

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.

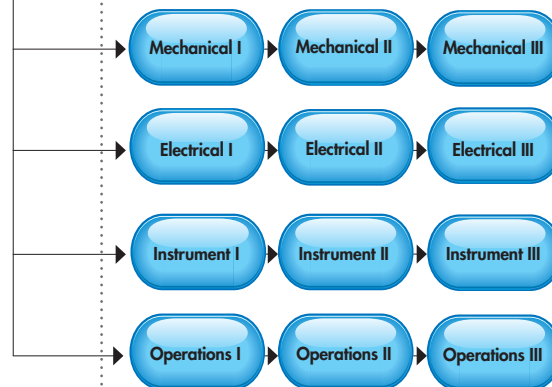
Stage I (58 COURSES)

FOUNDATION TRAINING



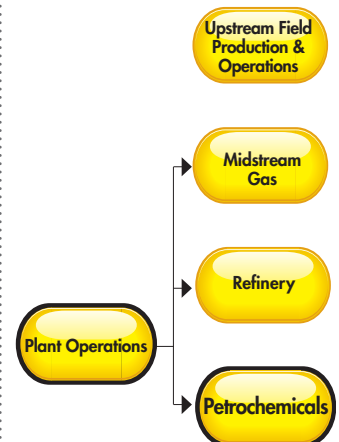
Stage II (60-70 COURSES)

FUNCTIONAL TRAINING PATHWAYS



Stage III (40 COURSES)

INDUSTRY SECTOR TRAINING PATHWAYS



Stage I Foundation Training

	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

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

**Oil & Gas
Business**
17.5 hr

HEALTH, SAFETY, & ENVIRONMENT

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

**Health, Safety
& Environment**
16.5 hr

CORE 1: MATH, SCIENCE, & DIAGRAMS

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 I
Math & Science**
12 hr

CORE 2: FUNDAMENTALS

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

**Core II
Technical**
16 hr

Stage II

Functional Training Pathways

	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

	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

	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

	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 Refrigeration 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

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

PLANT OPERATIONS

Plant Operations
22 hr

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

Petrochemicals
16 hr

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 modules, 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.

IHRDC

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