



المركز الوطني للتدريب
NATIONAL TRAINING CENTER



INSTRUMENTATION TRAINING

Num	TITLE	TABLE OF CONTENT	OBJECTIVES	DURATION
<u>Unit I-01</u>	INTRODUCTION TO INSTRUMENTATION	1.0 Component Elements of Process Control Loops. 2.0 Manual and Automatic Control. 3.0 Operating Principles Of Open And Closed Control Loops. 4.0 The Function ofthe Component Elements inthe Control Loop.	<ul style="list-style-type: none"> ◆ Identify The Different Types Of Control Loops. ◆ Describe The Function Of Each Of The Instruments Used In Each Loop. 	7 DAYS
<u>Unit I-02</u>	TERMINOLOGY & SYMBOLOGY	1.0 Glossary of Standard Process Instrumentation Terminology. 2.0 The Graphic Symbols for Process Measurement and Control.	<ul style="list-style-type: none"> ◆ Identify The Instrument Terminology And Symbology 	7 DAYS
<u>Unit I-03</u>	PRINCIPLES OF MEASUREMENT AND CONTROL	1.0 Identifying Measuring Instruments & Their Applications. 2.0 Identifying Indicating, Controlling Instruments & Their Applications. 3.0 Identifying Recording Instruments & Their Applications. 4.0 Identifying Final Controlling Instruments & Their Applications.	<ul style="list-style-type: none"> ◆ Identify The Indicating Instruments, Recording Instruments, Controlling Instruments And Final Controlling Instruments. 	7DAYS



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<u>Unit I-04</u>	PRESSURE MEASUREMENT	<ol style="list-style-type: none"> 1.0 Describe Process Variables. 2.0 Pressure Scales. 3.0 Pressure Measuring Devices. 4.0 Pressure Transmitters and Transducers. 	<ul style="list-style-type: none"> ◆ Describe The Pressure Variable ◆ Identify Pressure Measuring Devices ◆ Explain Their Principles Of Operation 	7 DAYS
<u>Unit I-05</u>	FLOW MEASUREMENT	<ol style="list-style-type: none"> 1.0 Describe The Flow Variable. 2.0 Units Of Flow. 3.0 Basic Properties Of Fluids. 4.0 Selecting A Flow Measuring System. 5.0 Quantity Meters. 6.0 Rate Of Flow Measurement. 7.0 Calibration Of Flow Measuring Devices. 8.0 Other Methods Of Flow Measurement. 	<ul style="list-style-type: none"> ◆ Describe The Flow Variable. ◆ Identify Flow Measuring Devices. ◆ Explain Their Principles Of Operation. 	7 DAYS
<u>Unit I-06</u>	LEVEL MEASUREMENT	<ol style="list-style-type: none"> 1.0 The Dip Stick. 2.0 The Dip Tape. 3.0 The Sight Glass. 4.0 Floats. 5.0 Hydrostatic Tank Gauging (Htg). 6.0 Displacers And Local Level Control. 7.0 Level Switches. 8.0 Air Bubble Method. 9.0 Other Methods Of Level Measurement. 	<ul style="list-style-type: none"> ◆ Describe the Level Variable ◆ Identify Level Measuring Devices. ◆ Explain their Principles of Operation. 	2 WEEKS



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<u>Unit I-07</u>	TEMPERATURE MEASUREMENT	1.0 Describe The Temperature Variable. 2.0 Heat Transfer. 3.0 Temperature Scales. 4.0 Expansion Type Thermometers. 5.0 Electrical Methods Of Temperature Measurement. 6.0 Thermowells. 7.0 The Electrical/Electronic Temperature Transmitter.	<ul style="list-style-type: none"> ◆ Describe The Temperature Variable ◆ Identify Temperature Measuring Devices ◆ Explain Their Principles Of Operation 	2WEEKS
<u>Unit I-08</u>	ANALYTICAL MEASUREMENT	1.0 An Introduction To Gas Chromatography. 2.0 Basic Principles. 3.0 Data Processing And Presentation.	<ul style="list-style-type: none"> ◆ Correctly Describe The Gas Chromatography Analyzer 	7 DAYS
<u>Unit I-09</u>	INSTRUMENT HARDWARE: SMART TRANSMITTERS	1.0 Tandard Transmitter Operation. 2.0 What Is A Smart Transmitter. 3.0 Intelligent Lnstruments& Instrument Configurations. 4.0 Possibilities With Intelligent Instruments. 5.0 Communication.	<ul style="list-style-type: none"> ◆ Correctly Describe The Additional Features That SMART Transmitters Offer Over Conventional Transmitters. 	7 DAYS



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<p><u>Unit I-10</u></p>	<p>INSTRUMENT HARDWARE, CONTROL VALVES</p>	<p>1.0 Components Of A Control Valve. 2.0 Valve Lift /Flow Characteristics. 3.0 Special Types Of Control Valves. 4.0 Robotarm Safety Shutdown Valve. 5.0 Motor Operated Valves (Movs). 6.0 Valve Positioners.</p>	<ul style="list-style-type: none"> ◆ Enable The Trainee To Identify Types Of Control Valves And Understand Their Control Functions. 	<p>7 DAYS</p>
<p><u>Unit I-11</u></p>	<p>CALIBRATION EQUIPMENT & TECHNIQUES</p>	<p>1.0 Calibration Preparation. 2.0 Pneumatic Instrument Calibration. 3.0 Calibrating An Electronic Instrument. 4.0 Glossary.</p>	<ul style="list-style-type: none"> ◆ Explain calibration test equipment accuracy requirements. ◆ Describe a calibration set-up for a pneumatic instrument 	<p>7 DAYS</p>
<p><u>Unit I-12</u></p>	<p>FAULT FINDING TECHNIQUES</p>	<p>1.0 Define Instrument Loop Troubleshooting. 2.0 Single Loop Systems. 3.0 Distributed Control Systems.</p>	<ul style="list-style-type: none"> ◆ Explain the importance of instrument troubleshooting ◆ Identify principles and methods associated to fault finding instrument loops. 	<p>7 DAYS</p>



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<p>Unit I-13</p>	<p>CONTROL SYSTEMS AND PLC</p>	<p>1.0 SIMPLE CONTROL SYSTEMS. 2.0 CONTROL LAGS. 3.0 CONVERTING SIGNAL. 4.0 PLC SYSTEMS. 5.0 LADDER DIAGRAMS. 6.0 PLC SYSTEM EXAMPLES. 7.0 SIMPLE PLC SHUTDOWN SYSTEM.</p>	<ul style="list-style-type: none"> ◆ Explain the term control lag. ◆ Identify process control systems. ◆ Explain the operation of a simple PLC ladder diagram. ◆ Explain the function of the Allen-Bradley PLC components. 	<p>7 DAYS</p>
<p>Unit I-14</p>	<p>COMMON PROCESS CONTROL MODES</p>	<p>1.0 Describe The Function And Operation Of P.I.D Control Modes. 2.0 Describe Operating Principles And Applications Of Cascade Control . 3.0 Describe The Principles And Applications Of Ratio Control. 4.0 Describe Operating Principles & Applications Of Split Range Control. 5.0 Describe Operating Principles & Applications Of Override Control</p>	<ul style="list-style-type: none"> ◆ Proportional Integral and Derivative Control ◆ Cascade Control ◆ Ratio Control ◆ Split Range Control ◆ Override Control 	<p>7 DAYS</p>
<p>Unit I-15</p>	<p>LOOP TUNING PROCEDURES</p>	<p>1.0 Controller Tuning. Trial And Error.</p>	<ul style="list-style-type: none"> ◆ Explain the importance of instrument tuning and identify tuning methods. 	<p>7 DAYS</p>



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<u>Unit I-16</u>	SAFETY SHUTDOWN SYSTEMS	1.0 ESD System Construction. 2.0 ESD System Description. 3.0 Logic Control Circuits.	<ul style="list-style-type: none"> ◆ Identify devices used in alarm and ESD and describe how they operate ◆ Describe the function of an ESD system 	7 DAYS
<u>Unit I-17</u>	FIRE & GAS SYSTEMS	1.0 General. 2.0 Detectors Of Flame, Fire And Smoke. 3.0 The Basics. 4.0 How Smoke Detectors Work. 5.0 Fire And Gas Detectors Using Infrared Technology. 6.0 How To Measure Infrared Absorption. 7.0 Important Note.	<ul style="list-style-type: none"> ◆ Ionization Chamber ◆ Photoelectric ◆ Infrared Absorption 	7 DAYS
<u>Unit I-18</u>	FISCAL METERING SYSTEMS (GAS & LIQUID)	1.0 Metering. 2.0 Gas Metering. 3.0 Condensate Metering. 4.0 Appendix 1.	<ul style="list-style-type: none"> ◆ Explain the use of the orifice plate in fiscal gas metering ◆ Understand the flow equations derived for use in the fiscal calculation of gas sales ◆ Explain the need for the analyser equipment added for correct fiscal gas metering 	7 DAYS
<u>Unit I-19</u>	HAZARDOUS AREA CLASSIFICATION	1.0 Hazardous Areas. 2.0 Hazardous Area Equipment 3.0 The Safety Barrier	<ul style="list-style-type: none"> ◆ Define what is meant by Zone 0, Zone 1 and Zone 2 hazardous areas. 	7 Days



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			<ul style="list-style-type: none"> ◆ Explain the coding of equipment used in hazardous areas. ◆ Sketch a one way barrier ◆ Sketch a two way barrier ◆ Explain how to check a barrier. 	
Unit I-20	FOUNDATION FIELDBUS, COMMUNICATIONS	1.0 Communication Technologies. 2.0 Applications. 3.0 Managing Fieldbus Projects.	<ul style="list-style-type: none"> ◆ Explain, in some detail, the Fieldbus System. 	7 DAYS
nit I-21	READING PIPING & INSTRUMENT DIAGRAM	1.0 Symbols And Abbreviations Used In P&Id. 2.0 The P&Id Layout. 3.0 Trace Process Flow On A P&Id.	<ul style="list-style-type: none"> ◆ To interpret and correctly identify equipment, instrumentation and the direction of process flow from the drawing. 	7 DAYS
Unit I-22	READING INSTRUMENT LOOP DIAGRAM	1.0 Instrument Symbols And Their Connections, 2.0 Instrument Loop Diagram Layout.	<ul style="list-style-type: none"> ◆ Correctly identify the instruments, locations, ranges, settings and their connections to their associated field and panel mounted devices. 	7 DAYS
Unit I-23	INTRODUCTION TO SCADA AND DCS	1.0 Scada. 2.0 Distributed Control System.	<ul style="list-style-type: none"> ◆ Explain what SCADA is. ◆ Explain typical uses of SCADA. ◆ Explain how Radio signals are used for SCADA communication. ◆ Explain what a Remote Terminal Unit (RTU) is. 	7 Days



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			<ul style="list-style-type: none"> ◆ Explain what a Master Terminal Unit (MTU) is. ◆ Draw a simple block diagram of a DCS system. ◆ Explain the 5 level DCS concept. 	
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