



Industrial Skills

eLearning Library

COURSES

Full Length (20-60 minutes)

SAFETY, HEALTH, AND PLANT SCIENCE

101-01 - Personal Protective Equipment

When you complete this lesson, you will be familiar with some of the requirements of employers and employees for reducing risk and avoiding injury, illness, and death by properly selecting, using, and maintaining personal protective equipment (PPE).

101-01 - Personal Protective Equipment (v2)

When you complete this lesson, you will be familiar with some of the requirements of employers and employees for reducing risk and avoiding injury, illness, and death by properly selecting, using, and maintaining personal protective equipment (PPE).

101-02 - Hearing and Noise Safety

When you complete this lesson, you will be able to identify conditions that lead to hearing damage or loss and use both engineering controls and personal protective equipment to prevent such damage.

101-02 - Hearing and Noise Safety (v2)

When you complete this lesson, you will be able to identify conditions that lead to hearing damage or loss and use both engineering controls and personal protective equipment to prevent such damage.

101-03 - Respiratory Protection Program

When you complete this lesson, you will be able to identify respiratory hazards and utilize personal respiratory equipment to prevent injury or illness caused by poor breathing conditions in the workplace.

101-70 - Introduction to OSHA

When you complete this lesson, you will be able to describe the large role OSHA plays in maintaining employee health and safety as employees perform their daily work.

101-71 - Introduction to Industrial Hygiene

When you complete this lesson, you will be able to discuss and apply principles of industrial hygiene towards a safer working environment.

102-01 - Slip, Trip, and Fall Prevention

When you complete this lesson, you will be able to adhere to safe practices to prevent slips, trips, and falls in the workplace.

102-02 - Ladder Safety

When you complete this lesson, you will be able to identify the specifications regarding several different types of ladders and adhere to standard safety precautions for the use, maintenance, and storage of ladders.

102-03 - Portable Power and Hand Tool Safety

When you complete this lesson, you will be able to identify hazards associated with the use of hand and power tools. You will be able to prevent accident and injury in the workplace by adhering to safety practices and requirements.

102-04 - Machine Hazards and Safety

When you complete this lesson, you will be able to identify common workplace hazards associated with operating machinery and apply safeguards to prevent injury and death in the workplace.

102-05 - Machine Guarding

When you complete this lesson, you will be able to adhere to machine guard safety requirements by describing the characteristics of a machine guard and explaining its function.

102-06 - Accident Causes, Prevention, and Investigation

When you complete this lesson, you will be able to recognize factors that cause accidents and methods to prevent accidents. In addition, you will understand the process of investigating an accident.

102-07 - Stationary Power Tool Safety

When you complete this lesson, you will be able to safely operate a number of stationary power tools by adhering to general work area safety requirements and specific requirements for many stationary power tools found in the workplace.

102-08 - Laboratory Health and Safety

When you complete this lesson, you will understand how to safely work in a laboratory. In addition, you will be able to describe the proper disposal of laboratory waste.

102-09 - Operator Fatigue

When you complete this lesson, you will be able to define and recognize symptoms of operator fatigue. You will also be able to recall the causes of operator fatigue, be familiar with ways to identify operator fatigue in yourself and others and identify wa

102-10 - Hazard Identification and Assessment

When you complete this lesson, you will be able to recall recommended practices for companywide safety and health programs regarding hazard identification and assessment.

103-01 - First Aid

When you complete this lesson, you will be able to describe common injuries that require first aid treatment and provide aid for such injuries. You will also identify major emergencies requiring the services of emergency personnel and provide initial trea

103-02 - Bloodborne Pathogens

When you complete this lesson, you will be able to define bloodborne pathogens and describe the common diseases caused by them. You will also understand how to protect yourself from exposure to bloodborne pathogens and what to do when exposed to them.

103-03 - First Aid Resuscitation - Choking, CPR, and AED

When you complete this lesson, you will be able

to demonstrate how to assist victims using appropriate first aid techniques including the Heimlich Maneuver, CPR, and the use of an AED (Automated External Defibrillator).

103-04 - Temperature Related Stress and Illnesses

When you complete this lesson, you will be able to recognize the causes and effects of temperature related stress. In addition, you will be able to identify illnesses associated with temperature related stress.

104-01 - Fire Prevention and Protection

When you complete this lesson, you will be able to plan, practice, and apply the standards of the fire protection program in the workplace.

104-02 - Fire Extinguisher Safety

When you complete this lesson, you will be able to identify the four fuel sources and the appropriate extinguisher to use to put out a small fire and apply the safest procedures for extinguishing a fire in the workplace. You will also be familiar with the

104-03 - Combustible Dusts

When you complete this lesson, you will be able to identify common combustible dusts and their associated workplace hazards. You will also understand basic control measures that reduce the production of combustible dusts.

105-01 - Lockout Tagout Safety Program

When you complete this lesson, you will be able to explain the necessity of a lockout/tagout program and adhere to the procedures and practices of lockout/tagout safety.

106-01 - Confined Space Entry - Entrant and Attendant Duties

When you complete this lesson, you will understand the role of the authorized attendant, as well as the entrant working in confined spaces. You will also be able to describe steps taken to safely enter and work within a confined space.

106-02 - Confined Spaces - Entry Supervisor Duties

When workers enter confined spaces, the entry supervisor oversees all operations prior to entry, as well as during, and after all work has been completed. The entry supervisor must be familiar with all operations of confined spaces to ensure the safety o

106-80 - Confined Spaces: Entrant and Attendant Duties (CAD)

When you complete this lesson, you will understand the role of the authorized attendant, as well as the entrant working in confined spaces. You will also be able to describe steps taken to safely enter and work within a confined space.

107-01 - Electrical Safety

When you complete this lesson, you will be able to describe the flow of electrical current, describe common hazards of electricity, and practice safety procedures to prevent injury, damage, and death caused by electrical hazards.

107-02 - Energized Electrical Equipment Safety

When you complete this lesson, you will recognize the industrial workplace safety authority and be able to describe safe workplace practices.

107-03 - Arc Flash Hazard Basics

When you complete this lesson, you will be able to define terminology applicable to arc flash, navigate the guidance of the NFPA 70E, and mitigate unsafe conditions potentially resulting in an arc flash.

108-01 - Materials Handling and Storing Safety

When you complete this lesson, you will be able to minimize the risks of injury and illness by safe handling and storing materials in the workplace.

109-01 - Rigging Safety

When you complete this lesson, you will have a clear understanding of the factors you need to

consider with every lift that involves the use of rigging.

110-01 - Scaffolding Safety

When you complete this lesson, you will be able to distinguish the responsibilities of those employees who work on or near scaffolding to assemble, maintain, and operate all scaffolding systems and adhere to safety requirements.

111-01 - Scissor Lift Operations and Safety

When you complete this lesson, you will be able to explain importance of operating the scissor lift according to the step-by-step procedures listed in most operating manuals. You will also be able to explain the safety measures that must be followed in de

112-01 - Crane and Hoist Safety

When you complete this lesson, you will be able to describe rules and responsibilities for the safe operation of cranes, hoists, and riggings and perform hand signals as well as perform a safety checklist for the operation of cranes and hoists.

113-01 - Forklifts and Powered Industrial Trucks Safety

When you complete this lesson, you will be able to adhere to the safe practices and procedures for minimizing the hazards of operating forklifts and other powered industrial trucks in the workplace.

114-01 - Fall Protection

When you complete this lesson, you will be able to avoid falls and injury due to falling objects in the workplace by adhering to safety precautions and utilizing safety equipment.

114-81 - Fall Protection (CAD)

When you complete this lesson, you will be able to recall best practices for avoiding falls and injury due to falling and falling objects in the workplace by adhering to safety precautions and utilizing appropriate safety equipment.

115-01 - Excavation and Trenching Safety

When you complete this lesson, you will be able to identify the safe procedures minimizing the hazards of working in or near excavation and trenching sites and adhere to safe practices applying to the heavy equipment used in excavation.

116-01 - Compressed Gas Cylinders Safety

When you complete this lesson, you will be able to safely handle, store, and use gas cylinders.

117-01 - Hazardous Materials Safety

When you complete this lesson, you will be able to identify hazardous materials common to the industrial and commercial workplaces and appropriately respond to spills, leaks, or other types of contamination within the workplace to protect personnel and th

117-02 - Acid and Caustic Awareness

When you complete this lesson, you will understand how substances are ranked on the pH scale. You will also be able to describe general safety precautions and emergency actions employed when working with acids and caustics.

117-03 - Asbestos and Silica Awareness

When you complete this lesson, you will recognize the health risks associated with both asbestos and silica. You also will be able to identify ways to prevent exposure to these materials in the workplace.

117-04 - Ammonia Awareness

When you complete this lesson, you will be able to recognize the health risks associated with working around ammonia. You will also be able to identify steps to protect yourself during general maintenance or emergency activities.

117-05 - Hydrogen Sulfide Awareness

When you complete this lesson, you will understand the common warning signs, health effects, and personal protection requirements related to H₂S exposure.

117-06 - Chlorine Awareness

When you complete this lesson, you will recognize the occupational hazards and potential health effects of chlorine exposure.

117-07 - Radiation Awareness

When you complete this lesson, you will understand a basic overview of radiation. In addition, you will be able to describe associated health risks commonly associated with radiation and identify methods to protect yourself and others from exposure.

117-08 - Hazardous Gases - Methane, Carbon Monoxide, and Carbon Dioxide

When you complete this lesson, you will be able to understand the common health and safety hazards associated with methane, carbon monoxide, and carbon dioxide. You will also understand where these gases can be found in the workplace and be able to descr

117-09 - Lead Awareness

When you complete this lesson, you will understand risks associated with lead, where you might encounter this element in the workplace, and the negative health effects it can cause. Additionally, you will be able to identify prevention measures, such as t

117-20 - Gas Monitoring Basics

When you complete this lesson, you will be able to describe the basic design and operation of a gas monitor.

117-83 - Asbestos Awareness

When you complete this lesson, you will recognize the health risks associated with asbestos. You also will be able to identify ways to prevent exposure to this material in the workplace.

117-85 Hydrogen Sulfide Awareness (CAD)

When you complete this lesson, you will be able to recall the common warning signs, health

effects, and personal protection requirements related to H2S exposure.

118-01 - HAZWOPER Regulation Overview

When you complete this lesson, you will be able to discuss an overview of federal acts and regulatory bodies that protect workers who deal with hazardous materials. In addition, you will have a basic understanding of terminology and numbering used to out

118-02 - Site Characterization and Analysis

When you complete this lesson, you will be able to describe how site characterization and analysis is used to protect the lives of employees and ensure a safe working environment at sites containing hazardous substances.

118-03 - Toxicology

When you complete this lesson, you will be able to explain the potential health effects of exposure to various toxic substances.

118-04 - Medical Surveillance

When you complete this lesson, you will be able to describe the design and function of a medical surveillance program.

118-05 - Decontamination

When you complete this lesson, you will be able to discuss principles of decontamination and describe activities performed in a standard decontamination corridor.

118-06 - Emergency Procedures

When you complete this lesson, you will be able to discuss the purpose and scope of an emergency response plan. You will also understand the roles and responsibilities of those individuals responding to a hazardous materials release.

119-01 - Written Hazardous Communication Program - Part 1

119-02 - Written Hazardous Communication Program - Part 2

119-03 - Hazardous Communications Employee Training Program, Part 1

When you complete this lesson, you will be able to discuss the Hazardous Communication Program and describe the training provided under this program for every employee.

119-04 - Hazardous Communications Employee Training Program, Part 2

When you complete this lesson, you will be able to describe how exposure to hazardous materials occurs. You will also be able to explain how to choose and use equipment for personal protection.

119-05 - Material Safety Data Sheets

119-06 - Hazard Communication Programs in the Workplace

When you complete this lesson, you will be able to discuss the Hazardous Communication Program and describe the training and information provided under this program for every employee.

119-07 - Exposure to and Detection of Hazardous Chemicals

When you complete this lesson, you will be able to describe how exposure to hazardous materials occurs and what can influence the severity of the effects of the hazard. You will also be able to describe ways a hazardous release can be detected.

119-08 - Physical, Health, and Environmental Hazard Classes

When you complete this lesson, you will be able to discuss the physical, health, and environmental hazard classifications according to The Globally Harmonized System of Classification and

Labelling of Chemicals (GHS). In addition, you will be able to reco

119-09 - Labeling and SDS for Hazardous Chemicals

When you complete this lesson, you will understand proper labeling requirements according to the GHS. In addition, you will be able to recognize pictograms for GHS hazard classifications and describe the contents of the standardized, 16 sections of the SD

120-01 - Classification of Physical Hazards

120-02 - Classification of Health and Environmental Hazards

120-03 - Hazard Communication - Labeling

120-04 - Hazard Communication - Safety Data Sheet (SDS)

122-01 - Safe Driving Practices

When you complete this lesson, you will be familiar with the requirements of drivers of Department of Transportation (DOT) Class 1-6 light or medium duty vehicles. Additionally, you will be aware of defensive driving techniques, hazard perception, and dri

122-02 - Drug and Alcohol Awareness

When you complete this lesson, you will be able to recall the effects of drugs and alcohol, be familiar with the DOT required testing process, and the result-based consequences.

130-01 - Behavior Based Safety Program Basic Design

When you complete this lesson, you will be able to describe the basic design of a behavior based safety program. In addition, you will be able to explain how you can participate in safety

committees and safety inspection teams to positively influence the

130-02 - Behavior Based Safety Program Concepts

When you complete this lesson, you will be able to describe the factors affecting your personal safety on the job including your capabilities, your work environment, and your attitude towards safety, and the behaviors you exhibit. In addition, you will be

130-03 - Hazardous Material Procedures

When you complete this lesson, you will be able to describe some of the basic hazardous materials found in a power plant. Additionally, you will be able to discuss some of the procedures used while working with these products.

130-04 - Confined Space Procedures

When you complete this lesson, you will be able to discuss the reason for a confined space procedure and discuss the basic information found on a confined space permit. In addition, you will be able to explain the difference between a non-permit required

130-05 - Hot Work Procedures

When you complete this lesson, you will be able to describe the purpose of a hot work permit procedure. In addition, you will be able to discuss the basic information that can be found on most hot work permits.

130-06 - Root Cause Analysis

When you complete this lesson, you will understand the process of root cause analysis and how to properly identify a root cause. In addition, you will understand the common tools used in determining root cause.

130-07 - Safety and Health Programs

When you complete this lesson, you will be able to recognize the true cost of workplace accidents, see the benefits of an effective safety and health program, describe the critical elements of an

effective safety and health program, and identify and prevent

131-01 - Ergonomics in an Office Environment

When you complete this lesson, you will understand ergonomics and the disorders related to it. In addition, you will be able to recognize ergonomic hazards in an office environment and determine ways to mitigate these hazards.

131-02 - Ergonomics in an Industrial Environment

When you complete this lesson, you will understand ergonomics and the disorders related to it. In addition, you will be able to recognize ergonomic hazards in an industrial environment and determine ways to mitigate these hazards.

131-03 - Proper Lifting Techniques

When you complete this lesson, you will be able to utilize proper lifting techniques when performing manual material handling tasks. In addition, you will be able to employ techniques to help prevent back injuries.

140-01 - General Concepts and Job Briefings

When you complete this lesson, you will be able to recall general concepts regarding safety while performing electrical work. You will also be familiar with what job briefings are and how they can help a worker avoid accidents.

140-04 - Enclosed Spaces

When you complete this lesson, you will be able to identify the conditions of an enclosed space and how to eliminate or reduce the hazards associated with working in an enclosed space.

140-09 - Electrical Clearances

When you complete this lesson, you will be familiar with the requirements for the control of hazardous energy sources used in power generation, transmission, and distribution.

140-11 - Mechanical Equipment

When you complete this lesson, you will be able

to recall the general requirements for using mechanical equipment during electrical work.

140-18 - Dog Bite Prevention

When you complete this lesson, you will be able to recall techniques for preventing a dog attack and techniques for minimizing the severity of the injury if the attack cannot be prevented.

150-01 - Environmental Awareness

When you complete this lesson, you will be able to identify ways your awareness can reduce the environmental impact of various processes and tasks. In addition, you will be able to describe the process of designing and implementing an environmental management

150-02 - Stormwater Regulations and Pollution

When you complete this lesson, you will be able to describe ways that stormwater runoff can impact the environment. In addition, you will be able to discuss stormwater regulations and explain how to effectively develop a stormwater pollution prevention plan

150-03 - Spill Prevention Control and Countermeasures

When you complete this lesson, you will be able to describe the use of spill prevention control and countermeasures plans. In addition, you will be able to discuss common practices for preventing, responding to, and reporting spills.

160-01 - Health Hazards in Construction

When you complete this lesson, you will be able to recall and discuss principles of industrial hygiene towards a safer working environment.

160-02 - Scaffolding Safety for Construction

When you complete this lesson, you will be able to distinguish the responsibilities of those employees who work on or near scaffolding to assemble, maintain, and operate all scaffolding systems and adhere to safety requirements.

160-03 - Portable Power and Hand Tool Safety for Construction

When you complete this lesson, you will be able to identify hazards associated with the use of hand and power tools. You will be able to prevent accident and injury in the workplace by adhering to safety practices and requirements. You will also be famili

160-04 - Materials Handling and Storing Safety for Construction

When you complete this lesson, you will be able to minimize the risks of injury and illness by safely handling and storing materials in the workplace. You will be able to identify potential hazards when handling materials and identify ways to prevent thos

160-05 - Personal Protective Equipment for Construction, Part 1

When you complete this lesson, you will be familiar with the hierarchy of control for reducing risk and avoiding injury, illness, and death by properly selecting, using, and maintaining personal protective equipment (PPE).

160-06 - Personal Protective Equipment for Construction, Part 2

When you complete this lesson, you will be familiar with some of the requirements of employers and employees for reducing risk and avoiding injury, illness, and death by properly selecting, using, and maintaining personal protective equipment (PPE).

160-07 - Excavation and Trenching Safety for Construction

When you complete this lesson, you will be able to identify hazards and methods of protecting workers from hazards during excavation and trenching operations. You will also be able to recognize the role of a competent person as well as the responsibilitie

170-01 - Introduction to Industrial Math

When you complete this lesson, you will be able to explain the mathematical order of operations, the use of exponents and square roots.

170-02 - Industrial Math: Measurements and Calculations

When you complete this lesson, you will be able to demonstrate how to use equations to solve industrial problems involving length, height, flow and temperature conversions and calculations. You will be able to explain how to read and interpret formulas,

170-03 - Industrial Math: Fractions, Percentages, and Ratios

When you complete this lesson, you will be able to interpret and solve problems using fractions, decimals, and percentages. You will also be able to interpret and solve problems using ratios and proportions.

171-01 - Atomic Structure and Chemical Bonding

When you complete this lesson, you will be able to describe the various components of an atom and discuss atomic theory. You will also be able to explain how chemical bonds are formed and describe the two most common types of chemical bonding.

171-02 - Introduction to the Periodic Table of Elements

When you complete this lesson, you will understand how elements are named, grouped, and listed on the periodic table.

171-03 - Chemical Formulas, Reactions, and Solubility

When you complete this lesson, you will be able to describe different types of chemical formulas and chemical reactions. In addition, you will be able to discuss components and characteristics of solutions.

171-04 - Introduction to Hydrocarbon Chemistry

When you complete this lesson, you will be able to discuss the molecular structure, physical properties, naming conventions, and commercial uses of several common hydrocarbons.

171-05 - Chemical Equations

When you complete this lesson, you will have the knowledge necessary to write and balance chemical formulas and equations.

171-10 - Introduction to Physics - Force and Motion

When you complete this lesson, you will be able to describe terms and types of force as they pertain to classical physics. In addition, you will be able to explain Newton's laws involving motion and perform basic calculations using these laws.

171-11 - Introduction to Physics - Energy, Work, and Power

When you complete this lesson, you will be able to define different types of energy, work and power. You will also be able to use formulas to calculate potential energy, kinetic energy, work done, and power used.

MECHANICAL MAINTENANCE**201-01 - Working Principles of Simple Machines**

When you complete this lesson you will be able to describe several simple machines used to make work easier. These simple machines are the inclined plane, wedge, lever, screw, pulley, gears, and the wheel and axle.

201-02 - Hand Tools I

When you complete this lesson, you will be able to explain safety precautions to take when working with hand tools. You will be able to explain and describe various types of wrenches, hammers, screwdrivers, and pliers commonly used in industrial facilities.

201-03 - Hand Tools II

When you complete this lesson, you will be able to explain and describe various types of saws, files, chisels, punches, vices, clamps, and levels commonly used in industrial facilities.

201-04 Portable Power Tools

When you complete this lesson, you will be able to explain some safety precautions to follow

when working with portable power tools. You will be able to identify and describe various types of grinders, impact wrenches, power drills, power screwdrivers, a

201-05 - Torque Wrenches

When you complete this lesson, you will be able to explain the need for torque wrenches in machining and maintenance operations. You will also be able to describe the various types of torque wrenches available and explain the proper procedures for their use.

202-01 - Introduction to Belt Drive Maintenance

When you complete this lesson, you will be able to knowledgeably discuss the general use and maintenance of belt drive systems.

202-02 - V-Belts

When you complete this lesson, you will be able to explain the design and use of the most common variations of V-belts.

202-03 - Positive Traction Belt Drives

When you complete this lesson, you will be able to describe the major components and proper operation of positive traction drive belt systems used in an industrial facility.

202-04 - Sheave Maintenance

When you complete this lesson, you will be able to describe the design and operation of sheaves and explain basic techniques employed to maintain them.

202-05 - Introduction to Conveyor Systems

When you complete this lesson, you will be able to identify basic conveyor designs and explain how various general configurations are used to move different products and materials from point to point.

202-06 - Conveyor System Design

When you complete this lesson, you will be able to describe the components of a typical belt conveyor used in an industrial setting. In addition, you will be able to identify the

equipment commonly found in large scale, industrial conveying systems, and

202-07 - Conveyor Belt System Inspection

When you complete this lesson, you will have the ability to describe the equipment that is used to protect plant personnel and conveying system equipment. In addition, you will be able to list the inspections that should be conducted on conveyor belt systems

202-08 - Conveyor Belt Installation and Repair

When you complete this lesson, you will be able to describe the basic technique used to install and adjust new belting on a large industrial conveyor.

203-01 Introduction to Bearings

When you complete this lesson, you will be able to explain the basic concepts behind the use of bearings. In addition, you'll be able to describe their mechanical functions, loading forces, common lubricants, main classifications, and the types of friction

203-02 - Rolling Contact Bearings

When you complete this lesson, you will be able to identify the most common types of rolling contact bearings, and recognize some of their design considerations and common operating characteristics.

203-03 - Sliding Surface Bearings

When you complete this lesson, you will be able to identify the most common types of sliding surface bearings, and recognize some of their design considerations and common operating characteristics.

203-04 - Bearing Installation and Removal

When you complete this lesson, you will be able to explain some basic techniques for the installation and replacement of rolling contact and sliding surface bearings.

203-05 - Bearing Seals

When you complete this lesson, you will be able

to describe and identify the seals most commonly used on bearings, their specific applications, and their design considerations.

203-06 - Troubleshooting Bearing Failures

When you complete this lesson, you will be able to recognize symptoms that may indicate failing bearings. In addition, you'll be able to troubleshoot bearing failures and use the information you gain to prevent a recurrence.

205-01 - Introduction to Gear Drives

When you complete this lesson, you will be able to describe and explain the function of a gear and define common terms utilized working with gears and gear drives.

205-02 - Types of Gears

When you complete this lesson, you will be able to describe six common types of gears used in industrial facilities.

205-03 - Maintaining Gear Drives

When you complete this lesson, you will be able to analyze and troubleshoot common gear drive problems. You will also be able to explain factors affecting gear backlash and proper gear lubrication.

205-04 - Clutches

When you complete this lesson, you will be able to explain the purpose of clutches and identify the operating principles of common industrial clutch designs.

207-01 - Lubrication Selection and Sampling in Rotating Machinery

When you complete this lesson, you will be able to describe factors that influence the selection of lubricants. In addition, you will be able to explain how to monitor the condition of lubricant.

207-02 - Lubrication Failures and Management in Rotating Machinery

When you complete this lesson, you will be able to describe the process and the importance of good lubrication management.

207-03 - Lubrication Analysis in Rotating Machinery

When you complete this lesson, you will be able to discuss the characteristics of lubricants and describe how they influence use.

208-01 - Pipe Connections and Symbols

When you complete this lesson, you will be able to describe the methods most commonly used to connect lengths of piping, and identify advantages and disadvantages of each. You will be able to recognize symbols commonly used to indicate types of pipes, pip

208-03 - Piping Construction and Sizing

When you complete this lesson, you will be able to discuss the materials, sizing methods, and construction techniques used in the construction of pipe systems in industrial facilities.

208-04 - Piping Expansion, Support, and Insulation

When you complete this lesson, you will be able to explain the effects of changing temperatures on industrial piping and describe ways to allow for those effects.

208-05 - Piping Auxiliaries

When you complete this lesson, you will be able to describe the design and function of steam separators and traps commonly used in piping systems.

208-06 - Tubing Types and Applications

When you complete this lesson, you will be able to describe the design and function of tubing. In addition, you will be able to apply criteria to appropriately select tubing for various common applications.

208-07 - Tube Fittings and Connection Methods

When you complete this lesson, you will be able to describe various methods to properly cut and join tubing segments.

208-08 - Tube and Conduit Bending

When you complete this lesson, you will be able

to describe how to properly bend tubing and conduit into a variety of angles and offsets.

209-01 Couplings

When you complete this lesson, you will be able to identify different styles of couplings and how to maintain them.

209-03 - Pre-Alignment Procedures

When you complete this lesson, you will be able to identify industry standard pre-checks, types of couplings, and types of misalignment.

209-04 - Rough Alignment

When you complete this lesson, you will be able to identify the planes, tools, and criteria necessary to perform a rough alignment.

209-05 - Mathematical Rim-and-Face Alignment

When you complete this lesson, you will be able to identify the methods of performing a mathematical rim-and-face alignment and the types of misalignment identifiable and correctable by this method.

209-06 - Graphical Rim-and-Face Alignment

When you complete this lesson, you will be able to recall the graphical method of performing rim-and-face alignment and the types of misalignment identifiable and correctable by this method.

209-07 - Reverse Dial Alignment

When you complete this lesson, you will be able to recall the theories and types of equipment associated with a reverse dial alignment.

209-09 - Laser Alignment

When you complete this lesson, you will be able to understand the theory, and equipment associated with laser alignment.

211-01 - Introduction to Chain Drives

When you complete this lesson, you will be able to describe the design and function of typical chain drive systems.

211-02 - Chain Drive Maintenance and Troubleshooting

When you complete this lesson, you will be able to describe techniques for maintaining and troubleshooting chain drive systems in industrial facilities.

213-01 - Lubrication Basics

When you complete this lesson, you will be able to explain how lubrication is used in machinery to reduce friction. In addition, you will be able to explain why certain types of equipment require lubricants with different viscosities.

213-02 - Types of Lubricants

When you complete this lesson, you will be able to describe the factors you must take into consideration when selecting a lubricant for a specific piece of equipment. In addition, you will be able to identify different viscosity grades and explain what e

213-03 - Lubrication Sampling and Analysis

When you complete this lesson, you will be able to explain the importance of lubrication sampling and describe basic techniques used to collect lubricant samples. In addition, you will be able to explain how to use lubrication schedules to ensure completi

213-04 - Lubrication Filtration and Purification

When you complete this lesson, you will be able to explain how to use mechanical filters and lube oil purifiers to keep lubricating oil free of contaminants. In addition, you will be able to describe methods used to filter and purify lubricating oil in a

213-05 - Lubrication Delivery Methods and Systems

When you complete this lesson, you will be able to describe common lubricant delivery methods and systems.

215-01 Introduction to Valves and Their Components

When you complete this lesson, you will be able to explain the basic design and function of valves, major valve components, and flow control elements.

215-02 - Valve Actuators

When you complete this lesson, you will be able to discuss the use, selection, and design of various actuators, from simple manual hand-wheels to relatively complex electrical and hydraulic manipulators.

215-03 - Gate Valves

When you complete this lesson, you will be able to explain the use, selection, and design of a gate valve. You will also be able to describe how different service conditions affect gate valve configuration.

215-04 - Globe Valves

When you complete this lesson, you will be able to describe the use, selection, and design of globe valves.

215-05 - Butterfly Valves

When you complete this lesson, you will be able to explain the use, selection, and design of typical butterfly valves found in industrial applications.

215-06 - Ball Valves

When you complete this lesson, you will be able to explain the use, selection, and design of ball valves found in industrial applications.

215-07 - Check Valves

When you complete this lesson, you will be able to explain the use, selection, and design of check valves found in industrial applications.

215-08 - Needle Valves

When you complete this lesson, you will be able to describe the use, selection, and design of a needle valve.

215-09 - Plug Valves

When you complete this lesson, you will be able

to describe the use, selection, and design of plug valves commonly found in industrial settings.

215-10 - Diaphragm Valves

When you complete this lesson, you will be able to describe the use, selection, and design of the two basic types of diaphragm valves.

215-11 - Pinch Valves

When you complete this lesson, you will be able to describe the use, selection, and design of pinch valves.

215-12 - Safety and Relief Valves

When you complete this lesson, you will be able to describe the use, selection, and design of safety valves and relief valves.

215-13 Solenoid Valves

When you complete this lesson, you will be able to describe the overall design and function of various solenoid valves.

215-14 Valve Positioners

When you complete this lesson, you will be able to describe the basic design and function of common types of valve positioners used in industrial facilities.

215-15 Pressure Regulator Valves

When you complete this lesson, you will be able to describe the basic design and function of common types of pressure regulating valves used in industrial facilities.

219-01 Introduction to Centrifugal Pumps

When you complete this lesson, you will be able to describe the basic design and function of both single stage and multi-stage centrifugal pumps.

219-02 - Centrifugal Pump Design

When you complete this lesson, you will be able to describe various centrifugal pump designs and explain the role design plays in matching a pump to an application.

219-03 - Centrifugal Pump Fundamentals

When you complete this lesson, you will be able

to describe the basic startup procedures used on single and multi-stage centrifugal pumps. In addition, you will be able to explain the basic inspections to be completed on operating centrifugal pumps during

219-04 - Centrifugal Pump Operation

When you complete this lesson, you will be able to describe the basic start-up and shutdown procedures used on single and multi-stage centrifugal pumps. In addition, you will be able to explain the basic inspections that should be completed on operating cen

219-05 - Centrifugal Pump Operations and Maintenance, Part 2

When you complete this lesson, you will be able to identify different types of pumps, recall pump operations and maintenance items, identify predictive maintenance concepts, and recall common pump operating problems.

219-08 - Impellers and Wear Rings

When you complete this lesson, you will be able to describe the principles behind centrifugal pump mechanical impellers, pump stages, fluid flow paths, and basic information regarding wear rings.

219-10 - Pump Troubleshooting

When you complete this lesson, you will be able to describe basic pump troubleshooting and identify pump visual, audible, and tangible symptoms of equipment malfunction.

219-12 - Pump Internal Inspection and Troubleshooting

When you complete this lesson, you will be able to describe an internal inspection of a centrifugal pump and identify unsatisfactory component conditions.

223-01 - Heat Exchanger Theory

When this lesson is completed, the student will be able to explain how heat is transferred from one substance to another via the use of heat

exchangers. In addition, they will be able to describe the basic differences between heat exchangers and the suppo

223-02 - Open Heat Exchanger Design and Operation

When you complete this lesson, you will be able to explain how open heat exchangers use direct contact to heat condensate and remove non-condensable gases from the condensate. In addition, you will be able to describe the three basic types of open heat e

223-03 - Closed Heat Exchangers

When you complete this lesson, you will be able to identify the difference between single and multi-pass heat exchangers, the components of a typical closed heat exchanger, flow types, and common maintenance and troubleshooting procedures.

225-01 - Compressed Air Systems

When you complete this lesson, you will be able to describe the basic classifications of air compressors used in industrial facilities. In addition, you will be able to explain the operation of service air and control air systems.

225-02 - Compressed Air System Components

When you complete this lesson, you will be able to describe the basic components that make up a typical compressed air system. In addition, you will be able to explain some basic troubleshooting techniques used to detect problems in compressed air syste

225-03 - Positive Displacement Compressors

When you complete this lesson, you will be able to explain the basic design and operation of positive displacement air compressors, including both the reciprocating and rotary types.

225-04 - Dynamic Compressors

When you complete this lesson, you will be able to describe the basic design and operation of

dynamic air compressors, including both the centrifugal and axial types.

225-06 - Axial Compressor Control Schemes

When you complete this lesson, you will be able to recall the fundamentals of axial compressor control, control system selection, surge control components, and surge control and avoidance.

229-01 Bolted Joints

When you complete this lesson, you will be able to describe commonly used bolt types and grades and discuss their proper use. You will be able to list common modes of joint failure and identify some preventive measures.

229-02 O-Rings

When you complete this lesson, you will be able to describe the design and purpose of O-rings. You will also be able to discuss how to use them successfully.

229-03 Making Gaskets

When you complete this lesson, you will be able to describe different types of gaskets and explain common methods for making gaskets from stock materials.

229-04 Fasteners

When you have completed this lesson, you will be able to describe the design and identify the purpose of various types of fasteners used in industrial facilities.

229-05 Packing Material Use and Installation

When you complete this lesson, you will be able to describe what packing is and identify common packing designs, components, and construction. In addition, you will be able to explain general procedures for installation and removal of packing from pumps

229-06 - Mechanical Seals Use and Installation

When you complete this lesson, you will be able to describe how mechanical seals work and identify the features of commonly used seal

types. In addition, you'll be able to explain proper seal care.

231-01 - Introduction to Positive Displacement Pumps

When you complete this lesson, you will be able to describe the basic design and operation of positive displacement pumps and identify operating conditions under which they are commonly implemented. Additionally, you will be able to discuss the operationa

231-02 - Reciprocating Positive Displacement Pumps

When you complete this lesson, you will be able to describe the design and function of reciprocating positive displacement pumps commonly used in industry.

231-03 - Displacement Pumps

When you complete this lesson, you will be able to describe the design and operation of rotary positive displacement pumps commonly used in industry.

243-01 - Introduction to Hydraulics

When you complete this lesson, you will be able to describe the basic components that comprise a typical hydraulic circuit and explain the function of each. In addition, you will be able to explain the use of hydraulic multiplication to increase the capa

243-02 - Hydraulic Systems

When you complete this lesson, you will be able to identify and describe the purpose of the various components used in hydraulic circuits. In addition, you will be able to describe the components used to control flow through a hydraulic circuit.

243-03 - Hydraulic Fluids

When you complete this lesson, you will be able to identify the three basic types of hydraulic fluids. In addition, you will be able to describe some of the considerations that need to be taken

into account when selecting a hydraulic fluid for a specific

271-01 - Vibration Introduction

When you complete this lesson, you will be able to define basic terms and measurement units associated with vibration. You will also be able to describe the relationship between a machine's operating speed and vibration problems.

271-02 - Vibration Causes and Characteristics

When you complete this lesson, you will be able to describe the characteristics of common, vibration-causing mechanical faults.

271-03 - Basic Vibration Troubleshooting Techniques

271-04 - Plant Vibration Program

When you complete this lesson, you will be able to describe a typical plant's vibration program and discuss how it contributes to the plant's operational readiness.

273-01 - Boiler Tube Repair

When you complete this lesson, you will be able to describe different types of tube assemblies which may need repair in a boiler. You will be able to list common causes of these leaks and procedures for repairing the tube and tube assemblies.

273-02 - Inspecting the Fireside of a Boiler, Part 1

When you complete this lesson, you will be able to explain some specific items to look for when doing a fireside inspection on the watertubes of a large watertube boiler.

273-03 - Inspecting the Fireside of a Boiler, Part 2

When you complete this lesson, you will be able to explain some specific things to look for when doing a fireside inspection on the superheaters, reheaters, economizers, ash hoppers, baffles,

sootblowers, and the boiler bottom seal on the fireside of a la

273-04 - Inspecting the Waterside of a Boiler

When you complete this lesson you will be able to identify unacceptable conditions when performing a water side inspection on steam drums, moisture separators, headers and tubes of a large water-tube boiler.

273-05 - Inspecting a Boilers Exterior

When you complete this lesson, you will be able to describe some specific areas to look at, and what to look for when inspecting the exterior of a large watertube boiler.

273-06 - Waterside and Fireside Cleaning of a Boiler

When you complete this lesson, you will be able to explain some methods and procedures for cleaning and testing the waterside and fireside of a large watertube boiler.

ELECTRICAL MAINTENANCE

401-01 - Electron Theory (v2)

When you complete this lesson, you will be able to describe the basic principles of magnetism.

401-01 Electron Theory

When you complete this lesson, you will be able to discuss basic electron theory and explain how the interaction between electrons and protons of atoms creates electrical energy. You will also be able to identify the factors that affect the movement of e

401-02 Magnetism and Electromagnetism Explained

When you complete this lesson, you will be able to describe the basic principles of magnetism.

401-03 Ohm's and Kirchoff's Laws Relating to DC Circuits

When you complete this lesson, you will be able to describe Ohm's law, the basic formula for

finding power (in watts), and Kirchoff's first and second laws as they relate to DC circuits.

401-04 - Evaluating Series and Parallel DC Circuit Performance

When you complete this lesson, you will be able to describe how current, voltage, resistance, and power flow through series and parallel DC circuits. You will also be able to calculate values of current, voltage, resistance, and power flow in DC series an

401-05 - Determine Circuit Outputs from Specified Inputs

When you complete this lesson, you will be able to use formulas to compute DC series and parallel circuit outputs based on the known inputs.

402-01 Introduction to Alternating Current (AC)

When you complete this lesson, you will be able to explain the differences between AC power and DC power, define terminology relating to graphing AC power, and explain what is meant by effective values of AC power. You will also be able to describe the c

402-02 Ohm's and Kirchoff's Laws Involving AC Circuits

When you complete this lesson, you will be able to describe Ohm's law and Kirchoff's current and voltage laws as they relate to AC circuits. You will also be able to calculate power in a resistive AC circuit.

402-03 Inductance in AC Circuits

When you complete this lesson, you will be able to understand and calculate values of inductance and find the total amount of inductive reactance in a circuit.

402-04 - Capacitance in AC Circuits (HTML 5)

402-04 Capacitance in AC Circuits

When you complete this lesson, you will understand how capacitance reacts in an AC

circuit, be able to calculate total values, and understand calculations for capacitive reactance.

402-05 Impedance in AC Circuits

When you complete this lesson, you will be able to determine the total impedance of an AC circuit and apply Ohm's law to find other unknown values.

402-06 AC Power

When you complete this lesson, you will be able to calculate for unknown values in a power triangle and calculate power factor.

402-07 Fundamentals of Three-Phase AC

When you complete this lesson, you will be able to identify the construction of an AC circuit, calculate the circuits' capacity value, and conduct power factor corrections in AC circuits.

405-01 Power Quality

When you complete this lesson, you will be able to discuss the nature of power supplied to electrical equipment and list circumstances that affect its quality.

405-02 Harmonics

When you complete this lesson, you will be able to describe problems that may arise in electrical systems due to harmonics. In addition, you will be able to identify the benefit of equipment with minimal harmonic distortion and discuss the wiring methods

405-03 High-voltage AC

When you complete this lesson, you will be able to identify the values of high and ultra-high-voltage systems, common system components, and high and ultra-high specific measurement and testing considerations.

409-01 AC Induction Motors

When you complete this lesson, you will be able to describe the design and function of several different types of AC induction motors.

409-02 - AC Generators

When you complete this lesson, you will understand how an AC generator produces an AC voltage.

409-03 AC Induction Motor Theory

When you complete this lesson, you will be able to describe how an electric AC motor uses the principles of magnetism and magnetic fields to convert electrical energy into mechanical energy.

409-04 Troubleshooting AC Induction Motors

When you complete this lesson, you will be able to discuss effective troubleshooting procedures for AC induction motors. You will also be able to state various problems related to motor installation, maintenance, and repair.

409-05 AC Induction Motor Maintenance

When you complete this lesson, you will be able to describe general electric motor maintenance and inspection activities.

409-06 Overhauling Induction Motors

When you complete this lesson, you will be able to describe and properly execute each of the steps necessary to the induction motor overhaul process.

409-07 - Generator System Heat Protection

When you complete this lesson, you will be able to discuss industry standard heat reduction methods for industrial AC power generation, including hydrogen cooling systems and their associated equipment.

409-08 Generator Overhaul

When you complete this lesson, you will be able to discuss the steps taken in shutting down the generator, preparing a generator for maintenance, and considerations when conducting the overhaul inspection.

409-09 - DC Motors and Generators

When you complete this lesson, you will understand how DC generators and motors convert energy from one form to another. In

addition, you will be able to describe basic DC generator and motor winding configurations, and identify uses of each type.

409-10 - DC Motors and Generators Troubleshooting and Maintenance

When you complete this lesson, you will be able to describe the basic components of a DC motor and a DC generator, and be prepared to conduct basic maintenance and inspections of each.

411-01 Introduction to Motor Controls

When you complete this lesson, you will be able to draw a simple motor control circuit and describe relative ladder logic.

411-02 Motor Protection and Faults

When you complete this lesson, you will be able to explain the difference between internal and external motor faults. In addition, you will be able to select the proper overcurrent and short circuit protection devices for motor branch circuits.

411-03 Motor Control Troubleshooting

When you complete this lesson, you will understand the basics of troubleshooting motor control circuits.

411-04 Motor Control Centers

When you complete this lesson, you will be able to explain the function of MCCs, common components of an MCC, and the difference between common classifications and their associated wiring schemes.

413-01 AC Drives Overview

Upon completion of this lesson, you will understand the basic designs, purposes, and applications for AC drive devices.

415-01 Transformer Basics

When you complete this lesson, you will be able to explain magnetism and electromagnetism and to explain the basic principles of electrical voltage transformation.

415-02 Transformer Design and Components

When you complete this lesson, you will be able to visually identify the type of core construction in a transformer, describe types of transformer cooling, temperature limits, and external devices of the transformer.

415-03 Transformer Connections

When you complete this lesson, you will be able to identify and explain how to make the most common types of connections for single-phase and three-phase transformers. You will be able to calculate the value of phase voltage and current, as well as line

415-04 Special Transformers

When you complete this lesson, you will be able to identify the various types of special transformers and describe how they are used.

416-01 Battery Basics

When you complete this lesson, you will understand the overall design and function of today's batteries. In addition, you will be able to identify maintenance practices you can perform to keep them ready for service.

416-02 Electrical Backup Systems

When you complete this lesson, you will be able to distinguish between types of backup systems and choose the type that fits your application.

416-03 - Uninterruptible Power Supplies (UPS)

When you complete this lesson, you will be able to identify common power problems that create a need for backup power systems, how UPS systems vary in characteristics, and how each is applicable to particular situations.

417-01 Switchgear

When you complete this lesson, you will be able to describe the function and operation of switchgear. You will be able to identify the equipment that makes up a switchgear system and describe the purpose of protection relays.

417-02 Low Voltage Breakers

When you complete this lesson, you will understand the purpose and use of low voltage circuit breakers in electrical circuits.

417-03 Medium and High Voltage Switchgear

When you complete this lesson, you will be able to identify the technical details associated with construction and operation of high and medium voltage switchgears.

417-04 General Switchgear Maintenance

When you complete this lesson, you will be able to identify and perform the common tasks and tests related to modern switchgear.

417-05 Breaker Specific Maintenance

When you complete this lesson, you will be able to complete breaker specific maintenance tasks in order to maximize breaker life and maintain system stability.

417-06 Circuit Breaker Time-Travel Characteristics and Testing

When you complete this lesson, you will be able to identify the purpose and principles of circuit breaker time-travel testing and explain the processes associated with conducting the three types of time-travel testing.

418-01 Electrical Faults and Current Ratings

When you complete this lesson, you will be able to explain causes and types of electrical overcurrent, and identify how to protect circuits from overcurrents and faults.

418-02 Overcurrent Protection, Fuses, and Breakers

When you complete this lesson, you will be able to identify types of fuses and breakers used in electrical distribution systems and explain how they work.

418-03 Protection Relays

When you complete this lesson, you will be able to identify protection relay elements on an electrical drawing according to their ANSI

(American National Standards Institute) standard device numbers. In addition, you will be able to describe basic relay o

418-04 Generator, Transformer, and Motor Protection

When you complete this lesson, you will understand the principles of operation governing ground fault protection, phase-to-phase short circuit, time overcurrent protection, and motor overload protection.

418-05 Grounding and Bonding

When you complete this lesson, you will be able to describe how grounding systems are used to ground electrical systems and equipment.

419-01 MOV (Motor Operated Valve) Application Construction

When you complete this lesson, you will be able to describe typical components, uses, and operations of motor operated valve actuators.

419-02 - MOV (Motor Operated Valve) Disassembly and Inspection, Part 1

When you complete this lesson, you will be able to explain how to disassemble, inspect, and reassemble a Limitorque® SMB-00/000 MOV actuator.

419-03 - MOV (Motor Operated Valve) Disassembly and Inspection, Part 2

When you complete this lesson, you will be able to describe the reassembly techniques applied to the SMB-00/000 Limitorque® MOV.

419-04 Limit Switch Adjustment

When you complete this lesson, you will be able to explain the process of adjusting the limit switch for a Limitorque® actuator.

421-01 Wire and Cable Management

When you complete this lesson, you will be able to determine how to properly use conduit and cable trays to ensure the necessary neat and workmanlike appearance required by the NEC.

421-02 Terminating and Connecting Wire in a Control Panel

When you complete this lesson, you will be able to explain the basic steps to wire a control panel.

421-03 Making Connections in a Junction Box

When you complete this lesson, you will be able to explain how to make connections and terminations in a junction box using several systems.

421-04 Installing Conduit and Pulling Wire

Upon completing this lesson, you will be able to describe the major types of electrical conduit and the basics of installing and pulling wire through electrical conduit.

423-01 Introduction to Medium Voltage Cable

When you complete this lesson, you will be able to identify the components of medium voltage cable and why each is needed.

423-02 Medium Voltage Splices and Terminations

When you complete this lesson, you will know the steps needed to splice and terminate medium voltage power cable.

425-01 Troubleshooting AC Circuits

When you complete this lesson, you will be able to outline the logical steps used for troubleshooting AC motor control circuits.

425-02 - Troubleshooting DC Circuits

When you complete this lesson, you will be able to outline the logical steps used to troubleshoot DC circuits.

427-01 Electrical Freeze Protection Components and Application

When you complete this lesson, you will be able to identify the fundamentals of heat-tracing and the methods used in its practice, as well as describe the types of electrical heat-tracing and their internal and external maintenance concerns.

POWER GENERATING SYSTEMS AND OPERATIONS**501-01 - Energy Conversion**

When you complete this lesson, you will be able to describe how energy from fossil and renewable fuels is captured and converted into electrical energy. In addition, you will be able to discuss efficiency and the role it plays in energy conversions.

501-02 - Steam Turbine Basics

When you complete this lesson, you will be able to describe the basic operation of a typical power plant's steam turbine and identify the functions of its critical components.

501-03 - Combustion System Component Overview

When you complete this lesson, you will be able to describe the equipment used to prepare and control natural gas, fuel oil, and coal as it is burned in the boiler. In addition, you will be able to identify some advantages and disadvantages of using each

501-04 - Boiler Water and Steam Cycle Overview

When you complete this lesson, you will be able to describe where boiler water comes from and how it enters and flows through a boiler. In addition, you will be able to explain the basic flow path the steam follows from the boiler to the steam turbine.

501-05 - Generator Overview

When you complete this lesson, you will be able to describe the relationship between electrical usage and generator output. In addition, you will be able to explain the basic principles of producing electricity using an electromagnet.

505-01 - Steam Turbine Design

When you complete this lesson, you will be able to describe the basic components that comprise a typical steam turbine and explain the purpose

of each. In addition, you will be able to trace the steam flow path through a typical steam turbine.

505-02 - Steam Turbine Control and Operation

When you complete this lesson, you will be able to describe the basic operation of the valves that control the speed and operation of a typical steam turbine.

505-03 - Steam Turbine Auxiliaries

When you complete this lesson, you will be able to describe the design and function of components found in a typical turbine lube oil system and gland steam seal system.

505-10 - Steam Turbine Governor System

When you complete this lesson, you will be able to identify the components and function of a typical turbine governor system.

507-01 - Generator and Auxiliary Systems Functions

When you complete this lesson, you will be able to describe the functions performed by the generator and its auxiliary components.

507-02 - Generator and Auxiliary Systems Flow Paths and Major Components

When you complete this lesson, you will be able to identify the flow paths associated with the major components that support generator operation.

507-03 - Generator Construction and Process Control

When you complete this lesson, you will be able to describe generator construction and explain some of the principles behind generator operation and process control.

507-04 - Generator and Auxiliary Systems Start-up

When you complete this lesson, you will be able to describe the steps to start-up the generator and establish it on the electrical grid.

507-05 - Generator and Auxiliary Systems Normal Operations

When you complete this lesson, you will be able to describe tasks performed during normal operations of the generator and auxiliary systems.

507-06 - Generator and Auxiliary Systems Shutdown

When you complete this lesson, you will be able to describe your role during shutdown of the generator and its auxiliary components.

511-01 - Gas Turbine Fundamentals and Configuration of Generating Facilities

When you complete this lesson, you will be able to discuss basic design of a simple cycle power plant and the function and operation of its fundamental piece of equipment, the combustion turbine.

511-02 - Introduction to GE LMc Series Gas

When you complete this lesson, you will be able to describe the basic components that comprise GE's LM series of gas turbine. In addition, you will be able to explain the basic compressed air and hot gas flow paths through each type of LM gas turbine.

511-03 - Introduction to GE Frame Series Gas

When you complete this lesson, you will be able to discuss the motivation behind the development of the F-series of gas turbine. In addition, you will be able to describe the Frame 7 gas turbine's basic components and general operation.

511-04 - Introduction to Siemens V-Series

When you complete this lesson, you will be able to describe the basic components that comprise the Siemens Westinghouse V-series gas turbines. In addition, you will be able to identify the basic compressed air and hot gas flow paths through the V94.3 gas

511-05 - Heavy Duty Gas Turbines – Major Components and Support Systems

When you complete this lesson, you will be able to discuss the motivation behind the development of the heavy duty gas turbine. In addition, you will be able to describe the gas turbine's basic components and general operation.

511-07 - Aero-derivative Gas Turbines – Major Components and Support Systems

When you complete this lesson, you will be able to discuss the motivation behind the development of the aero-derivative gas turbine. In addition, you will be able to describe the gas turbine's major components and support systems.

511-10 - Fundamentals of Gas Turbine Operation and Routine Maintenance

When you complete this lesson, you will be familiar with several common procedures for operating and maintaining a combustion turbine (CT) as well as some conditions that require emergency procedures.

511-11 - Gas turbine Control Schemes

When you complete this lesson, you will be able to identify common control schemes, gas turbine compressor startup and shutdown operations, and exhaust control on both simple cycle and combined cycle exhausts.

511-12 - Gas Turbine Fuel and Combustion Systems

When you complete this lesson, you will be able to identify common fuel and combustion system components and their functions.

511-13 - Gas Turbine Lube Oil and Control Oil Systems

When you complete this lesson, you will be able to identify common lube oil system components and operations as well as control oil system components and operations.

511-14 - Gas Turbine Air Systems

When you complete this lesson, you will be familiar with several subsystems of the air system of the gas turbine compressor.

511-15 - Gas Turbine Water Wash and Drain Systems

When you complete this lesson, you will be familiar with several subsystems of the water and drain systems of the gas turbine compressor.

521-01 - Introduction to Combustion Air and Flue Gas Systems

When you complete this lesson, you will be able to describe how the overall combustion process works and demonstrate a working knowledge of the combustion air and flue gas systems.

521-02 - Combustion Air and Flue Gas Flow Paths and Components

When you complete this lesson, you will be able to trace the flow paths of typical power plant combustion air and flue gas systems. You will also be able to describe the operation of major components within those flow paths.

521-03 - Control Loops and Methods of Control

When you complete this lesson, you will be able to discuss how control loops and methods of control can safely direct operational events in a power plant.

521-04 - Combustion Air and Flue Gas System Start-up

When you complete this lesson, you will be able to describe the steps performed to put the boiler fan operation system into service.

521-05 - Maintaining Fan Operations in Combustion Air and Flue Gas Systems

When you complete this lesson, you will be able to describe how to perform the checks and monitoring necessary to maintain operation of fans and their components.

521-06 - Shut Down Process

When you complete this lesson, you will have an overall understanding of the shutdown process and general knowledge of an operator's shutdown responsibilities.

522-01 - Coal Handling System

When you complete this lesson, you will be able to identify common coal handling processes. You will also be able to discuss the operation of essential pieces of equipment used at the plant site.

523-01 - Boiler Fuel System Function

When you complete this lesson, you will be able to describe the functions of the boiler fuel system and differentiate among types of boiler fuel systems.

523-02 - Process and Methods of Control for the Boiler Fuel System

When you complete this lesson, you will be able to describe the digital control system that regulates and automates the components of the boiler fuel system to attain specific setpoints and meet desired production loads.

523-03 - Boiler Fuel System Start-up

When you complete this lesson, you will be able to apply standard procedures for initiating the boiler fuel system components during start-up.

523-04 - Normal Operation of the Boiler Fuel Systems

When you complete this lesson, you will be able to explain the normal operation of the components of the boiler fuel system.

523-05 - Shutdown for the Boiler Fuel System

When you complete this lesson, you will be able to describe the controlled and emergency shutdown procedures for the feeders and pulverizers.

531-01 - Combustion Theory

When you complete this lesson, you will be able to explain the different types of fossil fuels commonly used in an industrial setting, and explain some characteristics of the fuels. In addition, you will be able to describe the elements and conditions th

531-02 - Basic Boiler Design

When you complete this lesson, you will be able to explain why different types of boilers are used for different processes. In addition, you will be able to describe the basic components that make up a fire tube and water tube boiler and explain the circ

531-03 - Boiler Valves and Fittings

When you complete this lesson, you will be able to identify the different types of valves, gauges, and steam traps used in the operation of a steam boiler. In addition, you will be able to explain how these steam fittings are used to safely operate a ste

531-04 - Boiler Fuel and Air Systems

When you complete this lesson, you will be able to identify the basic equipment found in high pressure gas systems and fuel oil systems and describe the design and operation of fuel oil burners. In addition, you will be able to describe boiler draft and i

531-05 - Boiler Water and Steam Cycle

When you complete this lesson, you will be able to explain the basic components that make up a condensate and feedwater system and describe the flow path through those systems. In addition, you will be able to explain the difference between saturated stea

531-06 - Boiler Heat Recovery Systems

When you complete this lesson, you will be able to describe the equipment used to recover waste heat in a boiler. In addition, you will be able to describe the basic design and operation of a superheater, economizer, and air preheater.

531-07 - Scrubbers and Ash Removal Systems

When you complete this lesson, you will be able to identify the primary pollutants emitted from fossil fired boilers. In addition, you will be able to explain the basic design and operation of baghouses, electrostatic precipitators, and scrubbers.

531-08 - Boiler Operator Roles and Responsibilities

When you complete this lesson, you will be able to explain the work environment a boiler operator is subject to and describe the primary responsibilities of a boiler operator.

533-01 - Fuel Combustion and Controls

When you complete this lesson, you will be able to understand the importance of complete combustion and describe the components used to make this possible. You will distinguish the different types of fuel controls used on a pulverized unit and a cyclone

533-02 - Boiler Burner Controls and Management

When you complete this lesson, you will be able to describe the different control types used, control hardware, and the effects of optimizing combustion. You will understand the system requirements for burner management, including flame monitoring techni

535-01 - Flue Gas Desulfurization System

When you complete this lesson, you will be able to describe the design and function of control systems that remove sulfur oxides and particulates from flue gas. In addition, you will be able to outline recovery systems, which extract and concentrate the

535-02 - Flue Gas Desulfurization System, Open Spray Design, Part 1

When you complete this lesson, you will be able to understand how the design of the open spray FGDS effectively reduces SO₂ and provides substantial flexibility in meeting SO₂ emissions requirements.

535-03 - Flue Gas Desulfurization System, Open Spray Design, Part 2

When you complete this lesson, you will have an understanding of the overall process of cleaning the SO₂ out of flue gas. In addition, you will have

general knowledge of each of the systems used to accomplish this.

535-04 - Dry Scrubber Operation

When you complete this lesson, you will be able to describe dry scrubber design and function. In addition, you will be able to compare the results of different installations, and describe some subtle design and operational differences that are believed t

535-05 - Selective Catalytic Reduction (SCR) System

When you complete this lesson, you will be able to explain what SCR is and its importance, as well as identify the components that the SCR consists of.

535-09 - Introduction to Continuous Emission Monitoring Systems

When you complete this lesson, you will be familiar with the purpose, function, and major components of Continuous Emission Monitoring Systems.

535-10 - Fundamentals of Using a CEMS

When you complete this lesson, you will be able to describe the basic steps for collecting Continuous Emission Monitoring System (CEMS) data readings, troubleshooting probe and sample systems, changing calibration gas bottles, and entering new data in the

535-11 - Calibration of CEMS Components

When you complete this lesson, you will be able to describe how components of the CEMS are calibrated to maintain accurate records of emissions.

551-01 - Introduction to the Circulating Water System

When you complete this lesson, you will be able to describe the design and operation of a circulating water system.

551-02 - Function of the Circulating Water System

When you complete this lesson, you will be able to describe the design and operation of a circulating water system.

551-03 - Circulating Water System Components

When you complete this lesson, you will be able to describe the components that make up a circulating water system and explain their functions.

551-04 - Circulating Water System Start-up

When you complete this lesson, you will be able to explain the steps required to safely start the circulating water system.

551-05 - Circulating Water System Normal Operations

When you complete this lesson, you will be able to describe how to monitor and adjust the circulating water system during normal operations.

551-06 - Circulating Water System Shutdown

When you complete this lesson, you will be able to describe circulating water system shutdown procedures.

551-07 - Circulating Water System Controls

When you complete this lesson, you will be able to describe typical instruments and control systems used with the circulating water system.

551-08 - Cooling Towers Operating Principles and Designs

When you complete this lesson, you will be able to explain the operating principles of a cooling tower and identify and describe various cooling tower designs.

551-09 - Cooling Towers Components

When you complete this lesson, you will be able to describe the basic structural, mechanical and electrical components used in the construction and operation of cooling towers.

551-10 - Air Cooled Condensers

When you complete this lesson, you will be able

to describe basic design principles, structural components, and operating considerations of industrial air cooled condensers. You will also be able to describe the flow of water for condensation of steam in

553-01 - Introduction to the Condensate System

When you complete this lesson, you will be able to explain the purpose and operation of all major components in the condensate system. In addition, you will be able to discuss the basic relationship between the condensate and feedwater systems.

553-02 - Introduction to the Feedwater System

When you complete this lesson, you will be able to describe the basic purpose and operation of the major components typically found in a feedwater system. In addition, you will be able to further explain the relationship between the condensate and feedwa

553-03 - Condensate and Feedwater Systems Operation

Upon completion of this lesson, you will be able to describe the basic procedures for the start-up and operation of the condensate and feedwater systems.

553-04 - Condensate and Feedwater System Control

When you complete this lesson, you will be able to explain steam drum level control methods and discuss their overall relationship to condensate and feedwater flow. In addition, you will be able to describe different types of level measurement used in the

555-01 - Boiler Feed Pumps and Associated Auxiliary Equipment

When you complete this lesson, you will be able to describe the design and function of a typical boiler feed pump.

555-02 - Boiler Feed Pump Flow Path and Major Components

When you complete this lesson, you will be able to identify the feedwater flow path and describe how various components contribute to its progress.

555-03 - Boiler Feed Pump Water Supply and Control Systems

When you complete this lesson, you will be able to discuss the value of maintaining proper water levels in the hotwell, deaerator, and steam drum. You will also be able to describe how built-in controls help maintain a balanced system.

555-04 - Boiler Feed Pump Start-up

When you complete this lesson, you will be able to explain the proper steps to place a boiler feed pump in service.

555-05 - Boiler Feed Pump Daily Operations

When you complete this lesson, you will be able to describe routine tests associated with the boiler feed pump and explain the importance of performing them regularly. You will also be able to explain what steps may be taken in response to test results.

557-01 - Function of the Boiler Water and Steam Systems

When you complete this lesson, you will be able to describe the function of the boiler water and the steam systems. You will also be able to distinguish between forced and natural circulation boilers.

557-02 - Flow Paths and Components of the Boiler Water and Steam Systems

When you complete this lesson, you will be able to identify the major components of boiler water and steam systems and explain their functions.

557-03 - Process Controls for the Boiler Water and Steam Systems

When you complete this lesson, you will be able to describe the process and controls of the boiler water and steam systems.

557-04 - Start-up Procedures for the Boiler Water and Steam Systems

When you complete this lesson, you will be able to identify and explain the general start-up procedures for a boiler's steam and water cycle.

557-05 - Normal Operation of the Boiler Water and Steam Systems

When you complete this lesson, you will be able to describe the normal operations of the water and steam cycle within a power generating unit, the relationship of components within the system, and the effect of adjustments made to those components that ma

557-06 - Shutdown of the Boiler Water and Steam Cycles

When you complete this lesson, you will be able to identify and explain the shutdown process for the steam and water systems in the boiler.

559-01 - Molecular Chemistry of Water

When you complete this lesson, you will be able to discuss which elements combine to form water and why they bond. You will also learn some basic history of water and its special characteristics.

559-02 - Elements and the Periodic Table of Elements

When you complete this lesson, you will understand how elements are named, grouped, and listed on the periodic table.

559-03 - Chemical Compounds

When you have completed this lesson, you will be able to identify individual compounds and describe their creation, reactions, and bonds. You will also be able to demonstrate a working knowledge of solutions.

559-04 - Corrosion Causes and Effects

When you complete this lesson, you will be able to identify the causes and effects of the various types of corrosion found throughout the water and steam systems in a industrial facility.

559-05 - Corrosion Control in Steam Production

When you complete this lesson, you will be able to describe how corrosion affects various systems within a steam production facility and explain how to detect common failures caused by excessive corrosion. In addition, you'll be able to identify causes and

559-06 - Steam Chemistry Control and Guidelines

When you complete this lesson, you will be able to describe the importance of steam purity and chemistry to the steam turbine. In addition, you will be able to identify how water and steam chemistry are monitored and controlled.

559-07 - Industrial Water Treatment Systems

When you complete this lesson, you will be able to describe the water pretreatment and treatment process, as it may exist in a typical industrial plant. In addition, you will be able to discuss chemical cleaning options for boilers and turbines.

559-08 - Introduction to Desalination

When you complete this lesson, you will be able to define desalination and discuss its importance to society. You will also be able to describe membrane and thermal technologies used for the desalination process, as well as the purpose of pre- and post-tr

559-09 - Desalination: Pre- and Post-treatment of Water

When you complete this lesson, you will be able to discuss industry standard pre- and post-treatment applications for desalinated water. You will also be able to discuss concerns associated with bringing seawater into a desalination system for processing,

559-10 - Reverse Osmosis

When you complete this lesson, you will be able to discuss the scientific principles on which reverse osmosis (RO) technology is based and explain the primary function of a reverse osmosis

desalination system. You will also be able to identify the key com

559-11 - Thermal Desalination Technologies

When you complete this lesson, you will be able to discuss the principles on which thermal desalination technologies are based and explain the importance waste heat or steam plays in multiple effect distillation (MED) and multi-stage flash (MSF) systems.

560-01 - Main Transformers

When you complete this lesson, you will be able to describe the overall design and function of a main station transformer. In addition, you will be able to discuss systems and inspections related to transformer protection.

560-02 - Station Service System

When you complete this lesson, you will be able to describe the general design and operation of a station service system.

560-03 - Fuses and Circuit Breakers

When you complete this lesson, you will be able to explain the design and function of commonly used fuses and circuit breakers, and how to test and protect them.

560-04 - Plant Protection Protective Relays and Instrument Transformers

When you complete this lesson, you will be able to describe the design and function of various types of protective relays and instrument transformers used to protect electrical circuits and equipment.

560-05 - Equipment Disconnects and Grounding

When you complete this lesson, you will be able to describe the design and function of disconnects used to isolate electrical circuits. You will also be able to explain some methods of grounding plant equipment.

561-01 - Preparing for Power Plant Start-ups

When you complete this lesson, you will be able to describe the basic checks that must be

performed on plant equipment, including the boiler, turbine, and generator, prior to a power plant start-up.

561-02 - Power Plant Start-up Procedures

When you complete this lesson, you will be able to describe the basic concepts and typical tasks associated with putting a fossil fuel-fired power plant online.

561-03 - Preparing for Power Plant Shutdowns

When you complete this lesson, you will be able to describe the basic tasks that must be performed on plant equipment prior to a power plant shutdown.

561-04 - Power Plant Shutdown Procedures

When you complete this lesson, you will be able to describe the basic steps associated with taking a fossil fuel-fired power plant off-line. In addition, you will be able to explain how operators prepare a power plant for an annual outage.

563-01 - Basic Power Plant Efficiency

When you complete this lesson, you will be able to explain the relationship between energy, work and efficiency. Heat rate, the term used to express power plant efficiency will be part of your vocabulary. You will be able to explain how the boiler, turb

563-02 - Water and Steam Terms and Principles

When you complete this lesson, you will be able to explain the relationship between energy, temperature, and the phases of water. You will also be able to describe the concept and importance of latent heat, the heat associated with phase changes of water

563-03 - Heat Transfer Principles

When you complete this lesson, you will be able to state the primary parameter that causes heat transfer. You will be able to explain the three types of heat transfer and the characteristics of them. You will also be able to describe conditions and prob

563-04 - Laws and Principles of Thermodynamics

When you complete this lesson, you will be able to explain thermodynamics. You will also be able to describe thermodynamic terms in your own words. You will also be able to explain the relationship of thermodynamic principles to plant efficiency.

563-05 - Performance Parameters

When you complete this lesson, you will be able to list several key operating parameters that affect efficiency. You will also be able to describe in your own words problems that can prevent key operating parameters from being operated at optimum level.

563-06 - Balancing Efficiency; Availability; Capability and Flexibility

When you complete this lesson, you will be able to explain efficiency, capability, flexibility, and availability in your own words. You will be able to describe the concept of economic dispatch. You will also be able to discuss running and shutdown rese

563-07 - Instrumentation and Controls

When you complete this lesson, you will be able to explain the basic operation of a boiler following instrumentation and control system. You will be able to describe the effects when actual parameter values are different than what is indicated. You will

563-08 - Boiler Efficiency

When you complete this lesson, you will be able to describe boiler efficiency and explain how it is determined. You will be able to discuss the major factors that can cause an increase or decrease in boiler efficiency.

563-09 - Boiler Reliability

When you complete this lesson, you will be able to explain the importance of maintaining proper boiler parameters. You will also be able to

identify several things that can decrease a boiler's reliability.

563-10 - Turbine Efficiency

When you complete this lesson, you will be able to explain how to calculate turbine efficiency. You will also be able to describe how parameters, components, and problems can affect turbine efficiency.

563-11 - Condenser Efficiency

When you complete this lesson, you will be able to explain how to evaluate and maintain condenser efficiency.

563-12 - Condenser Operation and Reliability

When you complete this lesson, you will be able to describe methods of troubleshooting condensers and identify symptoms of several problems that can negatively affect condenser reliability. You will also be able to discuss methods of remedying specific c

563-13 - Feedwater Heater Operation and Efficiency

When you complete this lesson, you will be able to describe feedwater heater operations and discuss problems that affect performance.

563-14 Pump Efficiency and Reliability

When you complete this lesson, you will be able to describe commonly used pumps and discuss their maintenance.

563-15 - Environmentally Sensitive Operations

When you complete this lesson, you will be able to discuss a power plant's potential environmental impacts and describe methods to minimize them.

565-01 - Distributed Control System Fundamentals

When you complete this lesson, you will be able to describe the design and function of a typical distributed control system (DCS).

565-02 - Distributed Control System Components

When you complete this lesson, you will be able to list the components associated with a common distributed control system (DCS) and describe their functions.

565-03 - Using Distributed Control System Diagrams

When you complete this lesson, you will be able to describe the basic symbols and parts of a logic diagram. You will also be able to explain how to use a DCS logic diagram as a troubleshooting tool.

565-04 - Power Plant Unit Control

When you complete this lesson, you will be able to describe the basic design and function of a boiler-following instrumentation and control system.

567-01 - Basic Principles of Water and Steam

When you complete this lesson, you will be able to describe the properties of water in its liquid, solid, and gaseous states. You will also detail how heat and pressure effect changes between these states. Additionally, given the weights of both steam and

567-02 - Saturated Steam Tables

When you complete this lesson, you will be able to explain the terms associated with the physical characteristics of water, saturated steam, and superheated steam. In addition, you will be able to interpret and discuss the information illustrated in stea

567-03 - Superheated Steam Tables

When you complete this lesson, you will be able to discuss the physical characteristics of superheated steam under various conditions. In addition, you will have the ability to interpret the information found in superheated steam tables and employ it in

581-01 - Diesel Engines for Power Generation

When you complete this lesson, you will be able to describe the design and operation of a diesel engine. In addition, you will be able to explain the importance of the diesel generator.

581-02 - Diesel Engine Support Systems

When you complete this lesson, you will understand the operation and importance of the supporting systems that make the diesel engine run and operate efficiently.

581-03 - Diesel-Powered Generation

When you complete this lesson, you will be able to describe applications for diesel-powered generators and explain the effects they have on society and the environment.

581-04 - Diesel Power Plant Operations

When you complete this lesson, you will be able to describe basic diesel power plant operations.

581-05 - Diesel Plant Control Systems and Protective Devices

When you complete this lesson, you will be able to describe the design and function of a typical control panel and identify its primary components. You will also be able to explain the importance of the protective devices built into the system.

581-06 - Diesel Plant Routine Maintenance

When you complete this lesson, you will be able to describe routine diesel inspections and discuss their contribution to safe and efficient operations.

582-01 - Combined Cycle Power Plants

When you complete this lesson, you will be able to describe the basic thermal cycles of a combined cycle power plant. You will also be able to list advantages and disadvantages of various combined cycle configurations and define common terminology associated

582-02 - Combined Cycle Power Plant Components

When you complete this lesson, you will be able to identify and describe the major components of a combined cycle power plant.

582-03 - HRSG - Flow Path and Major Equipment

When you complete this lesson, you will be able to identify and describe the major components and flow paths of a HRSG.

582-04 - HRSG - Auxiliary Equipment and Systems

When you complete this lesson, you will be able to identify some auxiliary systems that may be found in a HRSG and recall their purpose and benefit to the unit.

582-05 - HRSG - Basic Operating Concerns and Conditions

When you complete this lesson, you will be able to describe the steps to startup and shutdown the HRSG, and the steps to confirm it is operating normally. Additionally, conditions that may cause concern during operation will be covered.

582-06 - Combined Cycle Steam and Feedwater Operating Principles

When you complete this lesson, you will be able to describe the feedwater and steam flowpaths in a typical combined cycle power plant. You will also be able to explain the HRSG design principles governing plant operation.

582-07 - Combined Cycle Condensate and Circulating Water Systems

When you complete this lesson, you will be able to explain the flow paths of the condensate and circulating water systems and describe their major components. You will also be able to explain the design principles governing the operation of these systems.

582-08 - Combined Cycle Auxiliary Systems

When you complete this lesson, you will be able to describe the function and operation of the auxiliary components and systems found in a typical combined cycle power plant.

582-10 - Steam Turbines in a Combined Cycle Plant

When you complete this lesson, you will be able to describe the basic components of a steam turbine and explain their purpose in relation to a combined cycle power plant. In addition, you will be able to identify common turbine auxiliaries and describe ba

582-13 - Control Loops in a Combined Cycle Plant

TBD

583-01 - The Hydroelectric Role in the Power System

When you complete this lesson, you will be able to explain the advantages of hydroelectric power and describe the significant contributions of hydroelectric energy to the environment and economy.

583-02 - Hydroelectric Power Stations

When you complete this lesson, you will be able to identify the major components in a hydroelectric power station. You will also examine the operations of hydroelectric power stations, describe variations among them, and explain the components common to

583-03 - Water Management

When you complete this lesson, you will be able to identify the various issues of water management and their impacts on hydroelectric power generation.

583-04 - Hydroelectric Generators

When you complete this lesson, you will be able to identify and describe the operations of the hydroelectric power generator and the component of the lower unit.

583-05 - Generator Monitoring and Control

When you complete this lesson, you will be able to describe the monitoring and controlling of the generator in hydroelectric generating stations by

identifying the various components of the turbine and generator and explaining their functions.

583-06 - Hydroelectric Plant Auxiliaries

When you complete this lesson, you will be able to identify the auxiliary systems inside a hydroelectric power plant.

583-07 - Operating Electrical Equipment in a Hydroelectric Plant

When you complete this lesson, you will be able to identify the standard procedures for operating electrical equipment in a hydroelectric plant, including lockout/tagout procedures, start-up, and shutdown procedures.

583-08 - Mechanical Governor

At the end of this lesson, you will be able to identify components of the mechanical governor and be able to describe its operations.

583-09 - Electric Governor

When you complete this lesson, you will be able to identify the evolution of the electric governor, components, functions, and governor operations.

584-01 - Introduction to Biomass Power Plants

When you complete this lesson, you will be able to define biomass and list common biomass fuels used in the production of electricity. You will also be able to describe biomass storage, fuel handling equipment, and various configurations of biomass boiler

584-02 - Biomass and Waste to Energy Power Plants

When you complete this lesson, you will be able to explain the difference between mass burn and refuse derived fuel waste to energy plants. You will be able to describe the types of fuel and the fuel processing that takes place in these facilities. You

585-01 - Basic Wind Turbine Design

When you complete this lesson, you will be able to explain how a wind turbine harnesses the kinetic energy in wind and converts it into useful

mechanical energy. In addition, you will be able to identify the principle components that comprise a typical,

585-02 - Wind Farm Design

When you complete this lesson, you will be able to discuss the factors that must be considered when identifying a possible location for a wind farm.

585-03 - Horizontal Wind Turbine Design and Operation

When you complete this lesson, you will be able to explain how wind flowing over the blades causes the turbine rotor to turn. In addition, you will be able to describe the operation of wind turbine components and discuss how wind turbines are controlled.

585-04 - Wind Energy Production

When you complete this lesson, you will be able to discuss the relationship between the size of a wind farm and its corresponding capacity factor. In addition, you will be able to explain how wind energy impacts traditional energy markets.

586-01 - Introduction to Reciprocating Engine Power Plants

When you complete this lesson, you will be able to explain the operation of a reciprocating engine and describe the common configurations in which it can be used in power generation facilities.

586-03 - Fundamentals of Reciprocating Engine Design

When you complete this lesson, you will be able to describe the major types of reciprocating engines and their fuel sources. You will also be able to describe the function of the major components of a reciprocating engine as applied to power generation.

586-05 - Reciprocating Engine Auxiliary Systems

When you complete this lesson, you will be able to explain the operation of the major systems

commonly found in a reciprocating engine power plant and describe their major components.

586-06 - Reciprocating Engine Electrical and Control Systems

When you complete this lesson, you will be able to explain the electrical control modes used to maintain engine speed and the control systems used for starting, stopping, and maintaining safe engine operation.

586-07 - Reciprocating Engine Operations

When you complete this lesson, you will be able to describe the steps to startup and shutdown a reciprocating engine, and the steps to confirm it is operating normally. Additionally, some special operating conditions will be covered.

586-09 - Generator Control in Reciprocating Engine Power Plants

When you complete this lesson, you will be able to explain generator operation modes and the methods used to control generator output voltage. You will also be able to describe ways the automatic generator control system regulates loading and protects aga

586-11 - Reciprocating Engine General Inspection

When you complete this lesson, you will be able to identify the general inspection requirements, the components involved, and how to remove them for further inspection and overhaul.

587-01 - Nuclear Power Principles and Design

When you complete this lesson, you will be able to explain the basic theory and operation of a nuclear power plant. You will also be able to explain the basic process of nuclear fission and describe various nuclear reactor designs.

587-02 - PWR and BWR Operation and Design

When you complete this lesson, you will be able to describe and explain the operating principles and design of the two major types of nuclear power plants.

589-01 - Introduction to Solar Energy

When you complete this lesson, you will be able to explain the benefits of solar power generation and how solar power can be used to augment power generation from fossil fuels. You will also be able to describe the most common methods of solar power gener

589-03 - Solar Energy - Photovoltaic

When you complete this lesson, you will be able to explain the purpose of a photovoltaic cell and describe how they can be arranged to form arrays suitable for power generation. You will also be able to describe the common components required to support p

589-05 - Solar Energy - Thermal Applications

When you complete this lesson, you will be able to explain how concentrated solar power can be used to generate electricity. You will also be able to describe the function and operation of the components that make up a functioning solar thermal power gene

INSTRUMENTATION AND CONTROL

603-01 Instrumentation and Control Overview

When you complete this lesson, you will be able to describe the basic operating principles behind the instrumentation and control common to your unit. You will be able to identify various instrumentation components and discuss the ways instrumentation sy

603-02 - Principles of Temperature

When you complete this lesson, you will understand the concepts of temperature and heat transfer and be able to convert between common temperature scales. Define temperature and explain the difference between temperature and heat.

603-03 - Principles of Pressure

When you complete this lesson, you will understand pressure and how it is measured. You will be able to apply conversion formulas to

convert readings from one standard pressure scale to another.

603-04 - Principles of Level

When you complete this lesson, you will be able to explain the concept of level and describe how it is measured.

603-05 Principles of Flow

When you complete this lesson, you will be able to describe the principles of fluid flow and understand how these principles provide multiple means for measuring flow rate in the process industry. Define flow and flow rate.

603-06 - Temperature Instruments

When you complete this lesson, you will be able to identify various temperature measuring and sensing devices, and describe their operation. Identify types of thermometers and discuss the principles behind their operation.

603-07 Pressure Measuring Devices

When you complete this lesson, you will be able to identify and describe the operation of various pressure sensing and measurement devices.

603-08 Level Measuring Devices

When you complete this lesson, you will be able to identify various level sensing and measurement devices, and describe their basic operation.

603-09 Flow Measuring Devices

When you complete this lesson, you will be able to identify and describe the basic operation of various direct and indirect flow measurement devices.

603-15 - Weight Measuring Devices

When you complete this lesson, you will be able to describe various weight measuring devices used in industrial applications and explain their operating principles.

605-01 Multimeter

When you complete this lesson, you will

understand the basics of a digital multimeter and volt-ohm-meter and how to properly use a multimeter.

605-02 - Oscilloscopes

When you complete this lesson, you will understand how to use the controls of an oscilloscope for the purpose of measuring electrical signals. You will also be able to set an oscilloscope to measure voltage, frequency, time, and phase shift.

605-03 - Power Supplies

When you complete this lesson, you will be able to identify the main sections of a DC power supply and describe the types of regulation and regulators. You will also understand how a linear regulator works and be able to troubleshoot power supply problem

605-04 - Signal Generators

When you complete this lesson, you will understand the basic controls and operations of a signal generator. You will be able to use the device to generate basic waveforms for troubleshooting.

605-05 - Digital Thermometers and Calibrators

When you complete this lesson, you will understand the basic function and operation of temperature calibration equipment and loop calibrators. Explain the difference between contact and non-contact sensors.

605-06 Manometers

When you complete this lesson, you will understand how different types of manometers function and will be able to read them.

605-07 Pressure and Vacuum Calibrators

When you complete this lesson, you will be able to understand how pressure and vacuum calibrators operate and how to use them.

605-08 - Megohmmeters

When you complete this lesson, you will be able

to use a megohmmeter to safely take a reading of the resistance of wire insulation.

607-01 - Analytical Instruments

When you complete this lesson, you will be able to correctly identify analytical variables and explain the processes for measuring them. You will be able to explain analysis and describe the basic operation of direct and indirect analysis measurement dev

607-02 - Introduction to Analytical Testing

When you complete this lesson, you will be able to identify and describe the function of several key analyzers commonly found in industrial facilities.

609-01 - Calibration Overview I

When you complete this lesson, you will be able to explain calibration and describe basic calibration methods and equipment. Discuss the three-point and five-point methods of calibration.

609-02 - Calibration Overview II

Upon completion of this lesson, you will be able to explain methods used to calibrate transducers, control valve positioners, and smart instruments.

609-03 Introduction to Troubleshooting

When you complete this lesson, you will be able to describe basic troubleshooting techniques for temperature, pressure, level, and flow equipment in the plant.

609-04 Instrument Troubleshooting

When you complete this lesson, you will be able to explain the basic steps used in instrument troubleshooting.

611-01 PID Basics

When you complete this lesson, you will have the skills necessary to read a PID. You will be able to identify symbols and function labels, as well as describe how the components are related.

611-02 - Reading a P&ID

When you complete this lesson, you will be able

to use a PID to identify instrumentation, common equipment, and symbols used in your area. You will also be able to describe how components are related.

611-03 Electrical Drawings

When you complete this lesson, you will be able to identify the different types of electrical drawings and describe how each is used. You will also be able to identify and describe the common elements and symbols that make up electrical drawings. Describe

611-04 - Logic Diagrams

When you complete this lesson, you will be able to state the important features of a logic diagram and identify the most common types of logic gates and how each is used. You will also be able to identify the common symbols and components on a logic diagram

611-05 Industrial Print Reading Overview

When you complete this lesson, you will be able to describe the different types of drawings used by site employees to design, repair, and maintain equipment in the facility. In addition, you will have the skills necessary to determine which type of drawing

613-01 Introduction to Automated Control

When you complete this lesson, you will be able to discuss the basic design and function of automated control loops.

613-02 - Pneumatic and Electronic Control System

When you complete this lesson, you will be able to describe the design and function of typical pneumatic control systems used in industrial facilities.

613-03 Introduction to Switches

When you complete this lesson, you will be able to identify common types of electrical switching devices and describe the principles of their operation.

613-04 Electronic Control Systems

When you complete this lesson, you will be able to describe the design and function of typical electronic control systems used in industrial facilities.

615-01 - Signal Transmission

When you complete this lesson, you will be able to provide a general overview of how mechanical, analog, digital, pneumatic, electrical, fiber optic, and wireless systems are used to transmit signals in industrial control loops. You will also be able to c

615-02 Basic Principles of Industrial Transmitters

When you complete this lesson, you will be able to describe the basic function and operation of pneumatic and electric transmitters. You will also understand the formula relating transmitter outputs to inputs.

615-03 Smart Transmitters

When you complete this lesson, you will be able to describe the basic design, operation, and features of smart transmitters. You will also understand additional functionality available through the use of intelligent transmitters.

615-04 - Transducers

When you complete this lesson, you will be able to discuss the function of a transducer and describe types of conversions that transducers perform. You will also be able to explain the operating principles behind the most common types of transducers.

617-01 Controller Control Modes

When you complete this lesson, you will be able to describe the design and function of four main control modes used by industrial controllers.

617-02 - Operation of Automatic-Manual Transfer Stations

When you complete this lesson, you will be able

to describe the basic design, function, and use of an automatic-manual transfer station.

617-03 Final Control Elements

When you complete this lesson, you will be able to describe the basic design and function of various types of final control elements used in control loops in industrial facilities.

619-01 - Introduction to Industrial Electronics

When you complete this lesson, you will be able to describe the construction and operation of basic electronic components. You will also be able to explain common troubleshooting techniques used in electronic circuits.

619-07 Digital Electronics and Microprocessors

When you complete this lesson, you will be able to explain how digital signals differ from analog signals. You will also be able to describe the operation of many common types of digital components and circuits, including microprocessors.

621-01 Introduction to Programmable Logic Controllers (PLC)

When you complete this lesson, you will be able to describe the design and function of the major components of a PLC. In addition, you will be able to convert numbers from decimal to binary, binary coded decimal, and hexadecimal.

621-02 Input/Output (I/O) Processing

When you complete this lesson, you will be able to discuss I/O error checking and its impact on communications and function. In addition, you will be able to identify the various types and structure of PLC memory and describe how memory interacts with th

621-03 - Inputs and Outputs

When you complete this lesson, you will be able to describe the design and function of I/O (input/output) interfaces and the equipment used to produce and communicate I/O data.

621-04 PLC (Programmable Logic Controllers) Programming Instructions, Part 1

When you complete this lesson, you will be able to describe the functions of the programming instructions most commonly used in PLC programming.

621-05 PLC (Programmable Logic Controllers) Programming Instructions, Part 2

When you complete this lesson, you will be able to describe the functions of the programming instructions most commonly used in PLC programming.

621-06 PLC (Programmable Logic Controllers) Networks

When you complete this lesson, you will have a basic understanding of LAN architecture and topology, communication network access, and transmission media.

621-07 PLC Network Protocols

When you complete this lesson, you will have a basic understanding of common PLC network protocols.

670-01 Air Conditioning Fundamentals

When you complete this lesson, you will understand the basic refrigeration cycle and how it applies to air conditioning.

670-02 - Ductless Air Conditioning

When you complete this lesson, you will understand the various types of ductless air conditioners and how the components function, including basic maintenance.

670-03 Introduction to Industrial and Commercial Refrigeration

When you complete this lesson, you will understand the purpose and function of industrial and commercial refrigeration, how heat transfer and the refrigeration cycle drive the process, and the types of components and refrigerants that may be used in units

670-05 Refrigerant System Troubleshooting

When you complete this lesson, you will understand how to systematically troubleshoot and diagnose refrigerant systems based on their universal application of the refrigeration cycle. You will also be familiar with industry standard diagnostic and testing

670-06 Chiller Design and Maintenance

When you complete this lesson, you will know the purpose of an industrial HVAC chiller and understand how its main components work together to remove heat from the system's refrigerant, allowing the HVAC circuit to provide cool air to the facility. You

670-09 - Ducting and Air Movement for HVAC Systems

When you complete this lesson, you will understand the important role ducting plays in the HVAC system's ability to provide maximum airflow. You will also be able to identify common HVAC airflow issues related to poorly implemented ducting.

670-15 - District Energy Basics

When you complete this lesson, you will be able to define district energy and provide examples of the types of situations where district energy could be a solution. You will also be able to recall some advantages and disadvantages of the technology.

670-17 - Package Boiler Fundamentals

When you complete this lesson, you will be able to describe the purpose of the package boiler, the type and relationship of components within the system, and discuss the various situations in which a package boiler may be used, including its advantages an

670-19 Package Boiler Design

When you complete this lesson, you will be able to discuss the types of package boilers, their layout, and describe the location and functionality of the major components.

670-21 Package Boiler Startup, Operation, Shutdown and Maintenance

When you complete this lesson, you will be able to describe the common procedures for starting, stopping, and operating a package boiler, and discuss the typical routine maintenance required for proper boiler functionality.

670-23 Package Chiller Fundamentals

When you complete this lesson, you will be able to describe the purpose of district cooling and the package chiller, briefly describe the major components within the system, and discuss the various situations in which a package chiller may be used, includ

670-25 Package Chiller Design

When you complete this lesson, you will be able to describe the types of package chillers, the type and relationship of components within the system, and discuss the various designs offered for most district cooling package chillers.

670-27 Package Chiller Startup, Operation, Shutdown and Maintenance

When you complete this lesson, you will be able to describe the common procedures for starting, stopping, and operating a package chiller, and discuss the typical routine maintenance required for proper chiller functionality.

PROCESS SYSTEMS AND OPERATIONS**701-01 - Introduction to Petroleum Refining**

When you complete this lesson, you will be able to identify and briefly describe various refining processes that take place in a typical petroleum refinery.

701-02 - Basic Petroleum Chemistry

When you complete this lesson, you will be able to discuss the molecular structure, physical properties, naming conventions, and commercial uses of several common hydrocarbons.

701-03 - OSHAs Process Safety Management Standard

When you complete this lesson, you will be able to identify the main components and explain the objectives of the OSHA Process Safety Management (PSM) standard.

701-04 - History of Refining

When you complete this lesson, you will be able to provide a general overview of the evolution of crude oil processing from 1846 until the present day.

705-01 - Refinery Overview and Configuration

When you complete this lesson, you will be able to identify and discuss basic refinery purposes and operations, as well as recall the different configurations used in modern refining.

705-03 Crude Unit

When you complete this lesson, you will be able to describe the crude unit and its major components. You will also be able to identify and discuss the process of crude oil distillation.

705-05 Catalytic Reformer

When you complete this lesson, you will be able to define what catalytic reforming is, discuss the basic chemistry involved in reforming, and identify and describe the catalytic reforming process and components.

705-07 - Fluid Catalytic Cracker

When you complete this lesson, you will be able to define what fluid catalytic cracker is, discuss the principles of cracking, and identify and describe the fluid catalytic cracking process and components.

705-09 Coker Operations

When you complete this lesson, you will be able to define what catalytic reforming is, discuss the basic chemistry involved in reforming, and identify and describe the catalytic reforming process and components.

705-11 Gasoline Blending

When you complete this lesson, you will be able to describe what gasoline blending is, discuss the

process to blend gasoline and why blending plays such an important role in refinery operations, and describe the significance of octane and gasoline additives

705-13 Sweetening

When you complete this lesson, you will be able to identify and discuss what gas sweetening is and what role amines and solvent have in the sweetening process, and the process and equipment associated with a sweetening plant.

705-15 - Sulfuric Acid Plant

When you complete this lesson, you will be able to define what catalytic reforming is, discuss the basic chemistry involved in reforming, and identify and describe the catalytic reforming process and components.

707-01 - Features and Operation of Process Heaters

When you complete this lesson, you will be able to describe the features and operation of process heaters.

709-01 - Features and Uses of Process Tanks

When you complete this lesson, you will be able to describe the main features and uses of process tanks.

711-01 - Introduction to Distillation

When you complete this lesson, you will be able to describe the theory of distillation and the configuration of a distillation column and its components.

711-02 - Start-up; Normal Operation and Shutdown of a Distillation Column

When you complete this lesson, you will be able to describe the start-up, normal operation, and shutdown of a distillation column.

713-01 - Introduction to Process Separators

When you complete this lesson, you will be able to identify common types of process separators and their components. You will also be able to

describe the process separator's operating principles.

715-01 - Introduction to Process Reactors

When you complete this lesson, you will be able to describe chemical reactions, the features and operations of various types of reactors, and their application in the refining industry.

717-01 - Introduction to Naptha Reforming

When you complete this lesson, you will be able to explain how reforming relates to the operation of a refinery. You will also be able to identify reforming technologies, types of catalytic reformers, and how variables affect the process.

719-01 - Safety Alarm Systems and Instrumentation

When you complete this lesson, you will be able to describe the design, operation and use of safety alarm systems and instrumentation.

719-02 - Overpressure Safety Systems

When you complete this lesson, you will be able to describe the design, operation, and use of overpressure safety systems.

721-01 - Process Utilities Systems, Part 1

When you complete this lesson, you will be able to explain the function and design of plant water and air utility systems.

721-02 - Process Utilities Systems, Part 2

When you complete this lesson, you will be able to explain the function and design of heat and fuel, refrigeration, and power supply utility systems, and how they are linked in order to meet energy demands from industrial processes.

723-01 - Process Product Movement and Shipment

When you complete this lesson, you will be able to describe efficiency considerations in facility design, types of product storage and transportation, and precautions taken when handling product.

723-02 - Tanks and Vessels Used for Storage

When you complete this lesson, you will be able to describe and explain various types of non-pressurized, pressurized, and refrigerated storage tanks and vessels. You will also be able to explain safety equipment associated with these tanks and vessels.

725-01 - Sampling Principles and Methods

When you complete this lesson, you will be able to describe the importance of accurate sampling. You will also be able to explain several sampling types and systems. You will be able to describe correct sampling procedures.

725-02 - Testing Principles and Procedures

When you complete this lesson, you will be able to describe how tests are used to ensure on-specification quality products. You will be able to explain common chemical and physical tests performed on products to ensure this quality.

INDUSTRIAL MACHINING AND WELDING

801-01 - Introduction to Measuring and Care of Measuring Tools

When you complete this lesson, you will be able to explain the need for measuring tools in machining and maintenance operations. You will also be able to describe some of the precautions to take to properly care for these tools.

801-02 - Measuring Rules and Tapes

When you complete this lesson, you will be able to identify rigid rules, folding rules, depth rules, and tape measures; you will also be able to explain the correct procedures for taking accurate measurements with them.

801-03 - Micrometers

When you complete this lesson, you will be able to identify common micrometer types, identify their components, and correctly take readings using English, metric and Vernier micrometers.

801-04 - Fixed Gauges

When you complete this lesson, you will be able

to describe the various types of fixed gauges commonly used by maintenance and machining technicians. You will also be able to explain the purpose of the various fixed gauges.

801-05 - Measuring with Calipers

When you complete this lesson, you will be able to identify common types of calipers used in machining and maintenance work, and explain how to properly use them.

801-06 - Dial Indicators

When you complete this lesson, you will be able to list the major components of dial indicators and demonstrate how to use the instrument to take an accurate reading. You will also be able to describe how to use a dial indicator to measure the run out of

801-07 - Telescoping Gauges

When you complete this lesson, you will be able to describe the function and proper use of a telescoping gauge, and explain its care.

803-01 - Layout and Bench Work

When you complete this lesson, you will be able to identify the basic hand tools required and hand work methods used to manufacture replacement or repair parts used in various types of equipment.

803-02 - Threading and Tapping

When you complete this lesson, you will be able to describe taps, dies, and die nuts. You will also be able to explain how they are used in threading operations.

805-01 - Vertical Milling Machine

When you complete this lesson, you will be able to identify the basic control systems and machining methods used on a vertical milling machine and explain the basic operations necessary to manufacture replacement or repair parts used in various types of e

807-01 - Engine Lathe

When you complete this lesson, you will be able

to identify engine lathe control systems and machining methods, and explain the basic methods to manufacture replacement or repair parts for various types of equipment.

809-01 - Surface Grinder

When you complete this lesson, you will be able to describe surface grinder control systems and explain basic machining methods used to manufacture replacement parts used to repair various types of equipment.

811-01 - Pedestal Grinder

When you complete this lesson, you will be able to describe the design, function, and safe use of a pedestal grinder.

813-01 - Bandsaw

When you complete this lesson, you will be able to describe the design and operation of a band saw. In addition, you will be able to explain how to use a bandsaw to produce various cuts.

815-01 - Drill Press

When you complete this lesson, you will be able to describe the design, function, and safe operation of a drill press and its major components and attachments.

820-01 Scaffold Erection and Components

When you complete this lesson, you will be able to describe the proper erecting sequence of scaffolding. You will be able to identify components used to build a scaffold and the different types of scaffolding used in many constructions projects.

820-02 - Rigging I

When you complete this lesson, you will be able to describe the design and identify the classifications of wire ropes. You will learn to install wire ropes properly and the importance of inspections and lubrication.

820-03 - Rigging II

When you complete this lesson, you will be able to identify types of fiber ropes and the

applications where they are best used. In addition, you will be able to describe techniques for care and use of ropes.

820-04 - Rigging III

When you complete this lesson, you will be able to describe the design and importance of several types of rigging hardware. In addition, you'll be able to discuss appropriate applications for their use.

820-05 - Ladders

When you complete this lesson, you will be able to identify the design and function of several types of commonly used ladders. In addition, you will be able to describe proper care and safe use of ladders.

820-06 - Overhead Cranes

When you complete this lesson, you will be able to describe the design and function of various types of overhead cranes. In addition, you will understand the importance of responsibilities related to the operation, inspection, and maintenance of overhead

820-07 - Aerial Lift Devices

When you complete this lesson, you will be able to describe the three main aerial lift designs and their components. You will also be able to use this knowledge to choose the design that best suits the work you are doing.

841-01 - Safe Welding and Cutting Practices

When the lesson is complete, the user will be able to identify common welding hazards and describe how to use personal protective equipment (PPE), ventilation, and safety procedures to mitigate these hazards.

841-02 - Weldability of Metals

When you complete this lesson, you will be able to identify classifications of various metals and explain factors influencing their weldability.

841-03 - Shielded Metal Arc Welding (SMAW)

When you complete this lesson, you will be able to describe shielded metal arc welding (SMAW) and identify equipment, procedures, and methods used in successful SMAW operations.

841-04 - Gas Metal Arc Welding (GMAW)

When you complete this lesson, you will be able to describe gas metal arc welding (GMAW) methods. In addition, you will be able to discuss the design and function of components used in the GMAW process.

841-05 - Tungsten Inert Gas (TIG) Welding

When you complete this lesson, you will be able to describe tungsten inert gas (TIG) welding methods. In addition, you will be able to discuss the design and function of components used in the process.

841-06 - Oxyacetylene Welding (OAW)

When you complete this lesson, you will be able to describe oxy-acetylene welding (OAW) techniques. In addition, you will be able to discuss the design and function of components and apparatus used in the OAW process.