# Facilities Course Progression Map

## Oil and Gas Processing

<table>
<thead>
<tr>
<th>Gas</th>
<th>Oil / Water</th>
<th>General Processing</th>
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</thead>
<tbody>
<tr>
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<td>Process Safety</td>
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<td>Instrumentation &amp; Controls</td>
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<td>Offshore &amp; Subsea</td>
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<td></td>
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<td>Pipeline Engineering</td>
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</tbody>
</table>

### Specialized
- CO₂ Surface Facilities – PF81

### Intermediate
- Gas Treating and Sulfur Recovery – G6
- Practical Computer Simulation Applications in Gas Processing – G5
- Onshore Gas Gathering Systems: Design & Operation – PF45
- Troubleshooting Oil and Gas Processing Facilities – PF49
- Separation Equipment - Selection & Sizing – PF42
- Relief and Flare Systems – PF44

### Foundation
- Oil Well Pad Facilities (For Facilities Engineers) – OWPF-FE
- Fundamental and Practical Aspects of Produced Water Treating – PF23
- Applied Water Technology in Oil and Gas Production – PF21
- Process Safety Engineering – PS4
- Risk Based Process Safety Management – HS45
- Fundamentals of Process Safety – PS2
- Electrical Engineering Fundamentals for Facilities Engineers – E3
- Instrumentation and Controls Fundamentals for Facilities Engineers – IC3
- Instrumentation, Controls and Electrical Systems for Facilities Engineers – ICE21
- Corrosion Management in Production/Processing Operations – PF22

### Basic
- LNG Short Course: Technology and the LNG Chain – G20
- Overview of Gas Processing – G2
- Oil Well Pad Facilities (For Non-Facilities Engineers) – OWPF-NFE
- Introduction to Oil and Gas Production Facilities – PF2
- Choosing the Right Facilities Equipment for the Reservoir – PF3
- Process Safety Engineering Principles – PSE Virtual/Blended Course

### Specialized Courses
- 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

### Intermediate Courses
- Overiew of Offshore Systems – OS4
- Overiew of Subsea Systems – OS22
- Overview of Offshore Systems – OS21

### Foundation Courses
- Offshore Pipeline Design and Construction – PL43
- Onshore Gas Gathering Systems: Design & Operation – PF45
- Troubleshooting Oil and Gas Processing Facilities – PF49
- Separation Equipment - Selection & Sizing – PF42
- Relief and Flare Systems – PF44

### Basic Courses
- LNG Short Course: Technology and the LNG Chain – G20
- Overview of Gas Processing – G2
- Oil Well Pad Facilities (For Non-Facilities Engineers) – OWPF-NFE
- Introduction to Oil and Gas Production Facilities – PF2
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- Process Safety Engineering Principles – PSE Virtual/Blended Course

## Course Details

- **Introduction to Oil and Gas Production Facilities – PF2**
- **Choosing the Right Facilities Equipment for the Reservoir – PF3**
- **Process Safety Engineering Principles – PSE Virtual/Blended Course**
- **LNG Short Course: Technology and the LNG Chain – G20**
- **Overview of Gas Processing – G2**
- **Oil Well Pad Facilities (For Non-Facilities Engineers) – OWPF-NFE**
- **Introduction to Oil and Gas Production Facilities – PF2**
<table>
<thead>
<tr>
<th>Mechanical Engineering</th>
<th>Operations &amp; Maintenance</th>
<th>Project Mgmt.</th>
<th>Procurement/Supply Chain Management</th>
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<td>NGL Extraction, Stabilization and Fractionation for Operations &amp; Maintenance - OT42</td>
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</tbody>
</table>
Introduction to Oil and Gas Production Facilities – PF2

BASIC 3-DAY

The scope of the discussion ranges from an overview of the oil and gas industry, hydrocarbon phase behavior characteristics, and different reservoir types, to product specifications and the processes used to meet these. Other facilities considerations are addressed, such as process safety and downstream processing that may impact the production facility selection and operation.

DESIGNED FOR

Those interested in an overview of production facilities, including subsurface professionals, line managers, sales or business development staff, environmental personnel, operational staff, and those new to the industry.

YOU WILL LEARN

- How the reservoir type, drive mechanism, fluid properties, location, and product specifications influence the selection and design of the production facilities
- How to do quick "back of the envelope" calculations to better understand equipment sizing and capacity
- Parameters that affect the design and specification of oil stabilization and dehydration equipment
- Awareness of the parameters that determine flowline/gathering system capacity
- The purpose of separators in a production facility and familiarity with the typical configurations
- Typical design parameters, operating envelopes, common operating problems of oil and gas production equipment, and the effect of changing feed conditions over the life of a field
- To describe oil dehydration/desalting process options and equipment
- Produced water treating options and the dependence on surface vs. subsurface, offshore vs. onshore disposal
- Compressor performance characteristics and how they affect production rates and facility throughput
- Gas dehydration process options, with a particular emphasis on glycol dehydration
- The principles of asset integrity and inherently safe design given the rate, composition, temperature, and pressure of the production stream
- About midstream facilities required downstream of the primary production facility to deliver saleable products to the market, and how these facilities are affected by production rates, composition, and production facility performance

COURSE CONTENT

Overview of oil and gas industry • Qualitative phase behavior and reservoirs • Hydrocarbon properties and terminology • Typical sales/disposal specifications • Flowlines, piping and gathering systems • Production separation • Oil processing • Water injection systems (including pumps) • Gas handling – compression, dehydration, measurement and storage • Other facility considerations - utilities, process safety • Midstream facilities – gas processing, pipelines, LNG

Choosing the Right Facilities Equipment for the Reservoir – PF3

BASIC 5-DAY

This course is similar to Introduction to Oil and Gas Production Facilities (PF-2), but is presented in the concept of concept selection and front-end field development planning.

DESIGNED FOR

This course is intended for those working on field development teams, as well as those who need to better understand how surface facilities are selected and how subsurface characteristics affect facility design and specification.

YOU WILL LEARN

- How to develop the project framework and decision making strategy
- How the specification of production/processing facilities is influenced by reservoir type, drive mechanism, fluid properties, location, and contractual obligations
- Operating conditions that affect the specification of the production facilities from the wellhead through initial separation
- Parameters that affect the design and specification of oil stabilization and dehydration equipment
- The design and specification of produced water systems appropriate for the rate and composition of the produced water to meet the required environmental regulations and/or injection well capacity
- The design and specification of gas handling facilities, including compression dehydration equipment
- The impact of artificial lift systems and secondary/tertiary production projects on facilities selection and design
- The principles of asset integrity and inherently safe design given the rate, composition, temperature, and pressure of the production stream
- About midstream facilities required downstream of the primary production facility to deliver saleable products to the market, and how these facilities are affected by production rates, composition, and production facility performance

COURSE CONTENT

Reservoir types, fluid properties, and typical product specifications • Flowlines, gathering systems, flow assurance, and production separation • Oil dehydration and stabilization • Produced water treatment and water injection systems • Gas handling, including compression, dehydration, and sweetening • The effect of artificial lift systems, and secondary and tertiary recovery projects • Midstream facilities - gas processing, pipelines, product storage, and LNG • Other facility considerations – utility systems, process safety and asset integrity, and environmental regulations

Oil Well Pad Facilities (For Non-Facilities Engineers) – OWPF-NFE

BASIC 4-DAY

This course provides a comprehensive overview of onshore oil well-pad facilities as typically utilized for the development of shale/tight oil fields. The course is focused on the purpose, function, and operation of the facilities - what, why, how - not on the more detailed engineering aspects which are covered in a companion course OWP-FE (for Facilities Engineers). A major aspect of the non-Facilities Engineers course is how the pad facilities integrate with the wells/subsurface and also the product (oil, gas, produced water) outlet systems. This course does not contain many calculations; instead the intent is to generate discussion and better understanding of the issues involved with design, operation and maintenance of the pad facilities and their role in providing value to the development as a whole.

DESIGNED FOR

This course is aimed primarily at non-Facilities Engineers, e.g. production/reservoir engineers, operations personnel, environmental staff, etc, or anyone who needs a basic understanding of oil well pad facilities – what they do and how they work.

YOU WILL LEARN

- The different types of process flow schemes typically used for oil well pad facilities
- The various types of engineering drawings used to describe facilities and how to interpret them
- How well production characteristics/performance should be integrated into the facilities design
- The range of fluid compositions and properties typically encountered in the newer shale/tight oil developments and their impact on facilities design and operation
- The main processing requirements and associated equipment types typically required
- How the various processes and equipment types work together on the focus on the requirements of typical onshore shale/tight oil well pad facilities
- Effects of third party gas gathering system design and operation on the well pad facilities

COURSE CONTENT

Engineering drawings • Oil well pad process flow diagrams • Well production characteristics • Fluid compositions and properties • Separation equipment • Oil treating • Oil stabilization • Storage tanks and vapor recovery • Facility piping systems • Compressors • Sand handling • Produced water handling • Flow measurement

Oil Production and Processing Facilities – PF4

FOUNDATION 10-DAY

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 operation problems will also be covered, including emulsion treatment, sand handling, dealing with wax and asphaltene, etc. Exercises requiring calculations are utilized throughout the course. The course is intended to complement the G4-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, asphaltene, and scale • Transportation of crude oil • Produced water treatment • Water injection systems • Solution gas handling

2019 Schedule and Tuition (USD)

BAKERSFIELD, US 9-29 SEP $8615
DEERFIELD, US 17-28 JUNE $8615
DUBLIN, IRE 11-22 NOV $9525
HOUSTON, US 30 SEP-2 OCT $3185
KUALA LUMPUR, MYS 1-12 JULY $9740
KUWAIT CITY, KWT 17-28 NOV $9525
LONDON, UK 2-13 SEP $9395+VAT

See website for dates and locations.

Any course is available inhouse at your location. Contact us today.
**Process Safety Engineering Principles – PS2**

**FOUNDATION 5-DAY**

**BASIC 40 HOURS**

- **Self-paced, virtual course**
- **Start anytime.**
- **Tuition US$4325**

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**Process Safety Engineering – PS4**

**FOUNDATION 5-DAY**

This is a competency driven, fundamental course covering the broad scope of process safety engineering. Other topics relevant to process safety are introduced, showcasing how process safety engineering plays into the broader context of risk management and process safety management, but the emphasis is on the technical content. While many of the examples are drawn from upstream and midstream oil and gas facilities, the principles are applicable across all the hydrocarbon processing industries. The course is designed to accelerate the participants’ process safety learning curve. Serious process safety incidents occur somewhere in the industry nearly every week, and few if any are new; essentially the same ways of going wrong are found repeatedly, in different operating contexts. One of the main objectives of PS-4 is to develop knowledge of the more common ways of going wrong, and one of the ways of doing that is discussion of major incidents, including some of those that have affected our regulatory environment. PS-4 graduates should be able to see their facilities and projects with a new perspective, a new sense of not only how things work, but also of how things fail.

**DESIGNED FOR**

- Anyone who needs to work with process safety engineering, this includes facilities engineers, operations and maintenance supervisors, project engineers and managers, entry level process safety engineers, experienced professionals new to oil and gas, and anyone who needs a general understanding of the breadth of the process safety engineering discipline. Technical staff from insurance companies and regulatory agencies have found the course useful. Those requiring a less technical course may be interested in PS-2.
- Fundamentals of Process Safety, risk-based process safety management is the subject of HS45.

**YOU WILL LEARN HOW TO**

- Identify processes applicable to Process Safety Engineering.
- Understand the core concepts of the various process safety systems and tools for managing process safety. The course will benefit all staff associated with the operation, maintenance, and governance in production and processing facilities and is relevant to roles, including senior management, project and engineering support teams, HSE support, supervisors, and operators and maintenance technicians. It provides an understanding of the design basis and essentials for safe operations, without addressing the more detailed calculation aspects covered in Process Safety Engineering PS4.

**YOU WILL LEARN**

- How to analyze and assess different types of risk analyses.
- How to use models that are associated with risk management.
- The importance of building safety into processes.
- How Inherently Safer Design can be applied.
- and more...

**COURSE CONTENT**

- Process Safety Risk Analysis and Inherently Safer Design
- Process Hazards Analysis
- Layers of Protection analysis techniques
- Leakage and dispersion of hydrocarbons
- Combustion behavior of hydrocarbons
- Sources of ignition and hazardous area classification
- Specific plant systems and equipment
- Relief and flare systems
- Historical incident databases, plant layout and equipment spacing
- Fire protection systems
- SIS, monitoring and control

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**Risk Based Process Safety Management – HS45**

**FOUNDATION 5-DAY**

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 “RP027 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.

**YOU WILL LEARN HOW TO**

- Identify processes applicable to Process Safety Management (PSM) and describe relevant terms used.
- Identify which standards are to be applied for managing process hazards.
- Apply programs and tools for managing a PSM system.
- Choose appropriate decision making methods and tools to identify process hazards.
- Describe and use techniques available for control of hazards associated with process designs.
- Describe the criteria and methods of selecting equipment and safeguarding controls.
- Research and apply the performance parameters for the safety systems in operations.
- 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 (associated with plant failures)
- Measurement and metrics
- Management review and continuous improvement

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**FOR MORE INFORMATION, VISIT**

PETROSKILLS.COM/PSONLINE
Applied Water Technology in Oil and Gas Production – PF21

**FOUNDATION 5-DAY**

This course provides an overview of the main water handling systems typically encountered in upstream (E&P) production operations, both onshore and offshore. The chemistry of the main water-related problems of mineral scales, corrosion, bacteria, and oily water will be reviewed both from the theoretical and practical aspects. Produced water treatment equipment and typical water quality specifications will also be reviewed, as well as water injection and disposal systems. An exercise will be given to identify typical system problems and to apply the knowledge you gained to propose solutions. Emphasis will be placed on understanding and resolving operational problems in process equipment.

**DESIGNED FOR**
Managers, engineers, chemists, and operators needing to understand water-related problems in oil and gas production and their solutions.

**YOU WILL LEARN**
- The basics of oilfield water chemistry
- How to monitor and control corrosion, scale, and bacterial growth in produced water and water injection/disposal systems
- How to implement system surveillance programs to detect potential problems before system damage occurs
- Produced (oily) water treatment options and related treatment equipment
- How to use the knowledge gained to identify typical system problems and be able to propose solutions

**COURSE CONTENT**
- Water chemistry fundamentals – Water sampling and analysis
- Water formed scales – Corrosion control
- Water treatment microbiology
- Produced water discharged/disposal and treatment principles
- Produced water treatment equipment – theory of operation, corrosion, scale, and biological control
- Case study

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Fundamental and Practical Aspects of Produced Water Treating – PF23

**FOUNDATION 5-DAY**

This course covers topics related to Produced Water Treatment in upstream oil and gas operations. Produced water composition and physical properties are covered. Water quality requirements for various disposal methods are addressed, including onshore surface discharge, offshore discharge to sea, and re-injection for disposal or freshwater. Regulatory requirements and analytical methods used to monitor and ensure regulatory compliance are discussed. Treatment technology is presented along with practical considerations for selecting and operating typical water treatment equipment. Representative process flow diagrams illustrate equipment selection, design features, layout, and processes. Chemical treatment options are also considered.

**DESIGNED FOR**
Managers, engineers, chemists, and senior operations personnel responsible for designing, operating, and maintaining facilities that process and manage produced water. This course will provide participants with an understanding of the technical aspects required to select, design, maintain, and troubleshoot produced water equipment.

**YOU WILL LEARN**
- How produced water compositions affect water treatment system design and performance
- How to interpret produced water analytical data and calculate common Scale Indices
- How emulsions form and contribute to water treatment challenges
- How Total Suspended Solids (TSS) affects water quality and what to do about it
- What water quality is required for surface or overhead disposal, for injection disposal, or for beneficial use
- The regulatory requirements for offshore water disposal and what is in an NPDES Permit
- What analytical methods actually measure and how to select an appropriate method
- How separators, clarifier tanks, CPDs, hydrocyclones, flotation cells, and bed filtration work and how to improve their performance
- The most common causes of water treating problems and how to diagnose and resolve them
- Typical PFAs used to illustrate operational issues

**COURSE CONTENT**
- Introduction to water treatment technology and issues
- Produced water chemistry and characterization
- Defining and characterizing emulsions that impact water quality and treatment
- Water quality requirements for injection or surface disposal, NPDES permits, analytical methods
- Primary water treatment technologies – separators, hydrocyclones, and CPDs
- Secondary water treatment – induced gas flotation
- Tertiary water treatment technologies – media and membrane filtration
- Chemicals and chemical treatment
- Diagnostic testing and in-field observations
- Diagnosing and resolving water treatment issues based on actual field experiences

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Oil Well Pad Facilities (For Facilities Engineers) – OWPF-FF

**FOUNDATION 5-DAY**

This course is focused on onshore well-pad facilities that are typically used for the development of shale/tight oil fields. The course starts with the review of typical well-pad facility process flow diagrams (PFDs) and the considerations involved in selecting a suitable PFD for the given conditions. Variations on the different PFDs are evaluated and their applications, pros and cons discussed. The main equipment types utilized are reviewed with focus on selection and sizing. A key aspect of this course is understanding the interfaces between the producing wells, the well-pad facility, and the gas, oil and produced water export systems. Numerous exercises and calculations will be utilized throughout the course to develop solid understanding and competence level in the areas covered. This course differs from the OWPF-NFE (Non-Facilities Engineers) course in that it is longer, goes into more detail in the subject areas, and is focused on facilities engineering aspects and calculations.

**NOTE:** This course has some overlap of content with PF-4 Oil Production & Processing Facilities which is a 10-day Intermediate/Lower course. PF-4 is broader in scope, covers onshore and offshore facilities and goes into more detail in certain areas. OWPF is more narrowly focused on onshore oil pad facilities.

**DESIGNED FOR**
This course is aimed primarily at Facilities Engineers but would also be suitable for senior operations personnel involved with design and operation of onshore oil well-pad facilities. It is not an engineering discipline-specific course but instead covers multiple aspects of pad facilities. OWPF could also be used for cross-training of more specialized discipline engineers to provide them with a better understanding of how the various pad facilities components integrate and act together.

**YOU WILL LEARN**
- The factors involved with selecting a process flow scheme for a typical oil well-pad
- The effect of well production characteristics and well performance on the surface facilities
- Typical wellstream compositions and their variability, and how to determine the fluid properties needed for equipment selection and sizing and their effects on operations
- The main pad facility processing requirements needed to produce on-spec products for sale or disposal, and the associated equipment types and operating conditions typically utilized and more...

**COURSE CONTENT**
- Oil well pad process flow diagrams
- Well production characteristics
- Fluid compositions and properties
- Separation equipment
- Oil treatment
- Oil stabilization
- Storage tanks and vapor recovery
- Facility piping systems
- Rod- and tubing systems
- Compressors
- Sand handling
- Produced water handling
- Flow measurement

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Separation Equipment - Selection and Sizing – PF42

**INTERMEDIATE 5-DAY**

This course covers the different types of separation equipment typically encountered in oil and gas production facilities. Fractionation equipment and produced water treatment equipment are not covered in this course. You will learn where the different types of separation equipment are used based on operating conditions and separation performance requirements. Frequent references will be made to real production facility process flow diagrams (PFDs). Typical operational problems and their solutions will also be discussed. Exercises requiring calculations are utilized throughout the course as well.

Please be aware that due to overlap in content, it is not necessary to take the PF-42 course if you have already taken the PF-4 Oil Production and Processing Facilities course.

**DESIGNED FOR**
Process/Facilities engineers who need skills for design and troubleshooting of separators.

**YOU WILL LEARN**
- Different types of separation equipment utilized in the oil and gas industry and where they are used
- Separation performance capabilities of the different types of equipment
- How to size the different types of separation equipment
- How to troubleshoot and debottleneck separation equipment
- How to calculate the wall thickness and estimate the weight of separators
- Instrumentation and controls used on separation equipment

**COURSE CONTENT**
- Fluid properties and phase behavior
- Phase separation processes
- Gas-liquid separation equipment: slug catchers, conventional separators (horizontal and vertical), scrubbers, compact separators, filter separators/coalescing filters
- Separator internals: inlet devices, mist extractors, baffles, weirs, etc.
- Emulsions
- Oil-water separation equipment: conventional 3-phase separators and free-water knockouts, wash tanks
- Oil treatment and desalting equipment: mainly electrostatic coalescers
- Liquid-liquid coalescing filters
- Mechanical design aspects: pressure vessel codes, wall thickness and vessel weight estimation, material selection, relief requirements

**2019 Schedule and Tuition (USD)**

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<th>Dates</th>
<th>Tuition (USD)</th>
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See website for dates and locations.
### Process Facilities

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<tr>
<td><strong>Relief and Flare Systems</strong> – PF44</td>
<td><strong>Troubleshooting Oil and Gas Processing Facilities</strong> – PF49</td>
</tr>
</tbody>
</table>

#### COURSE CONTENT

**Relief and Flare Systems**
- The impact of gathering system pressure on gas well deliverability
- The impact of produced fluids composition on gathering system design and operation
- How to evaluate field facility and gathering system configurations for different applications
- To recognize and develop solutions to operating problems with existing gas gathering systems

**Troubleshooting Oil and Gas Processing Facilities**
- The difference between troubleshooting, optimization, and debottlenecking
- How to recognize trouble when it is occurring
- How to develop a methodical approach to troubleshooting
- To recognize different components of a facility and interrelate each other, and the significance of these interactions
- How to gather, validate, and utilize the data needed for troubleshooting
- The criteria to be considered for identifying the best solution when several feasible solutions are available
- Typical cases of problems, and their solutions, for the main types of processes and equipment used in the up-stream/midstream oil and gas industry

#### YOU WILL LEARN

-Codes and Standards used in relief systems
-Ways to mitigate relief, such as HIPPS
-How to define the relief scenarios and calculate their relief loads
-Commonly used pressure relieving devices, and how to size them
-How to calculate relief valve inlet losses
-How to fix relief valve excessive inlet losses
-How to size relief valve outlet piping and flare headers
-How to calculate relief valve backpressure
-How to size flare ko drums
-How to calculate flare stack height based on radiation limits
-Flare gas recovery systems
-Flare ignition systems available
-Advantages of using dynamic simulation for calculating relief loads

### 2019 Schedule and Tuition (USD)

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† includes field trip

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CROSS-TRAINING

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 fault, 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 Schedule and Tuition (USD)

HOUSTON, US  3-7 JUNE  $4325
2-6 DEC  $4325
KUALA LUMPUR, MYS  19-23 AUG  $5490
LONDON, UK  1-5 APR  $5035+VAT

2019 Schedule and Tuition (USD)

ORLANDO, US  21-25 OCT  $4370
PERTH, AUS  2-6 SEP  $5600+GST

2019 Schedule and Tuition (USD)

DEWERY, US  8-12 JULY  $4320
HOUSTON, US  18-22 NOV  $4325
LONDON, UK  19-23 AUG  $5035+VAT

Instrumentation and Controls Fundamentals for Facilities Engineers – E3

FOUNDATION 5-DAY

This course applies fundamental electrical engineering principles to oil and gas facilities. The course is designed for Facilities Engineers who interface with electrical systems, and provides practical insight and development of new Facilities Electrical Engineers. Through the use of individual and group problem solving, attendees will learn about power transformers, motors, generators, one-line diagram interpretation, protection and coordination of electrical equipment, site and standby generation, electrical safety, and hazardous areas identification. Participants will gain a better understanding of electrical power systems in oil and gas facilities. This course is a more in-depth version of the content of ICE21 and ICE21 is not a prerequisite for taking this course.

DESIGNED FOR

Those facilities personnel who interface with facility electrical power systems, including project engineers, operation leads, instrumentation, controls personnel, and electrical engineers who are new to electrical power systems within oil and gas facilities.

YOU WILL LEARN

• Fundamental concepts of electricity including voltage, current, resistance, power, induction, capacitance, and power factor
• The key components of facilities electric power distribution, which include circuit arrangements, low and medium voltage switchgear, and single-phase and three-phase schemes
• Transformer operator, components, turns and voltage ratios, losses, efficiency, rating, and connections
• The difference between direct current, induction and synchronous current motors, motor enclosures, and how to select, start, protect, and control motors
• The principles of protecting electrical equipment, including time current curves, fuses, circuit breakers, and coordination
• The purposes and sizing criteria for backup power, including generators and UPS power systems
• The considerations and sizing criteria for on-site power generation, which includes standby, prime, peak, and co-generation
• What grounding and bonding systems are, with an overview of ignition sources, shock protection, separately derived systems, and substation grounding
• The concepts, terminology and application of hazardous area classification standards, equipment protection methods, and installation requirements for NEC and IEC projects

COURSE CONTENT

Fundamentals of insulation and conduction • Direct current, alternating current • Transformers power and instrument • Motors induction and synchronous • Power distribution • System protection and coordination • Standby power systems • Power generation • Variable speed drive principles • Grounding, bonding, and electrical safety • Hazardous area identification

Overview of Offshore Systems – OS21

BASIC 5-DAY

This five-day course will accelerate the learning and productivity of individuals with little to no experience working in the offshore oil and gas industry. The course provides an overview of field development concepts and explains how offshore structures and facilities function as integrated systems. The content includes the full range of water depths from shallow water to ultra-deepwater. All major components required for offshore developments such as fixed and floating platforms, drilling and workover rigs, pipelines, risers, process and utilities and construction equipment are discussed.

YOU WILL LEARN TO

• Identify the key steps in the development of offshore fields from discovery through decommissioning
• Understand the elements of field architecture to define a workable field development
• Recognize key stakeholder issues
• Recognize offshore production facilities and structures, fixed and floating.
• Understand the impact of the ocean environment on facilities design and operations
• Identify major design, construction, and operational issues and interfaces of offshore systems
• Recognize important forces on offshore structures and their influence on design and cost
• Understand strategic options for well drilling (conventional and advanced)
• Appreciate the basic processes and equipment involved in the topsides design and operation
• Understand fluid transportation options and equipment
• Understand the marine equipment used in the construction of offshore facilities
• Understand basic issues in life-cycle and decommissioning decisions
• Appreciate advances in offshore technology

COURSE CONTENT

Field development concepts, fixed and floating • Subsea systems • Wells, construction and servicing • Topsides facilities; processing; utilities • Oil and gas transportation systems, design and installation • Production operations
• Offshore construction; equipment • Fabrication; transportation; integration; installation project management • Life-cycle considerations, including decommissioning

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**Piping Systems - Mechanical Design and Specification - ME41**

**INTERMEDIATE  5-DAY**

This 5-day, intermediate level course for engineers and piping system designers reviews the key areas associated with the design of piping systems for oil and gas facilities. The course is focused on four areas: codes and standards, pipe materials and manufacture, piping components, and piping layout and design. Applicable piping codes for oil and gas facilities (ISO, B31.3, B31.4, B31.8, etc.), pipe sizing calculations, pipe installation, and materials selection are an integral part of the course. The emphasis is on proper material selection and specification of piping systems.

**FIELD TRIP**

This PetroSkills training course is ideal for mechanical, facilities, plant, or pipeline engineers and piping system designers who are involved in the design of on-plant piping systems for oil and gas facilities.

**YOU WILL LEARN**

- To apply piping system codes and standards
- About line sizing and layout of piping systems in various types of facilities
- How to specify proper components for process and utility applications
- To compare alternative materials of construction
- The process of steelmaking, pipe manufacturing, and material specifications
- Joining methods and inspection techniques
- Key considerations for flare and vent systems, including PSV sizing

**COURSE CONTENT**

Piping codes and standards (ANSI/ASME, API, ISO) • Pipe materials and manufacturing • Basic pipe stress analysis methods • Valves and actuators • Welding and non-destructive testing • Line sizing basics (single-phase and multiphase flow) • Pipe and valve material selection • Piping layout and design • Manifolds, headers, and flare/vent systems • Non-metallic piping systems • Operations and maintenance considerations of facilities and pipelines

**2019 Schedule and Tuition (USD)**

- BRISBANE, AUS 9-13 DEC $6700+GST
- DUBAI, UAE 23-27 OCT $5405+VAT
- HOUSTON, US 22-26 JUNE $4425
- LONDON, UK 22-26 JULY $5135+VAT
- MIDLAND, US 19-23 AUG $4370

**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 compressor 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 Schedule and Tuition (USD)**


† includes field trip

**2019 Schedule and Tuition (USD)**


**Compressor Systems - Mechanical Design and Specification - ME46**

**SPECIALIZED  5-DAY**

This 5-day, specialized level course is for facility design engineers, operations engineers, and technicians seeking an in-depth understanding of centrifugal, reciprocating, and screw compression. This course provides basic knowledge of compressor types and associated auxiliary systems, mechanical design of equipment, operating and performance characteristics, control and monitoring systems, maintenance practices, and codes and standards.

**DESIGNED FOR**

Mechanical, facilities, plant, or pipeline engineers and technicians needing an in-depth understanding of the different types of compressors.

**YOU WILL LEARN**

- How to apply thermodynamics to compressor performance and operating characteristics
- How to size, specify, and select compressors
- Compressor auxiliary systems
- Series and parallel applications of compressors
- How to integrate compressor systems into process facilities used in the oil and gas industry
- How to use state-of-the-art monitor and control devices in the operation, maintenance, and troubleshooting of compression systems
- How to apply maintenance practices to improve compressor reliability
- Shop and field performance testing
- Compressor economics including DPEX vs. CAPEX considerations

**COURSE CONTENT**

Types and application of compressors • Selection criteria of dynamic and positive displacement compressors • Compressor thermodynamics and operating characteristics • Performance curves and off-design evaluations • Key compressor components and other auxiliary systems • Equipment specifications • Compressor controls and monitoring devices • Driver and gear involvement • Installation, operation, maintenance practices, and troubleshooting • Economic considerations

**2019 Schedule and Tuition (USD)**

- HOUSTON, US † 15-19 SEP $5560
- DENVER, US 17-21 JUNE $4420
- DUBAI, UAE 3-7 NOV $5545+VAT
- HOUSTON, US 22-26 JULY $4425
- KUALA LUMPUR, MYS 21-25 OCT $5135+VAT
- MIDLAND, US 29 JUL-2 AUG $4320

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Gas Conditioning and Processing – G4
The Campbell Gas Course®

FOUNDATION 10-Day
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
• About the selection and evaluation of processes used to dehydrate natural gas, meet hydrogen donor specifications, and extract NGLs
• 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-liquid phase behavior, hydrates, etc.
• Basic thermodynamics and application of energy balances
• Process control and instrumentation
• Relief and flare systems
• Fluid hydrates: two-phase flow
• Separation equipment
• Heat transfer equipment
• Pumps
• Compressors and drivers
• Refrigeration in gas conditioning and NGL extraction facilities
• Fractionation
• Glycol dehydration; TEG
• Absorption dehydration and hydrocarbon removal
• Gas treating and sulfur recovery
• Overview and summary

2019 Schedule and Tuition (USD)

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Overview of Subsea Systems – SS2

BASIC 5-DAY
An overview of subsea components and how they are integrated into field architecture is provided during this five-day course. Individuals will develop a basic understanding of the various subsea components used in all water depths, from relatively shallow to ultra-deepwater. The participants will all learn how the components are integrated into subsea field developments, which will accelerate learning and productivity. Installation and flow assurance are emphasized as key drivers in subsea design. The course emphasizes a systems approach to design. Individual and group exercises are used throughout the course, including a case study to develop field architecture recommendations, basic component selection, and high level project execution plans for a subsea development. Course instructors are experienced offshore managers.

DESIGNED FOR
Technical staff who are beginning or transitioning into the design, construction, and operation of subsea systems. Non-technical staff working with a subsea development team will benefit by developing an awareness of subsea systems.

YOU WILL LEARN HOW TO
• Recognize the integrated nature of field architecture, system design, and component selection
• Identify appropriate applications for subsea systems
• Identify the main subsea components, their functions, strengths, weaknesses, and interfaces from the well to the production facility
• Understand key design, construction, and installation issues
• Describe basic operating and maintenance considerations
• Understand the key steps, from drilling through startup, for the design, fabrication, testing, installation, and operation
• Understand the importance of an integrated approach to design, flow assurance, installation, and life-cycle considerations

COURSE CONTENT
Applications for subsea systems • Flow assurance considerations in system design and configuration • Field architecture considerations • Subsea component descriptions and functions • Manufacturing, testing, installation, commissioning, and operational issues • Production, maintenance, and repair considerations

2019 Schedule and Tuition (USD)

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- Offshore & Subsea
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- Mechanical Engineering
- Reliability Engineering
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**Petroleum Business and Professional Development**
- Petroleum Professional Development
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