## Facilities Course Progression Map

### Basic
- Introduction to Oil and Gas Production Facilities – PF2
- Overview of Gas Processing – G2

### Foundation
- Oil Well Pad Facilities (For Facilities Engineers) – OWPF-FE
- Applied Water Technology in Oil and Gas Production – PF21
- Process Safety Engineering – PS4
- Process Safety Engineering Fundamentals for Facilities Engineers – PS2
- Electrical Engineering Fundamentals for Facilities Engineers – E3
- Risk Based Process Safety Management – HS45
- Instrumentation and Controls Fundamentals for Facilities Engineers – IC3

### Intermediate
- Gas Treating and Sulfur Recovery – G6
- Onshore Gas Gathering Systems: Design & Operation – PF45
- Troubleshooting Oil and Gas Processing Facilities – PF49

### Specialized
- Gas Conditioning and Processing – G4
- Gas Conditioning and Processing - LNG Emphasis – G4LNG
- Offshore Pipeline Design and Construction – PL43
- Terminals and Storage Facilities – PL44
- Onshore Pipeline Facilities: Design, Construction and Operations – PL42
- Offshore Pipeline Design and Construction – PL43
- Corrosion Management in Production/Processing Operations – PF22

### Oil and Gas Processing
<table>
<thead>
<tr>
<th>Gas</th>
<th>Oil / Water</th>
<th>General Processing</th>
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### Process Safety
- General Process Safety
- Oil / Water
- Gas
- Instrumentation, Controls & Electrical
- Offshore & Subsea
- Pipeline Engineering

### Instrumentation, Controls & Electrical
- Electrical
- Instrumentation & Controls
- Practical PID Control and Loop Tuning – IC74
- Flow and Level Custody Measurement – IC73
- Valve and Actuator Technologies – IC72
- PLC and SCADA Technologies – IC71
- Flow Assurance for Offshore Production – FAOP

### Offshore & Subsea
- Overview of Offshore Systems – OS21
- Overview of Subsea Systems – OS21

### Pipeline Engineering
- Offshore Pipeline Design and Construction – PL43
- Terminals and Storage Facilities – PL44
- Onshore Pipeline Facilities: Design, Construction and Operations – PL42
- Corrosion Management in Production/Processing Operations – PF22

### Process Safety Engineering
- Process Safety Engineering – PS4

### Gas Conditioning and Processing
- Gas Conditioning and Processing – G4
- Gas Conditioning and Processing - LNG Emphasis – G4LNG
### Facilities Course Progression Map

#### Mechanical Engineering

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<th>Reliability</th>
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<td><strong>Project Mgmt.</strong></td>
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<tr>
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<td>Advanced Project Management II – FPM63</td>
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<td>Mechanical Specification of Pressure Vessels and Heat Exchangers – ME43</td>
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<tr>
<td>Fundamentals of Pump and Compressor Systems – ME44</td>
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#### Additional courses available in:

- **Production & Completions**
- **Health, Safety, Environment**
- **Petroleum Business**
- **Professional Petroleum Development**
- **Multi-Discipline Training**
Onshore Pipeline Facilities - Design, Construction and Operations – PL42

**FOUNDATION 5-DAY**

Successful onshore pipeline businesses require personnel competent in fully integrated approaches to evaluation, planning, design, construction, operations, and asset integrity management. This intensive, 5-day foundation level course explores best practices for developing and maintaining pipeline systems that maximize life cycle reliability; employee, public, and environmental safety; and cost effectiveness. Design and team exercises are an integral part of this course.

**DESIGNED FOR**
Pipelined project managers and engineers, operations and maintenance supervisors, regulatory compliance personnel, and other technical professionals with 1-3 years of experience in natural gas, crude oil, refined petroleum products, LPGs, NGL, chemical, carbon dioxide pipeline engineering, construction, operations, or maintenance. This course is intended for participants needing a broad understanding of the planning, development, construction, start-up, and operating and asset integrity management of onshore pipelines.

**YOU WILL LEARN HOW TO**
- Apply regulatory codes, standards, and industry guidelines (API and others) that control and guide the permitting, design, construction, operation, and maintenance of pipeline facilities
- Apply mechanical and physical principles to pipeline design, hydraulics, and material selection
- Describe the important factors in station design
- Describe the importance of route selection and hydraulic systems for long term profitability, reliability, and safety
- Identify special design and construction challenges of onshore pipeline systems
- Describe methods of river and road crossings, HDD crossings, boring
- Identify the principle interfaces and potential interdependencies of pipeline facilities, such as pump stations and terminals, on design and operations
- Apply operational and maintenance tools and procedures, including system monitoring and control, leak detection, corrosion control, custody measurement and quality control, asset integrity management, and emergency response planning

**COURSE CONTENT**

- Regulations and code compliance requirements
- Pipeline survey and routing
- Mechanical and hydraulic design
- Proportion sizing and design
- Equipment selection criteria
- Facilities sites and design concerns
- Construction methods and contracting approaches
- Operations and asset integrity management

**2019-2020 Schedule and Tuition (USD)**

<table>
<thead>
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<th>Location</th>
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<th>Tuition</th>
</tr>
</thead>
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**Offshore Pipeline Design and Construction – PL43**

**FOUNDATION 5-DAY**

This intensive five-day foundation level course covers the principal aspects of design, construction, and operations of offshore pipeline systems. The course focuses on pipeline mechanical, strength, and stability design, and construction. Special challenges, such as shoreline crossings, foreign pipeline crossings, repair methods, flow assurance, corrosion control and cathodic protection are an integral part of this course. Participants will acquire the essential knowledge and skills to design, construct, and operate pipelines. Design problems and team projects are part of this course.

**DESIGNED FOR**

Engineers, designers and operators who are actively involved in the design, specification, construction, and operation of offshore pipeline systems.

**YOU WILL LEARN HOW TO**
- Apply mechanical, strength, and physical principles to pipeline design, material selection, construction, and operation
- Describe the key construction methods
- Define the importance of environmental conditions, construction methods, and pipeline system hydraulics in design, installation, and operations of offshore pipeline systems
- Identify special design and construction challenges of offshore pipeline systems
- Incorporate construction methods into the design of a pipeline system
- Identify the principal interfaces of pipeline facilities, such as platforms, floating production systems, subsea wellheads, and SPMS on design, construction, and operations of offshore pipeline systems
- Identify offshore safety and environmental practices and their effect on design, construction, and operations

**COURSE CONTENT**

- Overview of oil and gas transportation systems
- Review pipeline hydraulics, focusing on those aspects that affect design, construction, and operations
- Pipeline systems definition, survey, and route selection
- Safety, environmental, and regulatory considerations, focusing on Codes and Standards related to pipelines
- Pipeline conceptual and mechanical design for strength, stability, and constructability
- Pipeline materials and components selection including line pipe, corrosion and cathodic protection, and coatings
- Specialized equipment and materials for integrating with subsea and umbilicals, foreign pipeline crossings, single point moorings, and shore approaches
- Introduction to flow assurance considerations and pipeline integrity aspects including in-line inspection, leak detection and emergency response planning
- Pipeline operations, maintenance and repair considerations and their impact on design and material selection

**Midstream Operations and Pipeline e-Learning Library**

This library extends technical skill fundamentals in midstream specific concepts.

**Topics include:**
- Storage Tanks
- Pipeline Fundamentals
- Condensate Stabilization System
- Dewpoint Testing
- Fractionation Distillation Process Fundamentals
- Hydrocarbons
- Purging Operations
- Purging with Nitrogen
- Salt Caverns and Underground Storage
- Solid Desiccants
- Tower Fouling and Corrosion Cleaning
- and more...

For more information, please visit
www.petroskills.com/elearning or email solutions@petroskills.com

+1.918.828.2500 | petroskills.com | +1.800.821.5933 (toll free North America)

Any course is available inhouse at your location. Contact us today.
The emphasis of this course is on oil production facilities - from the wellhead, to the delivery of a specification crude oil product, to the refinery. Both onshore and offshore facilities are discussed. Produced water treating and water injection systems are also covered. Solution gas handling processes and equipment will be discussed at a relatively high level. In addition to the engineering aspects of oil production facilities, practical operating problems will also be covered, including emulsion treatment, sand handling, dealing with wax and asphaltenes, etc. Exercises requiring calculations are utilized throughout the course. The course intended to complement the G-4 Gas Conditioning and Processing course, focused on the gas handling side of the upstream oil and gas facilities area.

**DESIGNED FOR**
Process/facilities engineers and senior operating personnel involved with the design and operation of oil and produced water processing facilities.

**YOU WILL LEARN**
- Well inflow performance and its impact on production/processing facilities
- About oil, gas, and water compositions and properties needed for equipment selection and sizing
- How to select and evaluate processes and equipment used to meet sales or disposal specifications
- To apply physical and thermodynamic property correlations and principles to the design and evaluation of oil production and processing facilities
- How to perform equipment sizing calculations for major production facility separation equipment
- To evaluate processing configurations for different applications
- How to recognize and develop solutions to operating problems in oil/water processing facilities

**COURSE CONTENT**
- Reservoir traps, rocks, and drive mechanisms
- Phase envelopes and reservoir fluid classification
- Well inflow performance
- Artificial lift
- Gas, oil, and water - composition and properties
- Oil gathering systems
- Gas-liquid separation
- Emulsions
- Oil-water separation
- Oil treating
- Desalting
- Oil stabilization and sweetening
- Oil storage and vapor recovery
- Sand, wax, asphaltenes, and scale
- Transportation of crude oil
- Produced water treatment
- Water injection systems
- Solution gas handling

**2019-2020 Schedule and Tuition (USD)**

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**Gas Conditioning and Processing – G4**

**The Campbell Gas Course®**

**FOUNDATION**

The Campbell Gas Course® has been the standard of the industry for more than 52 years. Tens of thousands of engineers have attended our G4 program, considered by many to be the most practical and comprehensive course in the oil and gas industry.

The Campbell Gas Course® textbooks, Volumes 1 and 2, are routinely updated to reflect evolving technologies in this broad industry.

Both hand-methods and computer-aided analysis are used to examine sensitivities of technical decisions. To enhance the learning process, about 30 problems will be assigned, reviewed, and discussed throughout the course. Problems will be solved individually and in teams.

**DESIGNED FOR**

Production and processing personnel involved with natural gas and associated liquids, to acquaint or reacquaint themselves with gas conditioning and processing unit operations. This course is for facilities engineers, process engineers, senior operations personnel, field supervisors, and engineers who select, design, install, evaluate, or operate gas processing plants and related facilities. A broad approach is taken with the topics.

**YOU WILL LEARN HOW TO**

- Application of gas engineering and technology in facilities and gas plants
- Important specifications for gas, NGL, and condensate
- How to apply physical/thermodynamic property correlations and principles to the operation, design, and evaluation of gas processing facilities
- Practical equipment sizing methods for major process equipment
- To evaluate technical validity of discussions related to gas processing
- To recognize and develop solutions for operating problem examples and control issues in gas processing facilities

**COURSE CONTENT**

- Gas processing systems
- Physical properties of hydrocarbons
- Terminology and nomenclature
- Qualitative phase behavior
- Vapor-liquid equilibrium
- Water-ءhydrocarbon phase behavior, hydrates, etc.
- Basic thermodynamics and application of energy balances
- Process control and instrumentation
- Relief and flare systems
- Fluid hydraulics; two-phase flow
- Fractionation equipment
- Heat transfer equipment
- Pumps
- Compressors and drivers
- Refrigeration in gas conditioning and NGL extraction facilities
- Glycol dehydration; TEG
- Adsorption dehydration and hydrocarbon removal
- Gas treating and sulfur recovery
- Overview and summary

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**2019-2020 Schedule and Tuition (USD)**

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<td>Singapore, Singapore</td>
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**Risk Based Process Safety Management – HS45**

**FOUNDATION**

This course introduces process safety management in the oil and gas industry, the elements and benefits of process safety management systems, and tools for implementing and managing a system. In this course the participant will learn to use tools and techniques for managing process safety. The Center for Chemical Process Safety’s (CCPS) book titled “Guidelines for Risk Based Process Safety” or “RBPS Guidelines” will be the text for this course. Participant centered exercises and selected case studies will be used to build on the concepts that CCPS advocates for risk based process safety.

Throughout the course, participants will be challenged to think how their process safety management system can be enhanced and modified to meet the concepts of risk-based decision making. An individual action plan will be developed to apply the information from the course to the workplace.

**DESIGNED FOR**

HSE professionals, operations and maintenance technicians, engineers, supervisors and project managers requiring a basic foundation in developing and managing process safety. The more technical aspects of process safety engineering are covered in PSA4, Process Safety Engineering.

**YOU WILL LEARN HOW TO**

- To identify processes applicable to Process Safety Management (PSM) and describe relevant terms used
- To identify which standards are to be applied for managing process hazards
- To apply programs and tools for managing a PSM system
- To choose appropriate decision making methods and tools to identify process hazards
- To describe and use techniques available for control of hazards associated with process designs
- To describe the criteria and methods of selecting equipment and safe guarding controls
- To research and apply the performance parameters for the safety systems in operations
- To explain the role of all disciplines and their contribution to the management of potential HSE hazards

**COURSE CONTENT**

- Process safety culture and competency
- Compliance with standards
- Understand hazards and risk
- Operating procedures and safe work practices
- Asset integrity and reliability
- Management of change
- Conduct of operations
- Incident investigation
- Project manager responsibility
- Incident investigation (associated with plant failures)
- Measurement and metrics
- Management review and continuous improvement

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**2019-2020 Schedule and Tuition (USD)**

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<thead>
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<th>Location</th>
<th>Dates</th>
<th>Tuition</th>
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<td>London, UK</td>
<td>27-31 JULY 2020</td>
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# Instrumentation, Controls, and Electrical Systems for Facilities Engineers – ICE21
## FOUNDATION  5-DAY

This foundation-level course provides an introduction and overview of electrical systems, instrumentation, process control, and control/safety systems typically encountered in oil and gas facilities. The focus is to understand terminology, concepts, typical equipment configurations, and common pitfalls in order to improve communication with electrical and I&C professionals. This course covers similar content to our E3 and IC3 courses, but at a more conceptual level. This course is not a prerequisite for taking E3 or IC3, but rather a replacement for those that are not able to take both E3 and IC3.

### DESIGNED FOR
- Process, chemical, and mechanical engineers, (i.e. non-instrumentation and non-electrical disciplines), as well as other technical and non-technical professionals with little or no background in I&C systems.
- Electrical and Instrumentation Engineers should consider E3 and IC3 for more in-depth coverage.

### YOU WILL LEARN
- Fundamentals of electricity, such as voltage, current, resistance, power factor, and single/three phase power systems
- Electrical specifications, such as voltage selection, load lists, and power
- How to read one-line diagrams and understand the function of the components of power distribution, including transformers, switchgear, MCCs, VFDs, and power distribution
- The function and considerations of infrastructure components, such as cable, conduit, cable tray, and duct banks
- Awareness of the concepts behind classification of hazardous locations and equipment specifications
- Safety risks and mitigation strategies for power systems, including short circuit and overcurrent protection, ground faults, shock hazards, and arc flash
- Fundamentals of control systems, sensors, controllers, and final elements
- Key requirements for instrument specifications such as accuracy, signal selection, process conditions, material compatibility, installation considerations, capabilities and limits, and relative cost
- Basics of specification of shutdown and control valves
- Control system functions, limitations, and architectures, including PLC, DCS, SIS, RTU, and SCADA; common networking systems, including Ethernet, Modbus and Fieldbus
- Exposure to the typical documentation and drawings necessary for the design, specification, installation, operation and maintenance of electrical, instrumentation and control systems

## COURSE CONTENT
- Fundamentals of electricity
- Control system fundamentals
- Field measurement and control devices
- Hazardous area classification for oil and gas applications
- Programmable electronic systems (PLC, DCS, SIS, SCADA)
- and more...

## 2019-2020 Schedule and Tuition (USD)

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# Fundamentals of Offshore Systems Design and Construction – OS4
## FOUNDATION  10-DAY

This 10-day course provides a fundamental understanding of the technology and work processes used for the design and construction of all types of offshore systems, including consideration of asset development, surveillance, and management. The content includes the full range of water depths from shallow water to ultra-deepwater and will also address life-cycle considerations in all phases of offshore field development and operation. All major components required for offshore developments, such as fixed and floating platforms, drilling rigs, workover equipment, pipelines, risers, process, and utilities and construction equipment are discussed. The emphasis is placed on the multi-discipline team approach needed to manage the myriad interfaces of offshore facility design, construction, and operations. Individual and group exercises are used throughout the course. A case study for an offshore project development is included.

### DESIGNED FOR
- Individuals with a basic awareness of or experience in offshore engineering and operations.
- Technical staff, project engineers, engineering discipline leads, engineering specialists, and operating staff find this course accelerates their capability to contribute on offshore field development planning, design, and construction projects and field operations.

### YOU WILL LEARN HOW TO
- Identify the key facilities parameters that must be evaluated for field development
- Recognize the best applications and characteristics of each type of offshore fixed and floating structure
- Account for the effects of the ocean environment on facilities design, construction, and operations
- Identify the impact space, loads and forces have on the structural design and global performance of offshore structures and how they influence their cost
- Describe the impact topside facilities (drilling, well servicing, processing, and utilities) affect the structural design and how the topside design process is done
- Recognize and manage key design and operational interfaces between the major components of offshore facilities systems
- Understand the key design, construction, and installation issues associated with fixed and floating platforms and how to apply the lessons learned to your work

### COURSE CONTENT
- Offshore systems overview and field architecture selection
- Well construction and servicing equipment and operations
- Flow assurance
- Topside facilities
- Oil and gas transportation facilities
- Riser systems
- Subsea systems
- Production operations
- Infrastructure impact on design and operations
- Effects of the ocean environment
- Introduction to naval architecture
- Structural design processes and tools
- Construction plans and execution
- and more...

## 2019-2020 Schedule and Tuition (USD)

<table>
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<th>Tuition</th>
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# Fundamentals of Pump and Compressor Systems – ME44
## INTERMEDIATE  5-DAY

This is an intensive 5-day course providing a comprehensive overview of pumps and compressor systems. The focus is on equipment selection, type, unit, and station configuration; and integration of these units in the process scheme and control strategy in upstream and midstream oil and gas facilities. The material of the course is applicable to field production facilities, pipelines, gas plants, and offshore systems.

### DESIGNED FOR
- Engineers, senior technicians, and system operators designing, operating, and maintaining pump and compressor systems in oil and gas facilities.

### YOU WILL LEARN
- Selecting the appropriate integrated pump and compressors units (drivers, pumps, compressors, and auxiliary systems)
- Integrating the pump or compressor units with the upstream and downstream piping and process equipment
- Evaluating pump and compressor units and their drivers in multiple train configurations, parallel and series
- Identifying the key local and remote control elements of pumps and compressors as well as their drivers
- Defining the major life-cycle events, such as changes in flows, fluid composition, and operating conditions that can affect equipment selection and operating strategies
- Assessing the key pump hydraulics and compressor thermodynamics, and their effect on selection and operations
- Identifying significant operating conditioning monitoring parameters and troubleshooting techniques

### COURSE CONTENT
- Types of pumps, compressors, and drivers, and their common applications and range of operations
- Evaluation and selection of pumps and compressors, and their drivers for long-term efficient operations
- Unit and station configuration including multiple trains in series and/or parallel operations
- Integration with upstream and downstream process equipment, local and remote control systems, and facilities utilities
- Key auxiliary systems including monitoring equipment, heat exchangers, lube and seal systems, and fuel/power systems
- Major design, installation, operating, troubleshooting, and maintenance considerations

## 2019-2020 Schedule and Tuition (USD)

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<td>MIDLAND, US</td>
<td>24-28 AUG</td>
<td>$4455</td>
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<th><strong>Health, Safety, Environment</strong></th>
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<td>Project Management</td>
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