IHRDC

International Human Resources Development Corporation

V.1.0

IHRDC's Competency-Based e-Learning **Pathways** for Petrochemicals Technicians

COMPETENCY-BASED TRAINING **PATHWAYS** FOR PETROCHEMICALS TECHNICIANS

Our highly regarded competency-based e-Learning **Pathways** have been designed to meet the competency development needs of petroleum technicians in the four traditional O&M specialties: Mechanical, Electrical, Instrumentation and Controls Technicians, and Plant Operators, who work in a variety of petroleum sectors: Refining, Petrochemicals, Midstream Gas, Upstream Oil, and Upstream Gas. This guide has been prepared for the training of technicians in Petrochemical plants.

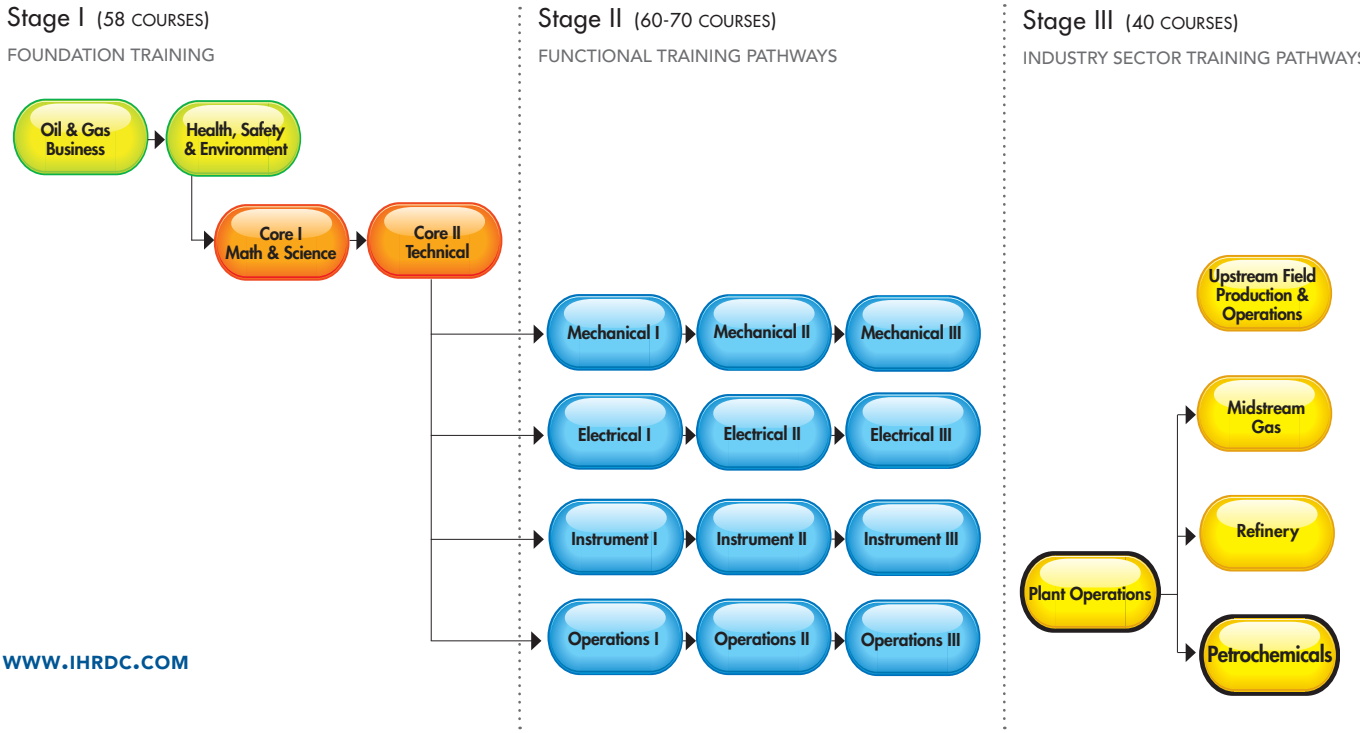
The Training Pathways are divided into three progressively more challenging Stages, as shown below.

Stage I: Foundation Training provides the background learning required for all new O&M personnel.

Stage II: Functional Training Pathways are divided into four paths, one for each functional area.

Stage III: Industry Sector Training Pathways provide the specific training in each industry sector; in this guide, Petrochemicals Technicians.

Sequential lists of e-Learning courses for each of the three Stages are shown on the following pages. The content of each course may be found in our online catalog, www.ihrdc.com/e-learningsolutions.



Stage I
Foundation Training

Learning Summary: Stage I

	COURSES	LEARNING HOURS
OIL & GAS BUSINESS	7 COURSES	17.5 HRS
HSE	22 COURSES	16.5 HRS
CORE 1: MATH, SCIENCE	12 COURSES	12.0 HRS
CORE 2: FUNDAMENTALS	16 COURSES	16.0 HRS

OIL & GAS BUSINESS

Oil & Gas Business
17.5 hr

All Sectors
- Oil and Gas Industry Overview

Upstream Sector
- Drilling and Well Completions
- Field Development and Production

Midstream Sector
- Crude Oil Transportation and Storage
- Refining and Product Specifications

Downstream Sector
- Overview of Petrochemicals
- Marketing and Distribution of Petroleum Products

HEALTH, SAFETY, & ENVIRONMENT

Health, Safety & Environment
16.5 hr

Chemical Safety
- Chemical Health Hazards
- Material Safety Data Sheets (MSDS)

Electrical Safety
- Electrical Safety I
- Electrical Safety II

Fire Protection
- Classes of Fires and Extinguishers
- Fire Safety

Hazardous Waste Operations
- First Responder - Awareness Level
- Hazard Communication

Health
- Hearing Conservation
- Workplace Ergonomics

Introduction to Safety
- Basics of Safety
- Safety Orientation

Materials Handling and Storage
- Transporting Hazardous Materials
- Warning Signs and Labels

Personal Protection Equipment
- Personal Protection Equipment
- Respirator Fit Testing
- Respiratory Protection

Quality Schemes
- ISO 9000

Workplace Safety
- Confined-Space Entry
- Driving Safety
- Fall Protection
- Lockout/Tagout

CORE 1: MATH, SCIENCE, & DIAGRAMS

Core I Math & Science
12 hr

Math
- Basics of Math
- Basic Operation 1
- Basic Operation 2
- Formulas, Graphs, and Trends
- Algebra

Chemistry
- Basic Principles of Chemistry 1
- Basic Principles of Chemistry 2
- Material Balancing
- Reaction Rates

Drawings & Diagrams
- Basic Diagrams and Symbols 1
- Basic Diagrams and Symbols 2
- Flow and Electrical Diagrams

CORE 2: FUNDAMENTALS

Core II Technical
16 hr

Workplace Safety
- Ladders and Scaffolds

Tools
- Introduction to Hand Tools
- Precision Measurement Instruments
- Introduction to Power Tools

Electrical Wiring
- Fasteners

Lubrication & Bearings
- Lubrication – Basics
- Bearings - Fundamentals

Basic & Heavy Lifting
- Overview of Rigging
- Basic Lifting
- Heavy Lifting

Measurement Devices
- Introduction to Vibration Analysis

Drawings & Diagrams
- Industrial Process Systems
- Blueprints
- Electrical Diagrams
- Piping and Instrumentation Diagrams

Gears, Equipment Drive Components, & Shaft Alignment
- Shaft Alignment - Fundamentals

Stage II Functional Training Pathways

Learning Summary: Stage II

	COURSES	LEARNING HOURS
MECHANICAL I	21 COURSES	20 HRS
MECHANICAL II	22 COURSES	21 HRS
MECHANICAL III	25 COURSES	19 HRS

MECHANICAL TECHNICIAN

Mechanical I

Mechanical I
20 hr

Chemistry
- Gases and Flowing Liquids
- Heat
- Heat Transfer
- Solids and Liquids

Electrical
- Basic Electrical Circuits
- Basic Electrical Principles

Lubrication & Bearings
- Lubricants and Bearings
- Lubrication - Using Lubricants

Materials Handling & Storage
- Tank Trucks

Physics
- Basic Principles [Basic Physics]
- Fluid Systems
- Forces and Machines

Pipes, Piping, & Auxiliaries
- Pipes and Pipe Fittings
- Piping - Basic Components and Functions
- Piping - System Components and Operation

Process Control
- Process Dynamics and Measurement

Pumps and Seals
- Seals - Gaskets and Packing
- Seals - Mechanical

Turbines & Steam Systems
- Steam Traps

Valves
- Safety Valves
- Valve Types and Operation

Mechanical II

Mechanical II
21 hr

Actuator, Valve, & Motor Controllers
- Electric and Hydraulic Actuators
- Hydraulic Valves
- Introduction of Actuators
- Motor Operators

Heat Exchangers
- Condensers and Reboilers
- Cooling Towers
- Introduction to Heat Exchangers
- Operation of Shell and Tube Types

Hydraulic Systems
- Hydraulic Actuators
- Hydraulic Component Inspection and Replacement
- Hydraulic Diagrams
- Hydraulic Fluid and Reservoirs
- Hydraulic Principles and Circuits
- Hydraulic Pumps
- Hydraulic Valves
- Routine Maintenance of Hydraulic Systems
- Troubleshooting of Hydraulic Systems

Valves
- Basic Valve Types and Operation 1
- Basic Valve Types and Operation 2
- Safety Valves I
- Safety Valves II
- Valve Maintenance

Mechanical III

Mechanical III
19 hr

Compressors
- Centrifugal Compressors
- Introduction to Compressors
- Operation of Centrifugal and Axial Compressors
- Positive Displacement Compressors
- Reciprocating Compressors
- Types of Compressors - Centrifugal and Axial

Gears, Equipment Drive Components, & Shaft Alignment
- Couplings
- Gear, Belt, and Chain Drives
- Gears - Overhauls
- Gears - Types and Characteristics
- Shaft Alignment - Reverse Dial and Laser
- Shaft Alignment - Rim and Face

Lubrication & Bearings
- Bearings - Rolling Contact
- Bearings - Sliding Surface

Other Systems & Equipment
- Fans

Pumps
- Basic Types and Operation of Pumps
- Fundamentals of Centrifugal Pumps
- Operation of Centrifugal Pumps
- Performance and Inspection of Pumps
- Reciprocating Positive Displacement Pumps
- Rotary Positive Displacement Pumps

Pumps & Seals
- Centrifugal Pump Basics and Troubleshooting
- Centrifugal Pump Overhaul
- Multistage Centrifugal Pumps
- Positive Displacement Pumps

Learning Summary: Stage II

	COURSES	LEARNING HOURS
ELECTRICAL I	20 COURSES	21 HRS
ELECTRICAL II	17 COURSES	17 HRS
ELECTRICAL III	22 COURSES	23 HRS

ELECTRICAL TECHNICIAN

Electrical I

Electrical I
21 hr

Circuits
- Parallel Circuits
- Series Circuits
- Series-Parallel Circuits
- Use of Ohm's and Kirchhoff's Laws in DC Circuits

Electrical
- AC Circuits
- Basic Electrical Circuits
- Basic Electrical Principles
- Basic Electrical Test Equipment
- Basic Electricity Review
- Sources of Electricity
- Voltage and Current Principles

Electrical Generation & Storage
- Battery Systems

Electrical Safety
- Electrostatic Discharge Precautions

Electrical Theory
- Kirchhoff's Law
- Magnets and Magnetic Fields
- Ohm's Law

Electrical Wiring
- Cables and Conductors
- Conduit Installation
- Introduction to the NEC

Electrical Wiring
- Digital and Analog Oscilloscope

Electrical II

Electrical II
17 hr

Actuator, Valve, & Motor Controllers
- AC Motor Controllers 1 [Basic Functions]
- AC Motor Controllers 2 [Troubleshooting]
- Motor Controllers and Operation

Electrical Components
- SCRs and TRIACs

Electrical Generation & Storage
- Power Supplies

Electrical Wiring
- Splices and Terminations

Motors
- AC and DC Motors
- DC Motors
- Motor Branch Circuit Protection
- Three-Phase Motors

Transformers, Breakers, & Switches
- Fuses

Variable Speed Drives
- Applications of VSDs
- Controllers and Troubleshooting
- Introduction to VSDs
- Programming Controllers
- System Troubleshooting of VSDs
- Systems and Integration of VSDs

Electrical III

Electrical III
23 hr

Circuits
- Troubleshooting Electrical Circuits
- J-K Flip-Flops
- Troubleshooting Operational Amplifier Circuits
- Filter Circuits

Electrical Components
- Inductors, Part 1
- Inductors, Part 2
- Capacitors, Part 1
- Capacitors, Part 2
- Specialized Electronic Devices, Part 1
- Specialized Electronic Devices, Part 2
- Transistor Configurations

Electrical Generation & Storage
- AC Generator Maintenance
- Electrical Production and Distribution

Electrical Wiring
- Grounding

Transformers, Breakers, & Switches
- Breakers and Switchgear 2 [High Voltage]
- Electromagnetic Relays
- Ground Fault Interrupters
- Introduction to Transformers, Breakers, and Switches
- Maintenance of Low-Voltage Circuit Breakers
- Relays 1
- Relays 2
- Transformers

Learning Summary: Stage II

	COURSES	LEARNING HOURS
INSTRUMENTATION & CONTROLS I	19 COURSES	26 HRS
INSTRUMENTATION & CONTROLS II	16 COURSES	24 HRS
INSTRUMENTATION & CONTROLS III	15 COURSES	19 HRS

INSTRUMENTATION & CONTROLS TECHNICIAN

Instrument I

Instrument I
26 hr

Circuits
- Parallel Circuits
- Series Circuits
- Series-Parallel Circuits
- Use of Ohm's and Kirchhoff's Laws in DC Circuits

Electrical
- AC Circuits
- Basic Electrical Circuits
- Basic Electrical Principles
- Basic Electrical Test Equipment
- Basic Electricity Review
- Voltage and Current Principles

Electrical Generation & Storage
- Battery Systems

Electrical Safety
- Electrostatic Discharge Precautions

Electrical Theory
- Kirchhoff's Law
- Magnets and Magnetic Fields
- Ohm's Law

Electrical Wiring
- Cables and Conductors
- Conduit Installation
- Introduction to the NEC

Measurement Devices
- Digital and Analog Oscilloscopes

Instrument II

Instrument II
24 hr

Actuator, Valve, & Motor Controllers
- AC Motor Controllers 1 [Basic Functions]
- AC Motor Controllers 2 [Troubleshooting]
- Motor Controllers and Operation

Electrical Generation & Storage
- Power Supplies

Electrical Wiring
- Splices and Terminations

Motors
- AC and DC Motors
- DC Motors
- Motor Branch Circuit Protection
- Three Phase Motors

Transformers, Breakers, & Switches
- Fuses

Variable Speed Drives
- Applications
- Controllers and Troubleshooting
- Introduction to VSDs
- Programming Controllers
- System Troubleshooting
- Systems and Integration

Instrument III

Instrument III
19 hr

Circuits
- Troubleshooting Electrical Circuits

Electrical Components
- Capacitors, Part 1
- Inductors, Part 1
- Electrical Generation and Storage
- AC Generator Maintenance
- Electrical Production and Distribution

Electrical Wiring
- Grounding

Transformers, Breakers, & Switches
- Introduction to Transformers Breakers, and Switches
- Breakers and Switchgear 2 [High Voltage]
- Electromagnetic Relays
- Ground Fault Interrupters
- Maintenance of Low-Voltage Circuit Breakers
- Relays 1
- Relays 2
- Transformers

Learning Summary: Stage II

	COURSES	LEARNING HOURS
OPERATIONS I	14 COURSES	19 HRS
OPERATIONS II	24 COURSES	25 HRS
OPERATIONS III	15 COURSES	17 HRS

PLANT OPERATOR

Operations I

Operations I
19 hr

Chemistry
- Gases and Flowing Liquids
- Heat
- Heat Transfer
- Solids and Liquids

Electrical
- Basic Electrical Circuits
- Basic Electrical Principles

Materials Handling and Storage
- Tank Trucks

Operations Fundamentals
- Communication
- Introduction to Operation Fundamentals
- Plant Production and Safety
- Trends, Maintenance, and Emergencies

Other Systems & Equipment
- Auxiliary Vessels

Physics
- Basic Principles [Basic Physics]
- Fluid Systems
- Forces and Machines

Pipes, Piping, & Auxiliaries
- Piping - Basic Components and Functions
- Piping - System Components and Operation

Process Control
- Process Dynamics and Measurement

Storage Tank Operations
- Above Ground Storage Tanks, Part 1

Operations II

Operations II
25 hr

Compressors
- Introduction to Compressors
- Types of Compressors - Centrifugal and Axial
- Operation of Centrifugal and Axial Compressors
- Positive Displacement Compressors

Environmental Protection
- Air Pollution
- Pollution Control in Plants
- Water Pollution and Waste Disposal

Operations Fundamentals
- Obtaining Samples
- Testing Samples

Other Systems and Equipment
- Filtration and Screening Unit Operations
- Fundamentals of Process Solubility

Physics
- Power and Energy

Power & Steam Systems
- Power Generation [and Hydrogen Cooling]

Power Plant Operation
- Basic Principles of Power Plant Operations

Pumps
- Fundamentals of Centrifugal Types
- Operation of Centrifugal Types
- Performance and Inspection of Pumps
- Reciprocating Positive Displacement Pumps
- Rotary Positive Displacement Pumps

Refining Process Technologies
- Typical Process Reactions, Part 1
- Typical Process Reactions, Part 2

Refrigeration System
- Basic Concepts of Refigeration Systems
- Operations of Refrigeration Systems
- Refrigeration Systems, Part 1

Operations III

Operations III
17 hr

Actuator, Valve, & Motor Controllers
- Introduction of Actuators
- Electric and Hydraulic Actuators

Boilers
- Boilers - Basic Principles and Types
- Boilers - Combustion, Water, and Steam

Distillation
- Basic System Components and Operation
- Control Systems in Distillation
- Operating Problems in Distillation

Furnaces
- Operating Conditions

Operations Fundamentals
- Process Examples

Process Control
- Introduction to Statistical Process Control
- Basic Control Charts
- Process Variations

Valves
- Basic Types and Operation 1
- Basic Types and Operation 2

Water Treatment
- Wastewater 2
- Water for Plant Systems 2

Stage III
Petrochemicals Training Pathways

Learning Summary: Stage III

	COURSES	LEARNING HOURS
PLANT OPERATIONS	22 COURSES	22 HRS
PETROCHEMICALS PROCESS	16 COURSES	16 HRS

PLANT OPERATIONS

Boilers
- Abnormal Conditions and Emergencies
- Combustion and Operation
- Normal Operations
- Startup and Shutdown
- Water and Steam
- Condensate and Feedwater Systems
- Condenser and Circulating Water

Furnaces
- Introduction to Furnaces
- Startup and Shutdown of Furnaces

Operations Fundamentals
- Basic Concepts of Operations
- Operator Responsibilities: Basic Operator Responsibilities
- Operator Responsibilities: Advanced Operator Responsibilities

Other Systems & Equipment
- Material Handling of Bulk Liquids
- Portable and Emergency Equipment
- Flaring, Venting, and Purging

Refrigeration System
- Refrigeration Systems, Part 2

Storage Tank Operations
- Above Ground Storage Tanks, Part 2
- Above Ground Storage Tanks, Part 3

Turbines & Steam Systems
- Boiler and Turbine Protection
- Steam Systems
- Bearings and Operation
- Steam Flow [Steam Turbines]

PETROCHEMICALS

Process Technologies
- Process Reactor Fundamentals
- Typical Process Reactions, Part 1
- Typical Process Reactions, Part 2
- Azeotropic, Extractive, and Vacuum Columns
- Crude Distillation Operations
- Hydrotreating and Catalytic Reforming 1
- Hydrotreating and Catalytic Reforming 2
- Treating and Sulfur Recovery Operations

Distillation
- Basic Principles of Distillation
- System Startup and Shutdown in Distillation
- Towers, Reboilers, and Condensers
- Basic System Components and Operation in Distillation
- Control Systems in Distillation
- Operating Problems in Distillation

Refinery Fundamentals
- Refining Basics

Refinery Operations
- Emission Controls

LICENSING BY STAGES

Clients may license these e-Learning Pathways on a **Stage basis** or as a complete three Stage package. The courses may be installed on a client's server or hosted on IHRDC's LMS.

IHRDC can aggregate our e-Learning courses to meet your training needs: entry level or advanced.

ESTIMATED TIME FOR COMPLETION

The time that it takes to complete the Petrochemicals Training Pathway depends on the learner's pace and the amount of time devoted to training each day or week.
The complete Petrochemicals e-Learning Pathway includes 158-167 courses, that consist of approximately 167 hours of learning.

Be sure to contact us today to discuss this outstanding e-Learning resource, view several typical courses, or obtain a quotation. Please visit **www.ihrdc.com** or contact a **Sales Representative** in your area (see below) by telephone or e-mail. We welcome the opportunity to share this innovative e-Learning system with you.

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