

# **PetroSkills®**

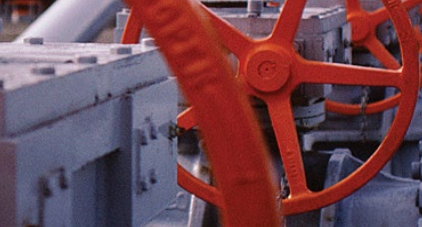
**2016 Mechanical Training Guide**



**OGCI®**

**John M. Campbell**

**RDC**



# Mechanical

## Course Progression Matrix

The Mechanical courseware progression covers equipment and systems that are key to any facility engineer or those that are pursuing a deeper rotating equipment role with your company. The Intermediate level opportunities involve specific sessions focused into key areas such as piping, pressure vessels, pumps and compression. In addition, a deeper focus into reliability and optimization is a key theme in the mechanical discipline as this is commonly an industry benchmark. Our specialized courses are designed for engineers with more than a few years of experience whereby the participant can focus on solutions to real world problems.

The following instructors have been selected and approved by the PetroSkills Curriculum Network:

MR. JOHN CURRY	MR. KEN LUNSFORD
MR. WOLFGANG FOERG	DR. MAHMOOD
MR. RON FREND	MOSHFEGHIAN
MR. JOSH GILAD	MR. PAUL VERRILL
MR. GERALD GUIDROZ	MR. STUART WATSON
MR. BOB HUBBARD	

### Piping Systems - Mechanical Design and Specification – ME-41

INTERMEDIATE

This five day, foundation 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 (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

#### 2016 Schedule and Tuition / 5 Days

DENVER, US	18-22 JUL	US\$4160
DUBAI, UAE	6-10 NOV	US\$5190
HOUSTON, US	15-19 FEB	US\$4150
	12-16 DEC	US\$4150
LONDON, UK	15-19 AUG	US\$4780+VAT

# MECHANICAL

### Mechanical Specification of Pressure Vessels and Heat Exchangers – ME-43

NEW

INTERMEDIATE **FIELD TRIP**

This five day, intermediate level course for facility engineers and project engineers reviews the key areas associated with the mechanical design of pressure vessels and heat exchangers for oil and gas facilities. The course is focused on vessels, heat exchangers built in accordance to ASME VIII Div 1, considering material selection, key design calculations, and manufacturing processes. The course is not aimed at process engineers sizing equipment (PF-42 and PF-43 cover these elements), although a brief review of the sizing correlations is included. The course is delivered from the perspective of a vessel fabricator to better understand the dos and don'ts of ideal mechanical specification of pressurized equipment by owner/operators, in order to optimize material utilization and minimize construction costs. Houston sessions feature an afternoon field trip to a large pressure vessel fabricator.

#### DESIGNED FOR

Mechanical, facilities, construction, or project engineers and plant piping/vessel designers who are involved in the specification and purchasing of pressure vessels, heat exchangers, and other pressure-containing equipment for oil and gas facilities.

#### YOU WILL LEARN

- About ASME B&PV code and the commonly used sections relevant to oil and gas equipment
- To specify correct and commonly used materials according to ASME II
- How to design vessel shells, heads, nozzles, and heat exchanger details
- How to provide accurate equipment specification documents and review documentation for code compliance
- Key fabrication processes used in the workshop and how to simplify construction through correct vessel specification
- About welding processes and inspection requirements per ASME IX

#### COURSE CONTENT

Vessel codes and standards (ASME B&PV Code, TEMA, API) • Vessel material selection, corrosion mechanisms, heat treatment, and basic metallurgy • Essential design calculations for vessels and heat exchangers • Welding process overview and inspection requirements • Constructability and operability considerations • Vessel integrity, evaluation, and re-purposing of pressure-containing equipment according to API/ASME

#### 2016 Schedule and Tuition / 5 Days

HOUSTON, US†	25-29 JAN	US\$4150
	8-12 AUG	US\$4150
	14-18 NOV	US\$4150

† includes field trip

### Fundamentals of Pump and Compressor Systems – ME-44

INTERMEDIATE

This is an intensive five 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

#### 2016 Schedule and Tuition / 5 Days

DENVER, US	25-29 JUL	US\$4160
DUBAI, UAE	13-17 NOV	US\$5190
HOUSTON, US	15-19 AUG	US\$4150
KUALA LUMPUR, MY	24-28 OCT	US\$5460
LONDON, UK	14-18 MAR	US\$4780+VAT
	22-26 AUG	US\$4780+VAT

SPECIALIZED

INTERMEDIATE

## Mechanical

TURBOMACHINERY MONITORING AND PROBLEM ANALYSIS – ME-62 (PAGE 2)

COMPRESSOR SYSTEMS - MECHANICAL DESIGN AND SPECIFICATION – ME-46 (PAGE 2)

FUNDAMENTALS OF PUMP AND COMPRESSOR SYSTEMS – ME-44 (PAGE 1)

MECHANICAL SPECIFICATION OF PRESSURE VESSELS AND HEAT EXCHANGERS – ME-43 (PAGE 1)

PIPING SYSTEMS - MECHANICAL DESIGN AND SPECIFICATION – ME-41 (PAGE 1)





## Compressor Systems - Mechanical Design and Specification – ME-46

SPECIALIZED

This five day, foundation 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.

### 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 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 compression systems
- How to apply maintenance practices to improve compressor reliability
- Shop and field performance testing
- Compressor economics including OPEX vs. CAPEX considerations

### COURSE CONTENT

- Types and application of compressors
- Selection criteria of dynamic and positive displacement compressor
- 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

## Turbomachinery Monitoring and Problem Analysis – ME-62

SPECIALIZED

This five day course is an intensive, specialized level program for experienced mechanical equipment engineers to develop and expand their capabilities in monitoring and problem analysis of turbomachinery. This course focuses on defining the systems and subsystems that form the turbomachinery, the potential problems with these systems and subsystems, monitoring techniques for early detection of problems, and methods to analyze the monitored variables to detect potential problems or reconstruct reasons for failures. Case studies are used throughout the course.

### DESIGNED FOR

Experienced mechanical or facilities engineers and senior technicians needing an understanding of monitoring and troubleshooting turbomachinery.

### YOU WILL LEARN

- How to evaluate turbine performance during startup and operation
- To identify turbomachinery system components
- How to define and use appropriate monitoring techniques and tools
- To utilize effective operation and shutdown procedures
- How to analyze common turbomachinery problems, such as vibration, temp/pressure operation, and surge
- To solve instrumentation and control problems
- Understand the inter-relationships of drivers, couplings, gearboxes, and driven equipment
- Installation techniques, equipment failures, and different maintenance practices
- Economic considerations

### COURSE CONTENT

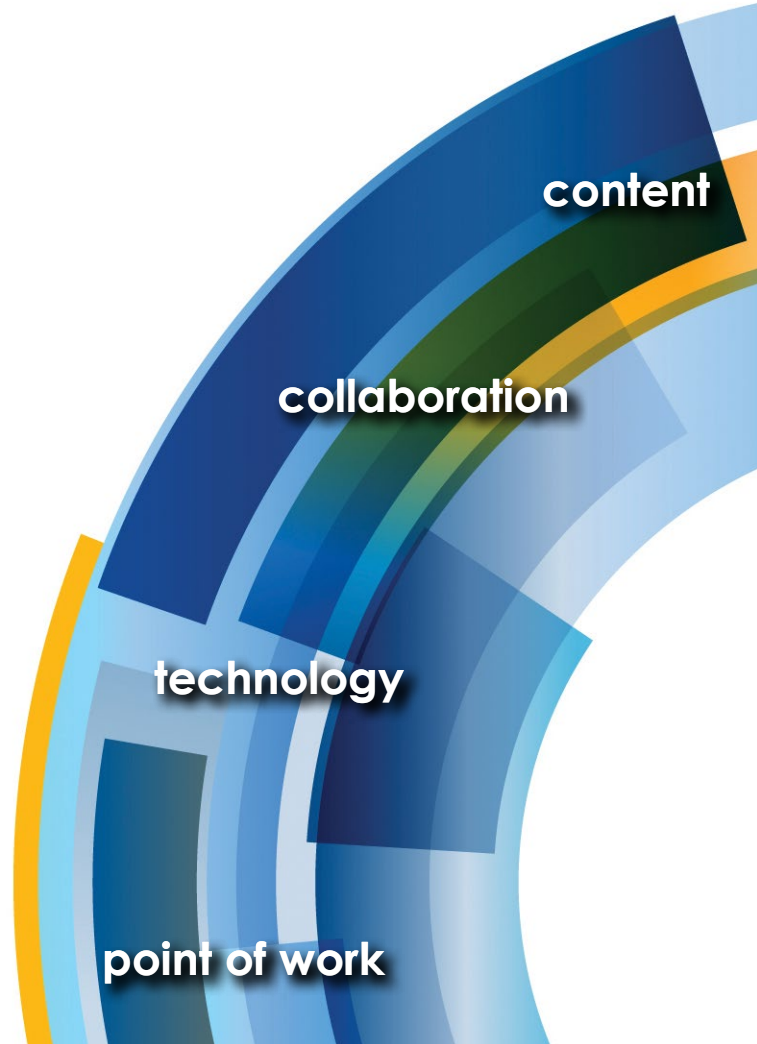
- Gas turbine machinery – general description
- Operating principles of gas turbines
- Key performance variables and means to monitor
- Major components of axial flow compressors: rotors, blades, shafts, combustion chambers, nozzles, etc.
- Auxiliary systems: lube oil, seal oil, fuel, start-up, etc.
- Evaluation of turbine performance parameters during start-up and normal operation
- Troubleshooting control systems for gas turbines: start-up, speed and temperature controls, vibration
- Principles of operation and general components of compressors: rotors, seals, diaphragms, etc.
- Operating characteristics curves
- Surging phenomenon
- Choking phenomenon
- Compressor instrumentation: various control loops, anti-surge control loops
- Compressor safety interlock and trip systems
- Gas turbine and compressor systems start-up procedures
- Normal operation – monitoring of parameters
- Shutdown procedures
- Logging of monitoring checks
- Vibration monitoring
- Troubleshooting

## PetroAcademy™ Blended Learning

PetroSkills Blended Learning Programs combine industry expertise, content, and technology to develop workforce competency with the added benefit of:

- ✓ **Reduced time to competency**
- ✓ **Eliminated travel expense**
- ✓ **Flexibility—less time away from work**
- ✓ **Learning applied at point of need**

See [petroskills.com/blended](http://petroskills.com/blended) for more information on PetroAcademy™ blended learning.



### 2016 Schedule and Tuition / 5 Days

LONDON, UK	19-23 SEP	US\$4780+VAT
ORLANDO, US	3-7 OCT	US\$4210

### 2016 Schedule and Tuition / 5 Days

HOUSTON, US	19-23 SEP	US\$4150
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# TO VIEW OUR COURSES IN OTHER DISCIPLINES, VISIT:

## Subsurface

- Introductory/Multi-Discipline
- Geology
- Geophysics
- Petrophysics
- Reservoir Engineering
- Well Construction/Drilling
- Production & Completions Engineering
- Unconventional Resources
- Integrated - Heavy Oil
- Petroleum Data Management

## Facilities

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

## Operations & Maintenance

## Health, Safety, Environment

## Petroleum Business and Professional Development

- Petroleum Professional Development
- Petroleum Business
- Project Management

**SIGN UP FOR PETROSKILLS EMAILS**