



المركز الوطني للتدريب
NATIONAL TRAINING CENTER



MECHANICAL TRAINING

Num	TITLE	TABLE OF CONTENT	OBJECTIVES	DURATION
<u>UNIT M-01</u>	HANDTOOL ID, SAFE USE & STORAGE	1.0 Introduction. 2.0 Hacksaw. 3.0 Holding Mechanisms. 4.0 Toolmakers Clamp. 5.0 Engineers Files. 6.0 Screw Threads. 7.0 Dies & Taps. 8.0 Hand Tapping. 9.0 Metal Snips & Bolt Cutters. 10.0 Punches. 11.0 Hammers. 12.0 Chisels. 13.0 Spanners. 14.0 Wrenches & Pliers. 15.0 Screwdrivers. 16.0 Screw Fixings 17.0 Scrapers & Wedges 18.0 Keys & Circlips	<ul style="list-style-type: none"> ◆ Identify and state the function of various hand tools. ◆ Identify the basic parts of various hand tools. ◆ Understand the safe working practices relating to specific hand tools. ◆ Identify, select and safely use marking-out tools and equipment 	1WEEK
<u>UNIT M-02</u>	HANDTOOL PROJECT – WORKSHOP PRACTICAL	1.0 Introduction. 2.0 Handtool Practical. 3.0 Drilling. 4.0 Twist Drills. 5.0 Reamers.	<ul style="list-style-type: none"> ◆ To introduce bench fitting skills in a practical workshop environment. ◆ To produce workpieces from raw materials using a variety of workshop handtools, power tools and equipment. 	2WEEKS



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<u>UNIT M-03</u>	MEASURING INSTRUMENTS	<p>1.0 Tool Identification And Function.</p> <p>2.0 Reading Precision Measuring Tools.</p> <p>3.0 Marking-Out.</p>	<ul style="list-style-type: none"> ◆ Identify and state the function of various precision tools. ◆ Identify the basic parts of various precision tools. ◆ Read a micrometer scale in either imperial or metric units. ◆ Describe and read a vernier scale. ◆ Identify, select and safely use marking-out tools and equipment ◆ Mark out workpieces 	1WEEK
<u>UNIT M-04</u>	MAINTENANCE	<p>1.0 Introduction.</p> <p>2.0 Types Of Maintenance.</p> <p>3.0 Introducing Planned Maintenance.</p> <p>4.0 Maintenance Procedure</p>	<ul style="list-style-type: none"> ◆ To give students an understanding of how the Maintenance function works ◆ To understand the different types of Maintenance and their applications ◆ How Condition Monitoring can aid Maintenance ◆ Steps to be taken in preparation for a Maintenance procedure 	1WEEK



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UNIT M-05	TRANSMISSION SYSTEMS {COUPLING}	1.0 Couplings. 2.0 Coupling Methods. 3.0 Couplings. 4.0 Rigid Coupling. 5.0 Flexible Couplings. 6.0 Fluid Couplings. 7.0 Hydrostatic Couplings. 8.0 Methods Of Joining And Securing Couplings To Shafts. 9.0 Clutches. 10.0 Types Of Clutch. 11.0 Plate Type Clutch. 12.0 Pressure Plate Clutch. 13.0 Overrunning Clutches. 14.0 Centrifugal Clutches. 15.0 Electrical Clutches.	<ul style="list-style-type: none"> ◆ State the different categories of couplings. ◆ Identify various types of coupling in each category, and describe their application and advantages. 	1 WEEK
UNIT M-06	PACKING SEALS & GASKETS & MECHANICAL SEAL	1.0 Static Seal. 2.0 Dynamic Fixed Seals. 3.0 Dynamic Rotating Seals.	<ul style="list-style-type: none"> ◆ Describe and the function of Static Seal. ◆ Describe and the function of Dynamic Fixed Seals ◆ Describe and the function of Dynamic Rotating Seals 	2 WEEKS



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UNIT M-07	VALVES AND STRAINERS	1.0 Valve Selection Factors. 2.0 Valve Materials. 3.0 Valve Design. 4.0 Types Of Valves. 5.0 Stream Traps. 6.0 Strainers. 7.0 Mechanism To Move Flow Control Element. 8.0 Sealing Valves.	<ul style="list-style-type: none"> ◆ State the function of a valve. ◆ List materials used to make valves. ◆ Name common valves and state their uses. ◆ Describe methods of sealing valves. 	1WEEK
UNIT M-08	BEARINGS	1.0 Rolling Bearings Overview. 2.0 Types Of Ball Bearing. 3.0 Roller Bearing Types. 4.0 Anti-Friction Bearings Designation. 5.0 Internal Bearing Clearances. 6.0 Preparations For Bearing Installation. 7.0 Heating Bearings. 8.0 Cold Mounting. 9.0 Shaft And Housing Considerations. 10.0 Pillow Block Housing. 11.0 Bearing Failure Symptoms. 12.0 Roller Bearing Seals. 13.0 Shaft Recommendations. 14.0 Roller Bearing Lubrication. 15.0 Bearing Codes. 16.0 Journal Bearings.	<ul style="list-style-type: none"> ◆ Describe the function of bearings ◆ Describe types and applications of different types of bearings (ball, roller, thrust, shell, etc.) ◆ Understand the need for lubrication ◆ Understand different techniques for installing and removing bearings ◆ Identify common faults associated to bearings 	2WEEKS



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<p>UNIT M-09</p>	<p>STATIC EQUIPMENT & PIPE-WORK</p>	<p>1.0 Pipe Work. 2.0 Piping System. 3.0 Types Of Pipe. 4.0 Methods Of Joining Pipe-Work. 5.0 Flanges. 6.0 Pipe Dimensions. 7.0 Methods Of Manufacturing Pipe. 8.0 Pipe Fittings. 9.0 Fabricating A Pipe System. 10.0 Pipe Leakage. 11.0 Pipe Hangers And Supports. 12.0 Tubing. 13.0 Storage Tanks. 14.0 Separators.</p>	<ul style="list-style-type: none"> ◆ List parts of a pipe system. ◆ demonstrate how pipe is dimensioned. ◆ describe methods of manufacturing pipe. ◆ list types of common pipe-fittings and state their use. ◆ list types of common pipe hangers and state their use. ◆ describe methods of forming pipe-work. 	<p>1WEEK</p>
<p>UNIT M-010</p>	<p>PUMPS</p>	<p>1.0 Introduction. 2.0 FLUIDS IN MOTION. 3.0 PUMPS. 4.0 The Centrifugal Pump. 5.0 PUMP LUBRICATION. 6.0 COMMON Centrifugal Pump Problems. 7.0 SEALS. 8.0 BEARINGS. 9.0 POSITIVE DISPLACEMENT PUMPS. 10.0 RECIPROCATING PUMPS. 11.0 ROTARY PUMPS. 12.0 PUMP MAINTENANCE.</p>	<ul style="list-style-type: none"> ◆ Understand forces that can move fluids. ◆ Describe three types of pressure. ◆ Name two things that a pump adds to a fluid. ◆ Name three main functions of a pump. ◆ State the two main types of pumps. ◆ Explain the basic operating principles of centrifugal pumps. ◆ Identify various types of centrifugal pumps. ◆ State the advantages and disadvantages of single and multi-stage pumps. ◆ Identify various types of 	<p>1WEEK</p>



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			<p>positive displacement pumps</p> <ul style="list-style-type: none"> ◆ Understand principles of operation ◆ Advantages and disadvantages 	
<u>UNIT M-011</u>	COMPRESSORS DYNAMIC & POSITIVE DISPLACEMENT	<p>1.0 Centrifugal Compressors. 2.0 Sealing Centrifugal Compressors. 3.0 Compressor Bearings. 4.0 Compressor Lubrication System. 5.0 Centrifugal Compressor Controls. 6.0 Positive Displacement Compressors. 7.0 Reciprocating Compressors. 8.0 Rotary Compressors.</p>	<ul style="list-style-type: none"> ◆ Name the two types of centrifugal compressor. ◆ Describe the operation of a centrifugal compressor. ◆ Name and describe the two designs of compressor casing. ◆ Describe various methods of sealing compressors. ◆ Explain the purpose of a volute and diffuser. ◆ Describe the most common types of compressor bearing. ◆ Describe the centrifugal compressor lubrication system. ◆ Describe centrifugal compressor methods. 	1WEEK
<u>UNIT M-12</u>	HEAT EXCHANGERS	<p>1.0 Heat Exchanger Theory. 2.0 Heat Exchanger Applications. 3.0 Construction. 4.0 Heat Transfer Rates. 5.0 The Coefficient Of Heat Conduction. 6.0 Type Of Flow. 7.0 Types Of Heat Exchangers. 8.0 Procedure For Pressure Testing. 9.0 Recommended Bolt Tightening</p>	<ul style="list-style-type: none"> ◆ State the main function of a heat exchanger. ◆ State the different functions for a heat exchanger in this industry. ◆ Name different types of heat exchangers. ◆ Describe a shell and tube heat exchanger. ◆ State the main types of shell 	1WEEK



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		Procedure.	<p>and tube heat exchangers.</p> <ul style="list-style-type: none"> ◆ Name the main parts of a shell and tube heat exchanger. ◆ List common types of baffles. ◆ List methods of attaching tubes to tube sheets. ◆ State the procedure for pressure testing a heat exchanger. 	
<u>UNIT M-13</u>	GAS TURBINES	<p>1.0 The Operating Principle Of A Gas Turbine.</p> <p>2.0 Main Parts Of A Gas Turbine.</p> <p>3.0 Types Of Turbine.</p> <p>4.0 Turbine Governors.</p> <p>5.0 Turbine Seals And Glands.</p> <p>6.0 Bearings And Lubrication.</p> <p>7.0 Gas Turbine Cycles.</p>	<ul style="list-style-type: none"> ◆ Explain the basic operating principle of a gas turbine. ◆ Identify the main parts of a gas turbine. ◆ Identify the main parts of a combustion chamber. ◆ Explain the difference between impulse and reaction turbines. ◆ Describe the function of a governor. ◆ Explain the function of an over-speed trip. 	1WEEK
<u>UNIT M-14</u>	ALIGNMENT	<p>1.0 Aligning Machinery.</p> <p>2.0 Dial Test Indicator .</p> <p>3.0 Pre-Alignment Checks.</p> <p>4.0 Types Of Alignment.</p> <p>5.0 Types Of Misalignment.</p> <p>6.0 Application Of Formulae To Worked Examples.</p> <p>7.0 Methods Of Alignment.</p> <p>8.0 Laser Alignment.</p>	<ul style="list-style-type: none"> ◆ Understand the three types of misalignment. ◆ State the effects of misalignment. ◆ Determine the misalignment type from given examples of dial indicator readings. ◆ Carry out practical alignment 	1WEEK



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<u>UNIT M-15</u>	HYDRAULICS	1.0 Basic Hydraulic Principles. 2.0 Hydraulic Pumps. 3.0 Hydraulic System Components. 4.0 Drives And Valves. 5.0 Hydraulic Piping And Fittings. 6.0 Troubleshooting And Safety.	<ul style="list-style-type: none"> ◆ Describe basic hydraulic principles. ◆ Transmission of force and displacement ◆ Explain the physical properties of fluids. ◆ Describe how a hydraulic system works. ◆ Name the advantages of a hydraulic system. ◆ Describe how a hydraulic pump works. ◆ Describe common types of hydraulic pump. ◆ List common hydraulic system components and state their uses. ◆ Describe end devices, various hydraulic control valves and state 	1WEEK



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			<p>their function.</p> <ul style="list-style-type: none"> ◆ Describe the various types of hydraulic piping and fittings. ◆ Describe how to torque and stop leakages on hydraulic fittings. ◆ List types of system failure and state their causes. ◆ State the advantages of preventative maintenance. ◆ Describe what is included in troubleshooting. ◆ Describe some of the safety hazards concerning hydraulics. 	
<u>UNIT M-16</u>	RECIPROCATING ENGINES	<p>1.0 Engine Working Principles. 2.0 Engine Details. 3.0 Engine Lubrication. 4.0 Engine Cooling System. 5.0 Petrol Engine Fuel System. 6.0 Diesel Engine Fuel System. 7.0 Engine Ignition System.</p>	<ul style="list-style-type: none"> ◆ Describe the engine working principles ◆ Identify engine details ◆ Identify engine lubrication system 	1WEEK



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			<ul style="list-style-type: none"> ◆ Identify engine cooling system ◆ Identify the petrol engine fuel system ◆ Identify the diesel fuel system ◆ Identify the engine ignition system 	
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