PetroSkills®
2019-20 Mechanical Engineering Training Guide
<table>
<thead>
<tr>
<th>Facilities Course Progression Map</th>
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</table>

### Process Safety
- General Processing
- Oil / Water
- Gas

### Oil and Gas Processing
- Gas Conditioning and Processing Principles – G4
- Gas Conditioning and Processing - LNG Emphasis – G4LNG
- Oil Production and Processing Facilities – PF4

### Instrumentation, Controls & Electrical
- Instrumentation and Controls Fundamentals for Facilities Engineers – IC3
- Electrical Engineering Fundamentals for Facilities Engineers – E3
- Process Safety Engineering – PS4
- Risk Based Process Safety Management – HS45

### Offshore \& Subsea
- Flow Assurance for Offshore Production – FAOP
- Offshore Pipeline Design and Construction – PL43
- Corrosion Management in Production/Processing Operations – PF22

### Pipeline Engineering
- Terminals and Storage Facilities – PL42
- Onshore Pipeline Facilities: Design, Construction and Operations – PL42

### Basic
- Overview of Gas Processing – G2
- Overview of Offshore Systems – OS21
- Overview of Subsea Systems – SS2

### Specialized
- Process Safety Engineering – PS4
- Practical PID Control and Loop Tuning – IC74
- Flow and Level Custody Measurement – IC73
- Valve and Actuator Technologies – IC72

### 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

### 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
- 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
- Instrumentation, Controls and Electrical Systems for Facilities Engineers – ICE21

### Electrical Instrumentation & Controls
- Instrumentation, Controls and Electrical Systems for Facilities Engineers – ICE21
- PLC and SCADA Technologies – IC71
- Flow Assurance for Offshore Production – FAOP

### General Processing
- CO2 Surface Facilities – PF81
- Separation Equipment - Selection & Sizing – PF42
- Relief and Flare Systems – PF44
<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>Mechanical Specification of Pressure Vessels and Heat Exchangers – ME43</td>
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<td>Fundamentals of Pump and Compressor Systems – ME44</td>
<td>Amine Sweetening and Gas Dehydration for Operations &amp; Maintenance – OT41</td>
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<td>Basics of Rotating Mechanical Equipment – BRM</td>
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This course will cover the main causes of corrosion in upstream oil and gas operations, as well as monitoring and mitigation methods. The various corrosion mechanisms give rise to a number of different forms of corrosion damage, which will all be considered. Participants will estimate the corrosivity of a given environment through analysis of the chemical and physical characteristics of the system, review approaches to selecting materials and coatings for corrosion resistance for different conditions and applications (including the use of NACE MR0175/ISO 15156), and be introduced to cathodic protection (CP) surveys, selecting the CP system type, estimating current requirements, and the design principles of simple cathodic protection systems. The participant will learn how to select and utilize corrosion inhibitors for different systems, and how to select and apply corrosion monitoring techniques to create an integrated monitoring program. The course content is based on a field facilities engineering point of view, as opposed to a more narrowly-specialized corrosion engineering or chemistry viewpoint. It provides an appropriate balance of necessary theory and practical applications to solve/mitigate corrosion-related problems.

**DESIGNED FOR**
Managers, engineers, chemists, and operators who need to understand corrosion and its control management in oil and gas production and processing.

**YOU WILL LEARN**
- The basics of corrosion chemistry
- The main corrosion mechanisms occurring in oil and gas production/processing systems
- The different types of damage caused by corrosion
- Materials selection for corrosion prevention
- Some methods for conducting cathodic protection (CP) surveys
- Items to consider in corrosion inhibitor selection
- Key advantages and disadvantages of the various corrosion monitoring methods
- Where the main locations of corrosion concern occur within oil production systems, gas processing facilities (including amine units), and water injection systems

**COURSE CONTENT**
Fundamentals of corrosion theory • Major causes of corrosion (O2, CO2, H2S, microbiologically influenced corrosion) • Forms of corrosion damage • Materials selection • Protective coatings and linings • Cathodic protection • Corrosion inhibitors • Corrosion monitoring and inspection • Corrosion in gas processing facilities • Corrosion in water injection systems • Corrosion management strategy and life-cycle costs

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

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

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.

**DESIGNED FOR**
This PetroSkills training course is ideal for mechanical, facilities, plant, or pipeline engineers and piping system designers who are involved in the design of in-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 (ASME/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 flares/vent systems • Non-metallic piping systems • Operations and maintenance considerations of facilities and pipelines

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

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FOR MORE INFORMATION, VISIT PETROSKILLS.COM/BRMBLENDED
FOR MORE INFORMATION, VISIT PETROSKILLS.COM/BSMBLENDED
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.

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 such as drives 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 hydraulic and compressor thermodynamics, and their effect on selection and operation
• 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

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 compressors. 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.

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 application 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 compressors
• How to apply thermodynamics to compressor

You will gain knowledge of:
• Identifying significant operating conditioning monitoring parameters and troubleshooting techniques
• Compressor economics including OPEX 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

Any course is available inhouse at your location. Contact us today.

+1.918.828.2500 | petroskills.com | +1.800.821.5933 (toll free North America)
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 hydrocarbon dewpoint 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-hydrocarbon phase behavior, hydrates, etc.
- Basic thermodynamics and application of energy balances
- Process control and instrumentation
- Relief and flare systems
- Fluid hydraulics, two-phase flow
- Separation equipment
- Heat transfer equipment
- Pumps
- Compressors and drivers
- Refrigeration in gas conditioning and NGL extraction facilities
- Fractionation
- Glycol dehydration, TEG
- Adsorption dehydration and hydrocarbon removal
- Gas treating and sulfur recovery
- Overview and summary

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

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**FOR MORE INFORMATION, VISIT PETROSKILLS.COM/G3ONLINE**
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**

Pipeline project managers and engineers, operations and maintenance, 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
- Apply mechanical and physical principles to pump and compressor selection
- Describe the important factors in station design
- Describe the importance of route selection and hydraulics 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, bores
- 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
- Proper system sizing and design
- Equipment selection criteria
- Facilities sites and design considerations
- Construction methods and contracting approaches
- Operations and asset integrity management

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

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<th>Course Fee</th>
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<td>HOUSTON, US</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 Sections E3 and I3 courses, but in more conceptual level. This course is not a prerequisite for taking E3 or I3, but rather a replacement for those who are not able to take both E3 and I3.

**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&E systems. Electrical and Instrumentation Engineers should consider E3 and I3 for 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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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 treatment 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 asphaltene, etc. Exercises requiring calculations are utilized throughout the course. The course is 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
- Solution gas handling

**COURSE CONTENT**

- Reservoir traps, rocks, and drive mechanisms
- Production/develop 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 treatment
- 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

**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 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, workshop equipment, pipelines, risers, process, and utilities and construction equipment are discussed. 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 facility 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 of topside facilities (well connection, well servicing, processing, and utilities) on the design of the supporting structure and outline the topsides design process
- 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 they impact the lessons learned to your work

**COURSE CONTENT**

- Offshore systems overview and field architecture selection
- Well construction and servicing equipment and operation
- Flow assurance
- Topsides 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>
<thead>
<tr>
<th>Location</th>
<th>Dates</th>
<th>Course Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAKERSFIELD, US</td>
<td>20 APR-1 MAY 2020</td>
<td>$9020</td>
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<tr>
<td>DENVER, US</td>
<td>11-22 MAY 2020</td>
<td>$9120</td>
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<tr>
<td>DUBAI, UAE</td>
<td>8-19 DEC 2019</td>
<td>$9525+VAT</td>
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<tr>
<td>HOUSTON, US</td>
<td>6-17 DEC 2019</td>
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<td>KUALA LUMPUR, MYS</td>
<td>11-22 NOV 2019</td>
<td>$8935</td>
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<td>KUALA KUMPAT, KUALA LUMPUR, MYS</td>
<td>17-30 NOV 2019</td>
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<td>LONDON, UK</td>
<td>13-24 SEP 2019</td>
<td>$9715</td>
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</tbody>
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- Petrophysics
- Reservoir Engineering
- Well Construction/Drilling
- Production and Completions Engineering
- Unconventional Resources
- Integrated - Heavy Oil
- Petroleum Data Management

**Facilities**
- Gas Processing
- Process Facilities
- Offshore & Subsea
- Pipeline Engineering
- Instrumentation, Controls & Electrical
- Reliability Engineering
- Procurement/Supply Chain Management
- Refining

**Operations & Maintenance**

**Health, Safety, Environment**

**Petroleum Business and Professional Development**
- Petroleum Professional Development
- Petroleum Business
- Project Management

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- Completions and Workovers
- Foundations of Petrophysics
- Gas Conditioning and Processing Principles
- NODAL Analysis Workshop
- Process Safety Engineering
- Production Logging
- Production Operations 1
- Production Technology for Other Disciplines
- Scale Identification, Remediation and Prevention Workshop

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