-type: none"> 1. Drilling 2. Boring 	Total 7 hrs Theory: 5hrs Practical: 2hrs	<ul style="list-style-type: none"> • Milling Machine • Gear Cutters • Milling Attachments • Indexing Head. • Measuring Tools 	Class room Mechanical Workshop

	<p>chart.</p> <ol style="list-style-type: none"> 5. Perform the boring operation according to the drawing. 6. Check quality of the component produced at different intervals. 7. Shut down the machine at safe position after finishing the work. 8. Observe personal and workplace safety at all time. 				
<p>Cu4. Milling a T slot</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Layout position of a T slot. 2. Square vertical milling machine with machine table. 3. Mount work in milling machine. 4. Machine the center 	<ol style="list-style-type: none"> 1. T-Slot 2. Cutting Speed 3. Feed 4. Cutting tool 	<p>Total: 9hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 4 hrs</p>	<ul style="list-style-type: none"> • Milling Machine • Gear Cutters • Milling Attachments • Indexing Head. • Measuring Tools 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>slot to proper depth of T slot by end mill.</p> <p>5. Remove end mill and mount proper t slot cutter.</p> <p>6. Machine lower part of the slot.</p>				
<p>Cu5. Generate Helical Gear On Milling Machine.</p>	<p>The trainee will be able to:</p> <p>1. Select a indexing plate to machine a helical gear on a manual machine,</p> <p>2. Mount gear set to engage lead screw and indexing head spindle</p> <p>3. Centre indexing head and its tail stock.</p> <p>4. Fix indexing head and tail stock on milling table.</p> <p>5. Adjust speed feed and direction of the</p>	<p>1. Helical Gear</p> <p>2. Indexing</p> <p>3. Gear Cutters</p> <p>4. Mandrel</p> <p>5. Indexing Head</p> <p>6. Gear Calculation</p>		<ul style="list-style-type: none"> • Milling Machine • Gear Cutters • Milling Attachments • Indexing Head. • Measuring Tools 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>cutter.</p> <p>6. Mount Gear blank on mandrel.</p> <p>7. Hold one side of mandrel on chuck of indexing head and other side in tail stock</p> <p>8. Start machine and carry out cutter at zero point vertically.</p> <p>9. Carry out cutter at zero point horizontally.</p> <p>10. Apply depth for rough cut and engage machine automatically in longitudinal direction</p> <p>11. Move table back at zero point.</p> <p>12. Apply full depth for final cut and engage machine</p>				
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	<p>automatically in forward direction.</p> <p>13. Repeat the process simultaneously until tooth is obtained.</p>				
<p>Cu6. Generate spur gear On Milling Machine.</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select gear cutter and indexing plate on a milling machine 2. Mount indexing plate on indexing head. 3. Centre indexing head and its tailstock. 4. Fix indexing head and tail stock on milling table. 5. ENGAGE worm shaft from worm wheel 6. Adjust speed feed 	<ol style="list-style-type: none"> 1. Super Gear 2. Indexing 3. Gear Cutters 4. Mandrel 5. Indexing Head 6. Gear Calculation 		<ul style="list-style-type: none"> • Milling Machine • Gear Cutters • Milling Attachments • Indexing Head. • Measuring Tools 	<p>Class room</p> <p>Mechanical Workshop</p>

	<p>and direction of the cutter.</p> <p>7. Mount Gear blank on mandrel.</p> <p>8. Hold one side of mandrel on chuck of indexing head and other side in tail stock</p> <p>9. Start machine and carry out cutter at zero point vertically.</p> <p>10. Carry out cutter at zero point horizontally.</p> <p>11. Apply depth for rough cut and engage machine automatically in longitudinal direction</p> <p>12. Move table back at zero point.</p> <p>13. Apply full depth for final cut and</p>				
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	engage machine automatically in forward direction. 14. Repeat the process simultaneously until tooth is obtained.				
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Raw material Inspector

Module 1: Carry out inspection and receiving of raw material

Objective of the module: The aim of this module to get knowledge, skills and understanding of supplier documentation, unloading of raw material, conformance of raw material and receiving log.

Duration: 30hours **Theory:** 9 hours **Practical:** 21 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Maintain receiving log	The trainee will be able to: 8. Check received date 9. Check PO number 10. Check description 11. Check weight in	<ul style="list-style-type: none"> Define relevant legislation, regulations and codes Describe receiving log <p>Practical Activity:</p> <p>Make a raw material receiving log for particular raw material.</p>	Total: 7hrs Theory: 2 hrs Practical: 3 hrs	<ul style="list-style-type: none"> Material handling equipment Check sheet Log book 	Work Shop

	kg 12. Check lot number 13. Check quantity received 14. Check shipment supplier 15. Check shipment carrier				
LU2: Arrange unloading of raw material	The trainee will be able to: 7. Identify raw material requiring specific unloading procedures. 8. Unload raw material using manual handling or appropriate lifting equipment. 9. Process carrier or supplier documentation according to standard operating	<ul style="list-style-type: none"> Describe material handling equipment. Types of material handling equipment Understand SOP. <p>Practical Activity:</p> <p>Identify which type of material handling equipments are required to unload different raw material.</p>	Total: 7hrs Theory: 2 hrs Practical: 3 hrs	<ul style="list-style-type: none"> Material handling equipment Check sheet Log book 	Work Shop

	procedures.				
LU3: Confirm the quality and quantity of received raw material	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 7. Verify quantity of raw material as per SOP according to type of raw material. 8. Check quality of raw material as per SOP according to type of raw material. 9. Identify incorrect and damaged raw material 10. Carry out appropriate action according to standard operating procedures. 11. Generate store receiving receipt as per SOP 	<ul style="list-style-type: none"> • Describe SOP's • SOP's to check quality of raw material <p>Practical Activity:</p> <p>Check the quality and quantity of given raw material as per the given SOP.</p>	<p>Total</p> <p>7 hrs</p> <p>Theory:</p> <p>2 hrs</p> <p>Practical:</p> <p>3 hrs</p>	<ul style="list-style-type: none"> • Material handling equipment • Check sheet • Log book 	Work Shop
LU4: Store received raw materials	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 12. Prepare raw 	<ul style="list-style-type: none"> • Describe inventory • Types of inventory • Inventory Replenishment <p>Practical Activity:</p>	<p>Total:</p> <p>9hrs</p> <p>Theory:</p>	<ul style="list-style-type: none"> • Material handling equipment • Check sheet 	Work Shop

	<p>material for storage according to standard operating procedures.</p> <p>13. Apply signs, codes or labels according to standard operating procedures.</p> <p>14. Complete inventory records documentation</p> <p>15. Identify storage location</p> <p>16. Store raw material in correct location using appropriate materials handling techniques</p> <p>17. Prepare report for record</p>	<p>Generate inventory replenishment report for a given data of raw material.</p>	<p>3 hrs</p> <p>Practical:</p> <p>3 hrs</p>	<ul style="list-style-type: none"> Log book 	
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	keeping and circulate to concerned department.				
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Module 2: Perform Raw Material Sampling

Objective of the module: The aim of this module to get knowledge, skills and understanding sampling of metal scrap, alloys, molding material, refractory material for lining and documentation for inspection

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Carry out sampling of metal scrap	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Collect random samples for testing from raw material 2. Deliver sample to laboratories 3. Sort various metal scrap as per requirement 4. Stack conformed metal scrap as per requirement 5. Provide required metal scrap to melting technician 6. Prepare report for record keeping and circulate to concerned 	<ul style="list-style-type: none"> • Define sampling • Describe various sampling techniques • Describe random sampling • Define metal scrap <p>Practical Activity:</p>	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> • Check sheet 	Work Shop

	department				
LU2: Carry out sampling of alloying materials	The trainee will be able to: <ol style="list-style-type: none"> 1. Collect random samples of alloying materials for testing 2. Deliver samples to laboratories 3. Sort Ferrous and non-ferrous alloys as per the requirement 4. Stack conformed Ferrous and non-ferrous alloys as per the requirement 5. Provide required Ferrous and non-ferrous alloys to melting section 	<ul style="list-style-type: none"> • Define ferrous and non-ferrous alloys 	Total: 7hrs Theory: 5hrs Practical: 2 hrs	<ul style="list-style-type: none"> • Check sheet 	Work Shop
LU3: Perform sampling of molding materials	The trainee will be able to: <ol style="list-style-type: none"> 1. Collect random 	<ul style="list-style-type: none"> • Explain molding materials 	Total 7 hrs Theory:	<ul style="list-style-type: none"> • Check sheet 	Work Shop

	<p>samples for testing as per requirement</p> <ol style="list-style-type: none"> 2. Deliver samples to laboratories 3. Sort various molding materials(silica sand, molasses, sodium silicate, mold coating and Co2 gas) as per the requirement 4. Stack conformed molding materials as per requirement 5. Provide required molding materials to appropriate personnel. 6. Prepare report for record keeping and circulate to concerned department 		<p>5hrs</p> <p>Practical:</p> <p>2hrs</p>		
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LU4: Perform sampling of refractory material for lining	The trainee will be able to: <ol style="list-style-type: none"> 1. Collect random samples for testing as per requirement 2. Deliver sample to laboratories 3. Sort various refractory material for lining (basic lining and acidic lining, refractory bricks, tundish refractory blocks, refractory nozzles,) as per the requirement 4. Stack refractory conformed materials as 	<ul style="list-style-type: none"> • Define refractory materials for lining 	Total: 9hrs Theory: 5 hrs Practical: 4 hrs	<ul style="list-style-type: none"> • Check sheet 	Work Shop
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	<p>per requirement</p> <ol style="list-style-type: none"> 5. Provide required refractory material for lining to appropriate personnel. 6. Prepare report for record keeping and circulate to concerned department 				
LU5: Complete documentation for inspection	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Compile reports of raw material 2. Compile reports of conformance 3. Compile reports of non-conformance 4. Compile ledger books regarding consumption 	<ul style="list-style-type: none"> • Define conformance • Define non-conformance • Define conformance report • Define non-conformance reports 		<ul style="list-style-type: none"> • Check sheet 	Work Shop

	<p>5. Provide reports to supervisor</p> <p>6. Prepare weekly/monthly report for record keeping and circulate to reporting officer</p>				
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Assistant Molder

Module 1: Prepare sand mold for casting

Objective of the module: This module covers the skills and knowledge required to basic moulding with two-piece pattern in sand molding for metal casting process.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare sand for molding	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare green sand by using sieve sand with riddle 2. Add additives as per requirements (Binders, Bentonite, Coal dust) 3. Sprinkle Water as required 4. Perform mixing of sand with hand tools or in Muller mixer machine 	<ul style="list-style-type: none"> • Understanding of Basic Molding • Types of Basic molding • Properties of green sand • Understanding of Molding Accessories • Cleaning process 	Total: 7hrs Theory: 5 hrs Practical: 2hrs	<ul style="list-style-type: none"> • Shovel • Riddle • Lifter • Sand • Water • Molding Box 	Class room / Workshop
LU2: Produce mold by hand	The trainee will be able to:		Total:	<ul style="list-style-type: none"> • Shovel 	

using two piece/split pattern	<ol style="list-style-type: none"> 1. Place pattern on molding platform 2. Place drag part of the mold and ram molding sand by rammer. 3. Roll over the drag part and strike off extra green sand. 4. Place other half of the pattern (with dowel) and match it 5. Place pouring basin at appropriate place 6. Place runner at appropriate place. 7. Place gate at appropriate place 8. Create a parting line by pouring parting sand on drag part. 9. Place cope part and sprue pin on runner. 10. Add riddled molding sand and ram using rammer. 11. Remove extra sand using strike 	<ul style="list-style-type: none"> • Molding accessories. • Repairing mound and its precautions. • Cleaning process • Molding techniques • Gating system 	<p>7hrs</p> <p>Theory:</p> <p>5hrs</p> <p>Practical:</p> <p>2 hrs</p>	<ul style="list-style-type: none"> • Riddle • Lifter • Sand • Water • Molding Box • Rammer • Sodium Silicate • CO₂ cylinder • Molding Tools • 3 piece pattern 	
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	<p>off bar</p> <p>12. Make vents for gas escaping with vent wire at appropriate place.</p> <p>13. Remove cope part and make pouring gate with gate cutter.</p> <p>14. Make cavity by drawing out pattern halves politely.</p> <p>15. Repair mold as required</p> <p>16. Place cope with locating plug</p>				
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Modules

Module 2: Perform core making

Objective of the module: This module covers the skills and knowledge required to Practice of making round core, Practice of making half core and Practice of baking and assembling half core.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare sand for core making	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare core sand by using sieve with riddle 2. Add additives and water as per requirements 3. Perform mixing of sand with hand tool or in Muller mixer machine 	<ul style="list-style-type: none"> • Preparation of core • Types of core • Properties of molasses sand • Types of core venting • Steps for core making • Methods of supporting core • Core making accessories 	Total: 7hrs Theory: 5 hrs Practical: 2hrs	<ul style="list-style-type: none"> • Molding tools • Split box • core sand • Molding tools • Split box • Left and right hand core box. • Two halves of core 	Class room / Workshop
LU2: Develop round core pattern	The trainee will be able to: <ol style="list-style-type: none"> 1. Mix riddle sand with molasses as per required and heat to attain molasses sand properties 2. Fill split box with 	<ul style="list-style-type: none"> • Round Core • Types of core venting • Steps for round core making • Methods of supporting round core • Round core making accessories 	Total: 7hrs Theory: 5hrs Practical:	<ul style="list-style-type: none"> • Molding tools • Split box • core sand • Molding tools • Split box • Left and right hand core box. • Two halves of 	Class room / Workshop

	core sand. 3. Ram core and do venting. 4. Remove clamp and split core box.		2 hrs	core	
LU3: Perform baking of core	The trainee will be able to: <ol style="list-style-type: none"> 1. Connect batch type core baking oven with electricity. 2. Set core on core plate and place it oven. 3. Set heating temperature. 4. Draw out core from oven 5. Laminate small parting line for proper finishing 	<ul style="list-style-type: none"> • Demonstrate making of Core • Understanding core venting • Demonstrate steps for baking of core • Demonstrate step to run the oven • Core making accessories 		<ul style="list-style-type: none"> • Molding tools • Split box • core sand • Molding tools • Split box • Left and right hand core box. • Two halves of core • Oven 	Class room / Workshop

Assistant Caster

Module 1: Maintain Safe Work Environment

Objective of the module: This module covers the skills and knowledge required to identify the risks at work place, create a safe and friendly work place and ensure equipment sorting.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
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LU1: Identify Hazards at Workplace	The trainee will be able to: 16. Identify activities which can cause potential injury 17. Identify areas in the plant which are potentially hazardous 18. Conduct regular checks with support of the maintenance team 19. Identify potential hazards due to wear and tear of machine 20. Inform the concerned authorities about the potential risks 21. Create awareness amongst other by sharing information on the identified risks	<ul style="list-style-type: none"> • Labels , signs & colors used as indicators • How to sort and store various types of tools, equipment, material etc. • To identify various types of waste products • Understand the impact of waste/ dirt/ dust/unwanted substances on the process • Best ways of cleaning & waste disposal • Understand the importance of standardization in processes 	Total: 7hrs Theory: 5 hrs Practical: 2 hrs	<ul style="list-style-type: none"> • Layout tools • Steel-toed footwear • Hard hat • Safety gloves • Appropriate safety glasses • Fall protection, and other applicable PPE • Site emergency response plan • Fire extinguishers 	Class room / Lab
LU2: Create a safe and friendly work place	The trainee will be able to: 10. Follow Safety,	<ul style="list-style-type: none"> • Basic 5S procedures • Know various types 5S practices followed in various areas 	Total: 7hrs Theory:	<ul style="list-style-type: none"> • Layout tools • Steel-toed footwear • Hard hat 	Class room / Lab

	<p>Health and Environment related practices developed by the organization</p> <p>11. Ensure relevant safety signs are placed on the shop floor</p> <p>12. Operate the machine using the recommended Personal Protective Equipment (PPE) at workplace</p> <p>13. Maintain a clean and safe working environment near work place</p> <p>14. Attend all safety and fire drills to be self aware of safety hazards</p> <p>15. Ensure that the waste material is kept in the designated area</p>	<ul style="list-style-type: none"> • Understand the 5S checklists provided in the department/ team • Skills to identify useful & non useful items • Labels , signs & colours used as indicators • How to sort and store various types of tools, equipment, material etc. • To identify various types of waste products • Understand the importance of standardization in processes 	<p>5hrs</p> <p>Practical:</p> <p>2 hrs</p>	<ul style="list-style-type: none"> • Safety gloves • Appropriate safety glasses • Fall protection, and other applicable PPE • Site emergency response plan • Fire extinguishers 	
LU3: Ensure equipment sorting	<p>The trainee will be able to:</p> <p>1. Sort tools/ equipment/ parts in designated area</p>	<ul style="list-style-type: none"> • Labels , signs & colours used as indicators • How to sort and store various types of tools, equipment, material etc. • To identify various types of 	<p>Total</p> <p>7 hrs</p> <p>Theory:</p> <p>5hrs</p>	<ul style="list-style-type: none"> • Layout tools • Steel-toed footwear • Hard hat • Safety gloves • Appropriate 	Class room / Lab

	<p>as per work instructions</p> <ol style="list-style-type: none"> 2. Segregate items which are labeled as red tag items for process area 3. Stack various types of boxes and containers as per the size/ utility to avoid any fall of items/ breakage 4. Return extra material and tools to designated sections 5. Follow the floor markings/ area markings used for demarcating various sections in plant as per standards 	<p>waste products</p> <ul style="list-style-type: none"> • Understand the impact of waste/ dirt/ dust/unwanted substances on the process • Understand the importance of standardization in processes 	<p>Practical:</p> <p>2hrs</p>	<p>safety glasses</p> <ul style="list-style-type: none"> • Fall protection, and other applicable PPE • Site emergency response plan • Fire extinguishers 	
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Modules

Module 2: Perform Sand Casting

Objective of the module: This module covers the skills and knowledge required to Read and Understand to determine sand casting requirements, Check the operations of equipment, Perform sand casting process, Monitor casting process parameters, Perform visual inspection to finish casting.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Identify sand casting requirements	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify casting process for completing the work order 2. Identify various casting parameters like temperature, pouring speed before starting the process 3. Identify the equipment availability as per requirement 	<ul style="list-style-type: none"> • Types of sand • Types of casting • Different parameters related to casting process • Equipment and tools used for casting process 	Total: 7hrs Theory: 5 hrs Practical: 3 hrs	<ul style="list-style-type: none"> • Crucible ring • Tongs • Personal protection gears • Refractory bricks • Pouring Ladles • Transfer ladles • Lid pole • Ladle Pre Heater • Overhead Chain Conveyer • Iron rods 	Class room / Workshop
LU2: Perform pre-casting	The trainee will be able to:	<ul style="list-style-type: none"> • Types of casting operations • Different raw materials used in casting operations 	Total: 7hrs	<ul style="list-style-type: none"> • Crucible ring • Tongs 	Class room / Workshop

operations	<ol style="list-style-type: none"> 1. Check the tilting operation of casting ladles 2. Set casting parameters as per requirement 3. Ensure melt is ready for casting 4. Perform pre-heating of the molds 5. Perform pre-heating of the ladle 	<ul style="list-style-type: none"> • Furnace operation, melting process, charging method • Effect of operators work on casting quality at in house and at customers 	Theory: 5hrs Practical: 2 hrs	<ul style="list-style-type: none"> • Personal protection gears • Refractory bricks • Pouring Ladles • Transfer ladles • Lid pole • Refractory Lined 150 kg Teapot Ladle With Handler • Ladle Pre Heater • Overhead Chain Conveyer • Iron rods 	
LU3: Perform sand casting process	The trainee will be able to: <ol style="list-style-type: none"> 1. Position the ladle in line with molds as per standard 2. Tilt the ladle to pour melt into the molds 3. Perform un-interrupted pouring during casting 4. Maintain down sprue level 	<ul style="list-style-type: none"> • Types of sand casting process • Different raw materials used in the melt shop and casting process • Furnace operation, melting process, charging method • Handling hot liquid iron, furnace lining process and control • Metallurgical properties of the metal used in the process • Effect of operators work on casting quality at in house and at customers 	Total 7 hrs Theory: 5hrs Practical: 2hrs	<ul style="list-style-type: none"> • Crucible ring • Tongs • Personal protection gears • Refractory bricks • Pouring Ladles • Transfer ladles • Lid pole • Refractory Lined 150 kg Teapot Ladle 	Class room / Workshop

	during pouring as per SOPs 5. Ensure metal stream inoculation for each mold			With Handler • Ladle Pre Heater • Overhead Chain Conveyer • Iron rods	
LU4: Monitor casting process parameters	The trainee will be able to: 1. Measure casting temperature if required to prevent deviation from desired specifications 2. Analyze any irregularity in the process to take preventive steps 3. Minimize metal spillage in the work area	<ul style="list-style-type: none"> • Casting defects and how they are generated, how they can be prevented, • Different raw materials, ferrous alloys and consumables used in the melt shop • Furnace operation, melting process, charging method • Handling hot liquid iron, furnace lining process and control 	Total 7 hrs Theory: 5hrs Practical: 2hrs	<ul style="list-style-type: none"> • Crucible ring • Tongs • Personal protection gears • Refractory bricks • Pouring Ladles • Transfer ladles • Lid pole • Refractory Lined 150 kg Teapot Ladle With Handler • Ladle Pre Heater • Overhead Chain Conveyer • Iron rods 	Class room / Workshop
LU5: Perform post casting operations	The trainee will be able to: 1. Shake out casting from molds	<ul style="list-style-type: none"> • Handling hot liquid iron, furnace lining process and control • Metallurgical properties of the metal used in the process • Effect of operators work on 	Total 7 hrs Theory: 5hrs	<ul style="list-style-type: none"> • Crucible ring • Tongs • Personal protection gears • Refractory 	

	<p>2. Inspect the final metal casting as prescribed in work order</p> <p>3. Send the casting for further processing in terms of chipping, fettling, wedge cutting etc.</p>	casting quality at in house and at customers	<p>Practical:</p> <p>2hrs</p>	<p>bricks</p> <ul style="list-style-type: none"> • Pouring Ladles • Transfer ladles • Lid pole • Refractory Lined 150 kg Teapot Ladle With Handler • Ladle Pre Heater • Overhead Chain Conveyer • Iron rods 	
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Module 3: Perform Gravity Die Casting

Objective of the module: This module covers the skills and knowledge required to Read and Understand to prepare equipment for casting, Carry out manual pouring, Remove extra materials, and clean die after casting.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare equipment for casting	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Mix die coat in correct proportion. 2. Maintain die temperatures at the correct level. 3. Use appropriate safety clothing and apparatus 4. Apply die coat in correct sequence according to standard operating procedures. 5. Place die correctly on machine 6. Handle closing of die correctly. 7. Attach clamps as 	<ul style="list-style-type: none"> • Correct identification of die coat materials • correct proportions and consistency of die coats • correct identification of die coat materials • Procedures for raising the temperature of the die to the correct level and maintaining the required temperature • Use and application of personal protective equipment • Safe work practices and procedures 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 4 hrs</p>	<ul style="list-style-type: none"> • Dies/Molds • Die coats • Temperature sensors • Tongs • Personal protection gears • Pouring Ladles • Transfer ladles • Overhead Chain Conveyer • Shot blaster • PPE 	Class room / Workshop

	per requirement 8. Attach air-cooling to the die as specified if required.				
LU2: Carry out manual pouring	The trainee will be able to: <ol style="list-style-type: none"> 1. Select appropriate pouring tool 2. Take melt from furnace 3. Pour melt in die while ensuring the minimal porosity and lamination. 4. Make allowance for adequate cooling time 5. Pour at a continuous and appropriate rate during filling. 6. Monitor die coating condition 7. Re-spray die coat as required 	<ul style="list-style-type: none"> • Procedures for raising the temperature of the die to the correct level and maintaining the required temperature • Procedures to be followed when pouring molten metal to produce sound castings • Causes of defects in castings • Curing times for castings of various volumes and materials • Timing of die coat application and quantity of die coat to be used for different applications • Correct procedures for removing castings from the die and storing of castings • Use and application of personal protective equipment • safe work practices and procedures 	Total: 7hrs Theory: 5hrs Practical: 2 hrs	<ul style="list-style-type: none"> • Dies/Molds • Flask • die coats • temperature sensors • Tongs • Personal protection gears • Pouring Ladles • Transfer ladles • Overhead Chain Conveyer • PPE 	Class room / Workshop
LU3: Remove extra materials	The trainee will be able to: <ol style="list-style-type: none"> 1. Remove cast parts from die 2. Store parts in a manner that 	<ul style="list-style-type: none"> • Procedures to be followed post melting • Causes of defects in castings • Curing times for castings of various volumes and materials • Correct procedures for 	Total 7 hrs Theory: 5hrs	<ul style="list-style-type: none"> • Dies/Molds • Flask • die coats • temperature sensors • Tongs 	Class room / Workshop

	<p>minimises damage</p> <p>3. Remove flash from the die surface.</p>	<p>removing castings from the die and storing of castings</p> <ul style="list-style-type: none"> • Use and application of personal protective equipment • Safe work practices and procedures 	<p>Practical:</p> <p>2hrs</p>	<ul style="list-style-type: none"> • Personal protection gears • Pouring Ladles • Transfer ladles • PPE 	
<p>LU4: Clean die after casting</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Operate shot blaster in safe manner according to standard 2. Apply remedial action as required to standard operating procedures. 3. Dross / De-gas furnace to standard operating procedures. 4. Clean work area of coating 5. Clean shot residue to appropriate standard. 	<ul style="list-style-type: none"> • Correct procedures for cleaning of castings after removing from the die • Storing of castings • Die condition and need for shot blasting • Shot blaster operating procedures • Use and application of personal protective equipment • Safe work practices and procedures 	<p>Total</p> <p>7 hrs</p> <p>Theory:</p> <p>5hrs</p> <p>Practical:</p> <p>2hrs</p>	<ul style="list-style-type: none"> • Dies/Molds • Flask • die coats • temperature sensors • Tongs • Personal protection gears • Pouring Ladles • Transfer ladles • Overhead Chain Conveyer • Shot blaster • PPE 	<p>Class room / Workshop</p>

Fettling Operator

Module 1: Fettle and trim metal Casting

Objective of the module: This module covers the skills and knowledge required to Read and understand to carry out safety practices for fettling operations, Select correct tool and equipment and fettle excess particle from casted part.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out safety practices for fettling operations.	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Ensure personal protective equipment(PPE) as per job requirement 2. Handle cast part as per SOP 3. Maintain balance position of cast part during lifting to avoid any 	<ul style="list-style-type: none"> • Handling and storage requirements • Use and application of personal protective equipment • Safe work practices and procedures • Hazards and control measures associated with fettling and trimming metal castings/forgings 	<p>Total:7hrs Theory: 5 hrs Practical: 2 hrs</p>	<ul style="list-style-type: none"> • PPE 	Class room / Workshop

	incident				
	4. Ensure safe workplace for fettling process				
LU2. Select correct tool and equipment	The trainee will be able to: <ul style="list-style-type: none"> • Select appropriate hand held tools and power tools for removing excess material from casting • Select appropriate repairing tool • Select appropriate hand and power tool for cutting and grinding • Identify appropriate equipment for surface cleaning. 	<ul style="list-style-type: none"> • Accept/reject/rework criteria • Fettling requirements • Fettling tools • Fettling standards 	Total: 7hrs Theory: 5hrs Practical: 2 hrs	<ul style="list-style-type: none"> • Hand tools (Dedicated tools for fettling and trimming: files, chisels, hammers etc.) • Power tools (Saws, croppers, grinding disks/belts (including grades), swing and pedestal grinders etc.) 	Class room / Workshop
LU3. Fettle excess metal from cast part	The trainee will be able to:	<ul style="list-style-type: none"> • Fettling Tools • Excess metals suitable for 	Total 7 hrs	<ul style="list-style-type: none"> • Hand tools (Dedicated tools for 	Class room / Workshop

	<ol style="list-style-type: none"> 1. Perform visual inspection to identify excess material for removal process 2. Mark excess material area for removal process 3. Fettle excess metal (runners, risers and flashing) as per standard operating procedures. 4. Verify the required specification after fettling process of excess metal 5. Record and report the casting defects as per standard operating procedures. 	recycling	Theory: 5hrs Practical: 2hrs	fettling and trimming: files, chisels, hammers etc.) <ul style="list-style-type: none"> • Power tools (Saws, croppers, grinding disks/belts (including grades), swing and pedestal grinders etc.) 	
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Module 2: Perform surface cleaning by sand blasting

Objective of the module: This module covers the skills and knowledge required to determine job requirements, set up equipment and prepare surface using abrasive blasting.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Determine job cleaning requirements	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Determine work requirements from job sheet, instructions or other predetermined specifications in accordance with standard operating procedures. 2. Identify appropriate abrasive blasting 	<ul style="list-style-type: none"> • Process for undertaking pre-operational checks • Reason for selecting the chosen sequence of operations 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 2 hrs</p>	Blasting equipment (Electric and diesel compressors, blast pots, blast rooms, centrifugal blast machines, water pressure washers to 35,000 kpa, air hoses and nozzles, and specified hand and power	Class room / Workshop

	<p>process, equipment and blasting media to meet job specification.</p> <p>3. Prepare work site for surface cleaning activities</p>			tools, etc.)	
LU2. Set up equipment	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Arrange appropriate equipment and related consumables 2. Set up equipment in accordance with manufactures specifications and standard operating procedures. 3. Select correct rust inhibitor for sand blasting as 	<ul style="list-style-type: none"> • Blasting equipment and media required • Equipment, consumables for various methods • Importance of using an appropriate rust inhibitor 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 2 hrs</p>	Blasting media (Abrasives, shot, glass beads, sand, steel shot, garnet, and other mediums accepted by industry and all regulatory bodies)	Class room / Workshop

	<p>per requirement</p> <p>4. Carry out pre-operational checks on equipment</p> <p>5. Rectify faults to execute the sand blasting</p>				
LU3. Perform surface cleaning	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Carry out abrasive media disposal in accordance with standard operating procedures. 2. Set air pressure as per requirement 3. Place sample in chamber 4. Operate blasting equipment in accordance with standard operating 	<ul style="list-style-type: none"> • Procedures or using abrasive blasting equipment • Procedures for abrasive media disposal • Procedures for maintaining and storing blasting equipment 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> • Rust inhibitor • Blasting equipment (Electric and diesel compressors, blast pots, blast rooms, centrifugal blast machines, water pressure washers to 35,000 kpa, air hoses and nozzles, 	Class room / Workshop

	<p>procedures.</p> <ol style="list-style-type: none"> Undertake emergency shut-down procedures Remove and clean specimen Clean blasting equipment 			and specified hand and power tools, etc.)	
LU4. Inspect specimen	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> Inspect specimen in accordance with requirement Record casting defect after cleaning operation and report in accordance with standard operating procedures. Record all post operation results 	<ul style="list-style-type: none"> Recording/reporting procedures; faulty equipment Checking prepared surfaces Rectification techniques Safe work practices and procedures Hazards and control measures related to abrasive blasting 	<p>Total:7hrs</p> <p>Theory:</p> <p>5 hrs</p> <p>Practical:</p> <p>2 hrs</p>	Inspection tools	Class room / Workshop

Module 3: Perform Shot blasting

Objective of the module: This module covers the skills and knowledge required to Identify shot blasting equipment, Shot blasting equipment, Shot blast the floor and Clean-up work area and tool.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Identify shot blasting equipment	The trainee will be able to: 1. Comply with applicable legislative , OHS and organisational requirements relevant to the use of shot blasting	<ul style="list-style-type: none">State or Territory OHS legislation, regulations, standards and codes of practice relevant to shot blastingorganizational and site standards, requirements, policies and procedures for the use of shot blasting equipment	Total: 7hrs Theory: 5 hrs Practical: 2 hrs	<ul style="list-style-type: none">Types of shot blasting equipment	Class room / Workshop

	<p>equipment</p> <p>2. Select shot blasting equipment and shot size consistent with the needs of the job</p> <p>3. Check shot blasting equipment for serviceability and safety</p> <p>4. Recognise sources of power supply</p>				
LU2: Perform shot blasting process	<p>The trainee will be able to:</p> <p>1. Identify shot media in accordance with standard operating procedures.</p> <p>2. Set air pressure as per</p>	<ul style="list-style-type: none"> types of shot blasters and procedures for their safe use, operation and maintenance shot blaster attachments, their uses, limitations and maintenance requirements characteristics, uses and limitations of the available shot sizes 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> Sources of power supply Attachments 	Class room / Workshop

	<p>requirement</p> <ol style="list-style-type: none"> Place sample in chamber Operate blasting equipment in accordance with standard operating procedures. Undertake emergency shut-down procedures Remove and clean specimen Clean blasting equipment 				
LU 3: Inspect Specimen	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> Inspect specimen in accordance with requirement Record casting defect after cleaning operation and report in accordance with 	<ul style="list-style-type: none"> environmental protection requirements established communication channels and protocols problem identification and resolution 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical: 2 hrs</p>	<ul style="list-style-type: none"> Fittings and fixtures Personal protective equipment 	Class room / Workshop

	<p>standard operating procedures.</p> <p>3. Record all post operation results</p>				
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Module 4: Perform cutting and grinding operation

Objective of the module: This module covers the skills and knowledge required to identify and use tools required for cutting and grinding operations.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1: Carry out Sawing	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Mark the job according to given drawing 2. Select appropriate blade according to job requirement 3. Set blade in frame of hacksaw as per procedure 4. Ensure the work piece is clamped firmly and 	<ul style="list-style-type: none"> • Describe basic measurement • Describe types of hacksaw frames • Describe basic measuring /Marking /cutting tools • Describe clamping/holding methods • Define methods and techniques of sawing. 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical : 2 hrs</p>	<ul style="list-style-type: none"> • Work bench • Bench vice • Tri-square • Hand hacksaw with blade • Scriber • Flat File • Vernier caliper • Punching tools 	Class room / Workshop

	properly				
	5. Adopt methods and techniques for sawing that is appropriate to job requirement by using Hand Hacksaw				
	6. Adopt methods and techniques for sawing that is appropriate to job requirement by using Power Hacksaw				
	7. Follow marked line during sawing to ensure accuracy.				

<p>LU2: Perform off-hand grinding</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select the proper size and shape of grinding wheel. 2. Hold the work piece firmly against the rotating wheel by placing it on the tool rest. 3. Use coolant at intervals to avoid over heating of the job. 4. Adopt technique and methods which are safe. 5. Produce component 	<ul style="list-style-type: none"> • Type and size of wheels and abrasive. • Method of dressing of grinding wheel. • Work holding methods which include: <ul style="list-style-type: none"> ○ Magnet Table ○ Vice ○ Angle Plate ○ Machine base 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical : 2 hrs</p>	<ul style="list-style-type: none"> • Offhand Grinding Machine • Bench vices • Hammer • Scriber • Vernier calliper • Set of spanners 	<p>Class room / Workshop</p>
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	<p>according to work operations</p> <p>6. Observe personal and workplace safety.</p>				
<p>LU 3: Perform swing grinder operation</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select the suitable size and type of grinding wheel. 2. Mount the work piece over the holding devices to ensure proper clamping. 3. Dress the wheel as per requirement. 4. Identify reference points on work 	<ul style="list-style-type: none"> • Importance of using coolant. • Methods and techniques for surface grinding. • Selecting right standing position during grinding. • Specific safety precautions and guidelines. • Describe the different type of dressing tools. • Describe the purposes of dressing. 	<p>Total:7hrs</p> <p>Theory: 5 hrs</p> <p>Practical : 2 hrs</p>	<ul style="list-style-type: none"> • Angle Grinding Machine • Surface Grinding • Machine • Holding Devices • Wheel Dresser • Grinding Wheels • Wheel Dresser Stand • Measuring Tools • Adjustable Wrench • Allen Key Set 	<p>Class room / Workshop</p>

	<p>piece before grinding.</p> <p>5. Adjust depth of cut according to speed of machine table.</p> <p>6. Use coolant continuously to avoid overheating of the job.</p> <p>7. Observe personal and workplace safety.</p>				
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Module 5: Perform basic welding operations

Objective of the module: This module covers the skills and knowledge required to use different welding types and their techniques.

Duration :	30hours	Theory:	20 hours	Practical:	10 hours
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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1: Perform oxy-acetylene flame cutting operations	The trainee will be able to: <ol style="list-style-type: none"> 1. Take Work piece as per drawing 2. Straiten it with the help of hammer and anvil required 3. Set the flame of welding cutting torch oxidizing flame as per standard 4. Start cutting for one side of work piece 5. Maintain standard distance between welding torch nozzle and work piece 6. Complete the cut as per standard. 	<ul style="list-style-type: none"> • Explain Welding techniques as per WPS/instruction sheet • Describe Welding procedure specifications (WPS) • Describe Method of Pre- heating of base metal • Describe Fillet lap joint • Describe Tee-fillet joint • Describe Corner joint • Describe Butt joint • Explain advantages of GMAW 	Total: 7 hrs Theory : 5 hrs Practical: 2 hrs	<ul style="list-style-type: none"> • Oxygen cylinder • Acetylene gas cylinder • Pressure regulators • Cylinder key • Welding torch • Rubber house pipe • Back fire arrester • Flash back arrester 	Class room / Workshop

LU2: Perform Oxy-Acetylene Welding	The trainee will be able to: <ol style="list-style-type: none"> 1. Open gas cylinder with the help of cylinder key 2. Adjust pressure of both gas cylinders with the help of regulator 3. Open acetylene gas knob of welding torch 4. Ignite acetylene gas with help of spark lighter 5. Open oxygen gas knob of welding torch 6. Set work piece as per standard 7. Perform fore hand welding method 8. Perform post welding operations. 	<ul style="list-style-type: none"> • State the purpose of using shielding gas in TIG welding • Explain Welding techniques as per WPS/instruction sheet • Describe Welding procedure specifications (WPS) 	Total: 7 hrs Theory : 5 hrs Practical: 2 hrs	<ul style="list-style-type: none"> • Oxygen cylinder • Acetylene gas cylinder • Pressure regulators • Cylinder key • Welding torch • Rubber house pipe • Back fire arrester • Flash back arrester 	Class room / Workshop
LU 3: Perform Shielded Metal Arc Welding (SMAW)	The trainee will be able to: <ol style="list-style-type: none"> 1. Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job 	<ul style="list-style-type: none"> • Define Electrical parameters like (voltage, current etc.) and their 	Total: 7 hrs Theory : 5 hrs Practical:	<ul style="list-style-type: none"> • Copper Filler rod • Spark lighter • Steel wire 	Class room / Workshop

	<p>requirement to produce acceptable weld</p> <p>2. Maintain gap between electrode and base metal as per standard practices</p> <p>3. Carry out welding as per given metal properties.</p> <p>4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>8. Follow applicable manufacturing codes and standards for</p>	<p>effects on weld</p> <ul style="list-style-type: none"> • Explain Welding techniques as per WPS/instruction sheet • Describe Welding procedure specifications (WPS) 	2 hrs	brush	
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	acceptance criteria of visual welding defects.				
LU 4: Perform Soldering Operation	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Perform marking as per drawing 2. Cut the metal sheet according to drawing using shearing machine 3. Straighten the material with help of hammer 4. File work if required 5. Perform soldering operation as per standard 	<ul style="list-style-type: none"> • Describe soldering 		<ul style="list-style-type: none"> • Solder gun • Solder wire 	
LU 5: Perform Brazing Operation	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Perform marking as per drawing 2. Cut the metal sheet according to drawing using shearing machine 3. Straighten the material with help of hammer 4. File work if required 5. Open gas cylinder with the help of cylinder key 6. Adjust pressure of both gas cylinders with the help of 	<ul style="list-style-type: none"> • Describe brazing • Define carburizing flame • Define neutral flame • Define oxidizing flame 		<ul style="list-style-type: none"> • Copper Filler rod • Electrode holder 	

	regulator 7. Select the correct size of the nozzle 8. Set flame to carburizing flame as per standard 9. Use copper filler rod as filler metal 10. Perform brazing as per standard.				
LU 6: Perform Post Welding Operations	The trainee will be able to: 1. Carry out finishing work of welds following standard procedures 2. Inspect weld visually and mark any visual defects, as required 3. Carry out repair work in accordance with approved procedures, as required 4. Clean work area in accordance with workplace safety practices 5. Maintain and store tools/equipment/consumable materials in accordance with organization	<ul style="list-style-type: none"> • Define Visual welding defects • Describe Welding codes and standards 		<ul style="list-style-type: none"> • Steel wire brush • Hammer 	

	guidelines.				
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General assessment guidance for *Technician in Metallurgy and Metal casting*

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

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

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

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

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

Methods of assessment

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

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

Examples for direct assessment of a Technician in metallurgy and metal casting include:

- Work performances, for example perform basic communication, maintain personal health, hygiene and safety, perform basic computer operations, and dispose the waste materials.
- Demonstrations, for example organize store merchandizing, handling documents
- Direct questioning, where the assessor would ask the student how to perform personal safety at work place, how they can communicate work place policy and procedures, how they can handle documents, what are the benefits of organizing store merchandising

- Paper-based tests, such as multiple choice or short answer questions on communication at work place policy and procedures, handling documents, organizing store merchandizing
- Indirect assessment is the method used where the performance could not be watched and evidence is gained indirectly.

Examples for indirect assessment of a Textile Merchandiser include:

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

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

Principles of assessment

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

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

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

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

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

Assessment strategy for Technician in metallurgy and metal casting

This curriculum consists of 06 modules:

- **Module 1:** Maintain Personal Health, Hygiene and Safety
- **Module 2:** Perform Basic Communication Skills
- **Module 3:** Perform Basic Computer Operations
- **Module 4:** Handle the Documents
- **Module 5:** Organise Store Merchandising
- **Module 6:** Dispose the Waste Materials

Sessional assessment

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

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

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

Final assessment

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

The assessment team

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

Planning for assessment

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

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

Complete list of tools and equipment

Sr#	Description	Quantity
1	Computer with internet	26
2	White board	1
3	Multimedia	1

List of consumable supplies

Sr no	Material	Quantity
1	Note book	25
2	Flip chart	25
3	Pencil	25
4	White sheets	25
5	Eraser	25
6	Sharpener	25
7	Pen	25

Credit values

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

The credit values are as follows:

Competency Standard	Estimate of hours	Credit
A.		
B.		
C.		
D.		
E.		
F.		