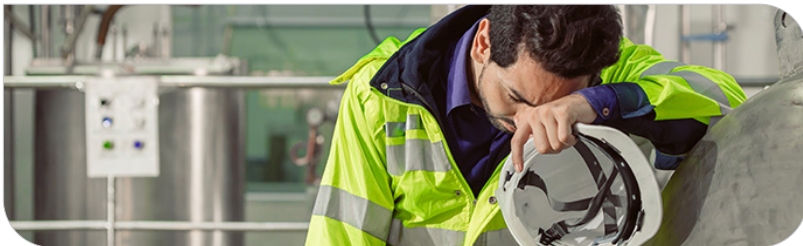


Industrial Skills Courses

100 – Safety, Health, and Plant Science

101 – Personal Protective Equipment (PPE)

101-01	Personal Protective Equipment
101-02	Hearing and Noise Safety
101-03	Respiratory Protective Program
101-70	Introduction to OSHA
101-71	Introduction to Industrial Hygiene



102 – Worksite Safety

102-01	Slip, Trip, and Fall Prevention
102-02	Ladder Safety
102-03	Portable Power and Hand Tool Safety
102-04	Machine Hazards and Safety
102-05	Machine Guarding
102-06	Accident Causes, Prevention, and Investigation
102-07	Stationary Power Tool Safety
102-08	Laboratory Health and Safety
102-09	Operator Fatigue
102-10	Hazard Identification and Assessment

103 – First Aid

103-01	First Aid
103-02	Bloodborne Pathogens
103-03	First Aid Resuscitation: Choking, CPR, and AED
103-04	Temperature Related Stress and Illness

104 – Fire Prevention

104-01	Fire Prevention and Protection Program
104-02	Fire Extinguisher Safety
104-03	Combustible Dusts

105 – Lockout/Tagout

105-01	Lockout/Tagout Safety Program
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106 – Confined Space Safety

106-01	Confined Spaces: Entrant and Attendant Duties
106-02	Confined Spaces: Entry Supervisor Duties
106-80	Confined Spaces: Entrant and Attendant Duties (CAD)

107 – Electrical Safety

107-01	Electrical Safety
107-02	Energized Electrical Equipment Safety
107-03	Arc Flash Hazard Basics

108 – Materials Handling

108-01	Materials Handling and Storing Safety
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109 – Rigging Safety

109-01	Rigging Safety
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110 – Scaffolding Safety

110-01	Scaffolding Safety
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111 – Scissor Lift Safety

111-01	Scissor Lift Operations and Safety
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112 – Crane and Hoist Safety

112-01	Crane and Hoist Safety
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› 100

Safety, Health, and Plant Science

› 200

Mechanical Maintenance

› 300

Electrical Transmission and Distribution

› 400

Electrical Maintenance

› 500

Power Generating Systems and Operations

› 600

Instrumentation and Control

› 700

Process Systems and Operations

› 800

Industrial Machining and Welding

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113 – Forklift Safety

113-01 Forklifts and Powered Industrial Trucks Safety

104 – Fall Protection

114-01 Fall Protection

114-81 Fall Protection (CAD)

115 – Excavation and Trenching

115-01 Excavating and Trenching Safety

116 – Compressed Gas Cylinder Safety

116-01 Compressed Gas Cylinder Safety

117 – Hazardous Materials Safety

117-01 Hazardous Materials Safety

117-02 Acid and Caustic Awareness

117-03 Asbestos and Silica Awareness

117-04 Ammonia Awareness

117-05 Hydrogen Sulfide Awareness

117-06 Chlorine Awareness

117-07 Radiation Awareness

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

117-09 Lead Awareness

117-20 Gas Monitoring Basics

117-83 Asbestos Awareness (CAD)

117-85 Hydrogen Sulfide Awareness (CAD)

118 – HAZWOPER

118-01 HAZWOPER Regulation Overview

118-02 Site Characterization and Analysis

118-03 Toxicology

118-04 Medical Surveillance

118-05 Decontamination

118-06 Emergency Procedures



119 – Hazard Communications

119-03 Hazardous Communications Employee Training Program, Part 1

119-04 Hazardous Communications Employee Training Program, Part 2

119-06 Hazard Communication Programs in the Workplace

119-07 Exposure to and Detection of Hazardous Chemicals

119-08 Physical, Health, and Environmental Hazard Classes

119-09 Labeling and SDS for Hazardous Chemicals

122 – Transportation

122-01 Driving Safety Practices

122-02 Drug and Alcohol Awareness

130 – Behavior Based Safety Training

130-01 Behavior Based Safety Programs Basic Design

130-02 Behavior Based Safety Program Concepts

130-03 Hazardous Material Procedures

130-04 Confined Space Procedures

130-05 Hot Work Procedures

130-06 Root Cause Analysis

130-07 Safety and Health Programs

131 – Ergonomics

131-01 Ergonomics in an Office Environment

131-02 Ergonomics in an Industrial Environment

131-03 Proper Lifting Technique



140 – Qualified Electric Worker

140-01 General Concepts and Job Briefings

140-04 Enclosed Spaces

140-09 Electrical Clearances

140-11 Mechanical Equipment

140-18 Dog Bite Prevention

150 – Environmental Awareness

150-01 Environmental Awareness

150-02 Stormwater Regulations and Pollution Prevention Plans

150-03 Spill Prevention, Control, and Countermeasures

160 – Construction Safety

160-01 Health Hazards in Construction

160-02 Scaffolding Safety for Construction

160-03 Portable Power and Hand Tool Safety for Construction

160-04 Materials Handling and Storing Safety For Construction

160-05 Personal Protective Equipment for Construction Part 1

160-06 Personal Protective Equipment for Construction Part 2

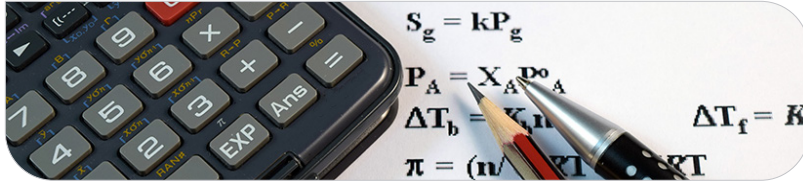
160-07 Excavation and Trenching Safety for Construction

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Industrial Machining and Welding
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170 – Industrial Mathematics

- 170-01 Introduction to Industrial Math
- 170-02 Industrial Math: Measurements and Calculation
- 170-03 Industrial Math: Fractions, Percentages, and Ratios



171 – Industrial Sciences

- 171-01 Atomic Structure and Chemical Bonding
- 171-02 Introduction to the Periodic Table of Elements
- 171-03 Chemical Formulas, Reactions, and Solubility
- 171-04 Introduction to Hydrocarbon Chemistry
- 171-05 Chemical Equations
- 171-10 Introduction to Physics: Force and Motion
- 171-11 Introduction to Physics: Energy, Work, and Power

180 – Human Performance

- 180-01 Fundamentals of Human Performance Improvement

200 – Mechanical Maintenance

201 – Intro to Industrial Maintenance and the Tools of the Trade

- 201-01 Working Principles of Simple Machines
- 201-02 Hand Tools, Part 1
- 201-03 Hand Tools, Part 2
- 201-04 Portable Power Tools
- 201-05 Torque Wrenches

202 – Belt Drive Maintenance

- 202-01 Introduction to Belt Drive Maintenance
- 202-02 V-belts
- 202-03 Positive Traction Belt Drives
- 202-04 Sheave Maintenance
- 202-05 Introduction to Conveyor Systems
- 202-06 Conveyor System Designs
- 202-07 Conveyor Belt System Inspection and Operation
- 202-08 Conveyor Belt Installation and Repair



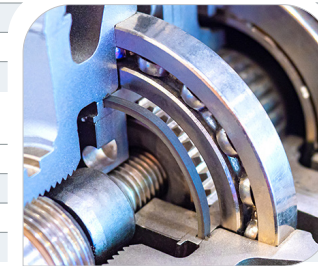
203 – Bearing Maintenance

- 203-01 Introduction to Bearings
- 203-02 Rolling Contact Bearings
- 203-03 Sliding Surface Bearings

- 203-04 Bearing Installation and Removal
- 203-05 Bearing Seals
- 203-06 Troubleshooting Bearing Failures

205 – Gear Maintenance

- 205-01 Introduction to Gear Drives
- 205-02 Types of Gears
- 205-03 Maintaining Gear Drives
- 205-04 Clutches



207 – Lubrication of Rotating Machinery

- 207-01 Lubrication Selection and Sampling in Rotating Machinery
- 207-02 Lubrication Failures and Management in Rotating Machinery
- 207-03 Lubrication Analysis in Rotating Machinery

208 – Piping and Tubing

- 208-01 Pipe Connections and Symbols
- 208-03 Piping Construction and Sizing
- 208-04 Piping Expansion, Support, and Insulation
- 208-05 Piping Auxiliaries
- 208-06 Tubing Types and Applications
- 208-07 Tube Fittings and Connection Methods
- 208-08 Tube and Conduit Bending

209 – Shaft Alignment

- 209-01 Couplings
- 209-03 Pre-Alignment Procedures
- 209-04 Rough Alignment
- 209-05 Mathematical Rim-and-Face Alignment
- 209-06 Graphical Rim-and-Face Alignment
- 209-07 Reverse Dial Alignment
- 209-09 Laser Alignment

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211 – Chain Drive Maintenance

211-01	Introduction to Chain Drives
211-02	Chain Drive Maintenance and Troubleshooting

213 – Lubrication

213-01	Lubrication Basics
213-02	Types of Lubricants
213-03	Lubrication Sampling and Analysis
213-04	Lubrication Filtration and Purification
213-05	Lubrication Delivery Methods and Systems

215 – Valve Selection and Maintenance

215-01	Introduction to Valves and Their Components
215-02	Valve Actuators
215-03	Gate Valves
215-04	Globe Valves
215-05	Butterfly Valves
215-06	Ball Valves
215-07	Check Valves
215-08	Needle Valves
215-09	Plug Valves
215-10	Diaphragm Valves
215-11	Pinch Valves
215-12	Safety and Relief Valves
215-13	Solenoid Valves
215-14	Valve Positioners
215-15	Pressure Regulator Valves



219 – Centrifugal Pumps

219-01	Introduction to Centrifugal Pumps
219-02	Centrifugal Pump Design
219-03	Centrifugal Pump Fundamentals
219-04	Centrifugal Pump Operation and Maintenance, Part 1
219-05	Centrifugal Pump Operations and Maintenance, Part 2
219-08	Impellers and Wear Rings
219-10	Pump Troubleshooting
219-12	Pump Internal Inspection and Troubleshooting

223 – Heat Exchangers

223-01	Heat Exchanger Theory
223-02	Open Heat Exchanger Design and Operation
223-03	Closed Heat Exchangers

225 – Compressors

225-01	Plant Compressed Air Systems
225-02	Compressed Air System Components
225-03	Positive Displacement Compressors

225-04	Dynamic Compressors
225-06	Axial Compressor Control Schemes

229 – Fasteners and Seals

229-01	Bolted Joints
229-02	O-Rings
229-03	Making Gaskets
229-04	Fasteners
229-05	Packing Material Use and Installation
229-06	Mechanical Seals Use and Installation



231 – Positive Displacement Pumps

231-01	Introduction to Positive Displacement Pumps
231-02	Reciprocating Positive Displacement Pumps
231-03	Rotary Positive Displacement Pumps

243 – Hydraulics

243-01	Introduction to Hydraulics
243-02	Hydraulic Systems
243-03	Hydraulic Fluids

271 – Vibration

271-01	Vibration Introduction
271-02	Vibration Causes and Characteristics
271-04	Plant Vibration Program

273 – Boiler Repair

273-01	Boiler Tube Repair
273-02	Inspecting the Fireside of a Boiler, Part 1
273-03	Inspecting the Fireside of a Boiler, Part 2
273-04	Inspecting the Waterside of a Boiler
273-05	Inspecting a Boiler's Exterior
273-06	Waterside and Fireside Cleaning of Boiler



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300 – Electrical Transmission and Distribution

301 – Distribution Systems

301-02	Electrical Distribution System Fundamentals*
301-03	Primary and Secondary Distribution Systems
301-04	Distribution System Components and Application
301-05	Characteristics of Distribution Switchgear
301-06	Ohm's Law, Energy Formulas, Basic Concepts, Circuits*
301-08	Single and Poly-Phase Metering*
301-18	Regulatory Overview and Electrical Safety Principles
301-19	Safe Working Practices
301-20	Arc Flash Analysis and Safety Equipment
301-21	Switching Practices
301-22	Post-storm Electrical Safety
301-23	Distribution Reliability
301-24	Power Quality
301-25	Planned Maintenance and Test Equipment
301-26	Smart Grid Systems



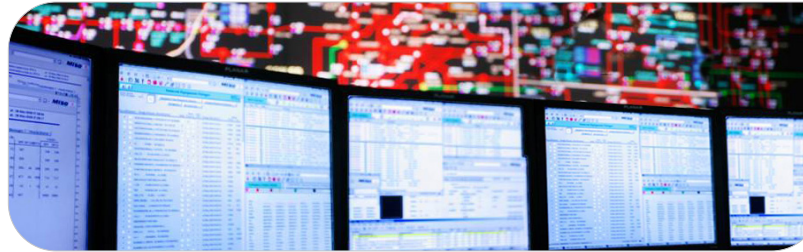
312 – Basic Electricity Fundamentals

312-01	Basic Electricity*
312-02	Laws of Electricity*
312-03	AC, DC, and Circuit Interactions*
312-04	Three Phase AC Connections & Effects*
312-05	Electric Devices*
312-06	Ohm's Law, Energy Formulas, Basic Concepts of Circuits*
312-07	Formulas for Voltage and Current Division*
312-08	Inductance, Capacitance, and Phase and Power Angles*
312-09	Phasors, Capacitance, Inductance, and Symmetrical Components*
312-10	Electromagnetism, Induction, Transformers, and Conductors*
312-11	Generators, Torque Angle, and Synchronizing*

320 – Power Markets

320-01	Market Concepts*
320-02	Regulators, RTOs, ISOs, Long Term Power Supply*

320-03	Near Term, Day Ahead, Hour Ahead, Real Time Power Supply*
320-04	Ancillary Services*
320-05	Risk Protection*



345 – Introduction to NERC

345-01	NERC Overview and Application for Generator Operators
345-02	NERC Overview
345-03	PER-006 for Generator Operators
345-10	FERC Standards of Conduct*

350 – System Protection

350-01	Elements of System Protection*
350-02	Types of Protective Relays*
350-03	Monitoring System Conditions*
350-04	Disturbance Monitoring Equipment*
350-05	Line Protection*
350-06	Transformer Protection*
350-07	Pilot Protection*
350-09	Bus Protection*
350-10	Generator Protection*
350-11	Protection System Misoperation*
350-12	Protection Systems Maintenance Programs*
350-14	General Relay Operations and Categories and Input*
350-15	Auxiliary Relays*
350-16	Fault Analysis, Relay Coordination, and Back-up Protection*
350-17	Breaker Operations*
350-18	Protection & Control*
350-19	Protection and Switching*
350-20	Remedial Action Schemes*



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375 – Resource and Demand Balancing

375-01	Real Power Balancing Control Performance
375-02	Disturbance Control Performance
375-03	Frequency Response Bias
375-05	Automatic Generation Control
375-12	Real Power Balancing Control Performance (BAL-001)*
375-13	Disturbance Control Performance (BAL-002)*
375-14	Inadvertent Interchange (BAL-003/BAL-005)*
375-15	Area Control Error Equation*
375-16	Evaluation and Implementation of Interchange Transaction*
375-17	Generation*

376 – Communication

376-01	Bulk Power System Communication Basics
376-02	Bulk Power System Communications and Coordination
376-04	Communication (COM-001/COM-002)*
376-05	Principles of Synchrophasors*
376-06	Application of Synchrophasors*
376-07	Effective Communication Overview*
376-08	Effective Verbal Communication*
376-09	Effective Written Communication*
376-10	Effective Communication Strategies and Best Practices*

377- Critical Infrastructure Protection

377-01	CIP Personnel Responsibilities
377-02	CIP Perimeters and Configurations
377-03	Controls and Management
377-04	CIP Related BES Recovery Plans
377-05	CIP Physical Security
377-06	Critical Infrastructure Protection Overview*
377-07	CIP Physical and Electronic Access*
377-08	CIP Incident Response, Recovery, Data Protection, and Risk Management*



378 – Emergency Operations Planning

378-01	Emergency Policies and Procedures
378-09	Event Reporting and Emergency Operations (EOP-004/EOP-011)*
378-10	System Restart from Blackstart and System Restoration Coordination (EOP-005/EOP-006)*
378-11	Loss of Control Center and Geomagnetic Disturbance Operations

(EOP-008/EOP-011)*	
378-12	Energy and Weather Event Summary*
378-13	Energizing and Restoring the Electric System*
378-14	Identifying and Responding to Blackouts*
378-15	Performing System Restoration*
378-18	Blackout Events*
378-19	Geomagnetic Disturbances*

381 – Interconnection Reliability Operations and Coordination

381-05	Reliability Coordination - Planning and Operations
381-06	Coordinating Entities and Duties
381-07	Reliability Coordinator Responsibilities (IRO-001/IRO-008/IRO-009)*
381-08	Reliability Coordinator Data Needs (IRO-002/IRO-010/IRO-014/IRO-018)*



387 – System Operations

387-01	Energy Production and Transfer
387-02	Transmission Operations
387-04	Power System Control Elements
387-10	Power System Restoration
387-03	Economic Power System Operations*
387-05	Interconnected Energy Accounting*
387-07	Supervisory Control and Data Acquisition Systems (SCADA)*
387-11	Basics of Power System Operations*
387-10	Power System Restoration
387-12	Human Performance for System Operators*
387-13	Renewable Energy Integration*
387-14	Solar, Hydro, Tidal, Geothermal, and Variable Generation*
387-15	Wind Generation*
387-16	Operations Planning, Monitoring, Analysis (TOP-002/TOP-003/TOP-010)*
387-17	Transmission Operations (TOP-001)*
387-18	Power System Concepts*
387-19	Transmission and Distribution Operations*
387-20	Emergency Response Application with Simulation*
387-21	Transmission Stations and Switchyards*
387-22	Transformer Principles*
387-23	Circuit Breakers and Disconnects*

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387 – System Operations, *continued...*

387-24	Transmission Lines, Station Protection, and Monitoring and Control*
387-25	Distribution and Shift Factors*
387-27	Contingency Analysis with Simulation*
387-29	Advanced Human Performance for System Operators*
387-30	Overview, Interconnected Power Systems Operations*
387-31	Transmission, Substations, and System Protection*
387-32	Control Center Operations and Governance*
387-33	Basic Electricity Concepts for System Operators*
387-34	Transmission Application with Simulation*
387-35	Math for System Operators*

400 – Electrical Maintenance

401 – Direct Current (DC)

401-01	Electron Theory
401-02	Magnetism and Electromagnetism Explained
401-03	Ohm's and Kirchoff's Laws Relating to DC Circuits
401-04	Evaluating Series and Parallel DC Circuit Performance
401-05	Determine Circuit Outputs from Specified Inputs



402 – Alternating Current (AC)

402-01	Introduction to Alternating Current (AC)
402-02	Ohm's and Kirchoff's Laws Involving AC Circuits
402-03	Inductance in AC Circuits
402-04	Capacitance in AC Circuits
402-05	Impedance in AC Circuits
402-06	AC Power
402-07	Fundamentals of Three-Phase AC

405 – Power Quality

405-01	Power Quality
405-02	Harmonics
405-03	High Voltage AC

409 – Industrial Motors

409-01	AC Induction Motors
409-02	AC Generators

388 - Active and Reactive Power

388-01	Active and Reactive Power Fundamentals
388-02	Active and Reactive Power Limits and Flows
388-08	Reactive Power Fundamentals*
388-09	Reactive Power Production Equipment*
388-10	Power Control Scenarios*
388-11	Electric Power Principles*
388-12	Voltage and Reactive Control*
388-13	Generators and Transmission Lines*
388-14	Generation Operations for Maintaining Network Voltage Schedules*
388-15	Voltage and Power Control Equipment*

409-03	AC Induction Motor Theory
409-04	Troubleshooting AC Induction Motors
409-05	AC Induction Motor Maintenance
409-06	Overhauling Induction Motors
409-07	Generator System Heat Protection
409-08	Generator Overhaul
409-09	DC Motors and Generators
409-10	Maintenance of Direct Current Motors and Generators

411 – Motor Control and Protection

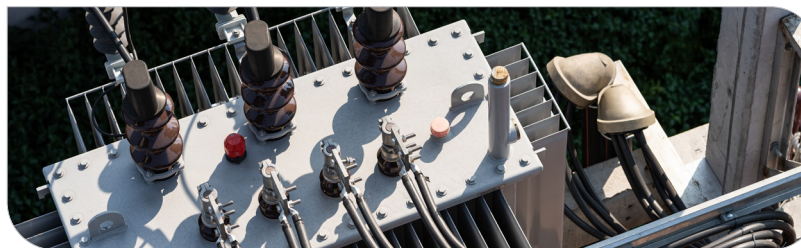
411-01	Introduction to Motor Controls
411-02	Motor Protection and Faults
411-03	Motor Control Troubleshooting
411-04	Motor Control Centers

413 – AC Drives

413-01	AC Drives Overview
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415 – Transformers

415-01	Transformer Basics
415-02	Transformer Design and Components
415-03	Transformer Connections
415-04	Special Transformers



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416 – Batteries, Battery Chargers, and UPS

416-01	Battery Basics
416-02	Electrical Backup Systems
416-03	Uninterruptible Power Supplies (UPS)

417 – Switchgear Maintenance

417-01	Switchgear
417-02	Low Voltage Breakers
417-03	Medium and High Voltage Switchgear
417-04	General Switchgear Maintenance
417-05	Breaker Specific Maintenance
417-06	Circuit Breaker Time-Travel Characteristics and Testing



418 – Electrical Protection and Grounding

418-01	Electrical Faults and Current Ratings
418-02	Overcurrent Protection, Fuses, and Breakers
418-03	Protection Relays
418-04	Generator, Transformer, and Motor Protection
418-05	Grounding and Bonding

419 – Motor Operated Valves

419-01	MOV (Motor Operated Valve) Application and Construction
419-02	MOV Disassembly and Inspection, Part 1
419-03	MOV Disassembly and Inspection, Part 2
419-04	Limit Switch Adjustment

421 – Wiring Installation

421-01	Wire and Cable Management
421-02	Terminating and Connecting Wires in a Control Panel
421-03	Making Connections in a Junction Box
421-04	Installing Conduit and Pulling Wire

423 – Cable Splicing

423-01	Introduction to Medium Voltage Cable
423-02	Medium Voltage Splices and Terminations

425 – Troubleshooting Electrical Circuits

425-01	Troubleshooting AC Circuits
425-02	Troubleshooting DC Circuits

427 – Freeze Protection

427-01	Electrical Freeze Protection Components and Application
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500 – Power Generating Systems and Operations

501 – Power Generation

501-01	Energy Conversions
501-02	Steam Turbine Basics
501-03	Combustion System Component Overview
501-04	Boiler Water and Steam Cycle Overview
501-05	Generator Overview

505 – Turbine Auxiliaries System and Control

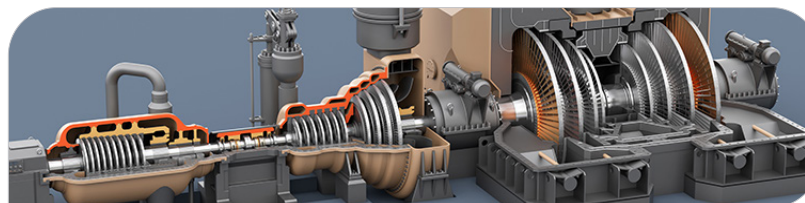
505-01	Steam Turbine Design
505-02	Steam Turbine Control and Operation*
505-03	Steam Turbine Auxiliaries
505-10	Steam Turbine Governor System

507 – Generator and Auxiliary Systems and Control

507-01	Generator and Auxiliary Systems' Functions*
507-02	Generator and Auxiliary Systems' Flow Paths and Major Components
507-03	Generator Construction and Process Control*
507-04	Generator and Auxiliary Systems Start-up
507-05	Generator and Auxiliary Systems Normal Operations
507-06	Generator and Auxiliary Systems Shutdown

511 – Combustion Turbine Fundamentals

511-01	Gas Turbine Fundamentals and Configuration of Generating Facilities
511-02	Introduction to the GE LM Series Gas Turbine
511-03	Introduction to GE Frame Series Gas Turbines
511-04	Introduction to the Siemens V-Series Gas Turbine
511-05	Heavy Duty Gas Turbines – Major Components and Support Systems
511-07	Aero-derivative Gas Turbines – Major Components and Support Systems
511-10	Fundamentals of Gas Turbine Operation and Routine Maintenance
511-11	Gas turbine Control Schemes
511-12	Gas Turbine Fuel and Combustion Systems
511-13	Gas Turbine Lube Oil and Control Oil Systems
511-14	Gas Turbine Air Systems
511-15	Gas Turbine Water Wash and Drain Systems



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521 – Combustion Air and Flue Gas System

521-01	Introduction to Combustion Air and Flue Gas Systems
521-02	Combustion Air and Flue Gas Flow Paths and Components
521-03	Control Loops and Methods of Control
521-04	Combustion Air and Flue Gas System Start-up
521-05	Maintaining Fan Operations in Combustion Air and Flue Gas Systems
521-06	Combustion Air and Flue Gas System Shutdown Process

522 – Coal Handling System

522-01	Coal Handling System
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523 – Boiler Fuel Systems

523-01	Boiler Fuel System Function
523-02	Process and Methods of Control for the Boiler Fuel System
523-03	Boiler Fuel System Start-up
523-04	Normal Operation of the Boiler Fuel Systems
523-05	Shutdown of the Boiler Fuel System

531 – Hydrocarbon Fired Boilers

531-01	Combustion Theory
531-02	Basic Boiler Design
531-03	Boiler Valves and Steam Fittings
531-04	Boiler Fuel and Air Systems
531-05	Boiler Water and Steam Cycle
531-06	Boiler Heat Recovery Systems
531-07	Scrubbers and Ash Removal Systems
531-08	Boiler Operator Roles and Responsibilities

533 – Boiler Firing Controls and Components

533-01	Fuel Combustion and Controls
533-02	Boiler Burner Controls and Management



535 – Fundamental Aspects of Emission Controls

535-01	Flue Gas Desulfurization System
535-02	Flue Gas Desulfurization System, Open Spray Design, Part 1
535-03	Flue Gas Desulfurization System, Open Spray Design, Part 2
535-04	Dry Scrubber Operation Lesson
535-05	Selective Catalytic Reduction (SCR) System
535-09	Introduction to Continuous Emission Monitoring Systems
535-10	Fundamentals of Using a CEMS
535-11	Calibration of CEMS Components

551 – Circulating Water System

551-01	Introduction to the Circulating Water System
551-02	Function of the Circulating Water System
551-03	Circulating Water System Components
551-04	Circulating Water System Start-up
551-05	Circulating Water System Normal Operations
551-06	Circulating Water System Shutdown
551-07	Circulating Water System Controls
551-08	Cooling Towers: Operating Principles and Designs
551-09	Cooling Towers: Components
551-10	Air Cooled Condensers



553 – Condensate and Feedwater Systems

553-01	Introduction to the Condensate System
553-02	Introduction to the Feedwater System
553-03	Condensate and Feedwater Systems Operation
553-04	Condensate and Feedwater System Control

555 – Boiler Feed Pumps

555-01	Boiler Feed Pump and Associated Auxiliary Equipment
555-02	Boiler Feed Pump Flow Path and Major Components
555-03	Boiler Feed Pump Water Supply and Control Systems
555-04	Boiler Feed Pump Startup
555-05	Boiler Feed Pump Daily Operations

557 – Boiler Water and Steam Systems

557-01	Function of Boiler Water and Steam Systems
557-02	Flow Paths and Components of the Boiler Water and Steam Systems
557-03	Process Controls for Boiler Water and Steam Systems
557-04	Startup Procedures for the Boiler Water and Steam Systems
557-05	Normal Operation of the Boiler Water and Steam Systems
557-06	Shutdown of the Boiler Water and Steam Systems

559 – Water Treatment

559-01	Molecular Chemistry of Water
559-02	Elements and the Periodic Table of Elements
559-03	Chemical Compounds
559-04	Corrosion Causes and Effects
559-05	Corrosion Control in Steam Production
559-06	Steam Chemistry Control Guidelines
559-07	Industrial Water Treatment Systems
559-08	Introduction to Desalination
559-09	Desalination: Pre- and Post-treatment of Water
559-10	Reverse Osmosis
559-11	Thermal Desalination Technologies

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560 – Plant Electrical Systems

560-01	Main Transformers
560-02	Station Service System
560-03	Fuses and Circuit Breakers
560-04	Protective Relays and Instrument Transformers
560-05	Equipment Disconnects and Grounding

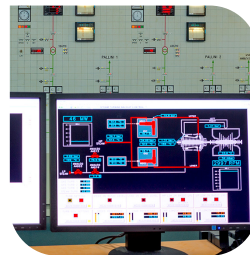


561 – Unit Start-up and Shutdown

561-01	Preparing for Power Plant Startups
561-02	Power Plant Startup Procedures
561-03	Preparing for Power Plant Shutdown
561-04	Power Plant Shutdown Procedures

563 – Efficiency, Reliability, and Environmentally Sensitive Operations

563-01	Basic Power Plant Efficiency
563-02	Water and Steam: Terms and Principles
563-03	Heat Transfer Principles
563-04	Laws and Principles of Thermodynamics
563-05	Performance Parameters
563-06	Balancing Efficiency, Availability, Capability and Flexibility
563-07	Instrumentation and Controls
563-08	Boiler Efficiency
563-09	Boiler Reliability
563-10	Turbine Efficiency
563-11	Condenser Efficiency
563-12	Condenser Operation and Reliability
563-13	Feedwater Heater Operation and Efficiency
563-14	Pump Efficiency and Reliability
563-15	Environmentally Sensitive Operations



565 – Plant Control System

565-01	Distributed Control System Fundamentals
565-02	Distributed Control System Components
565-03	Using Distributed Control System Diagrams
565-04	Power Plant Unit Control

567 – Heat Rate Optimization

567-01	Basic Principles of Water and Steam
567-02	Saturated Steam Tables
567-03	Superheated Steam Tables

581 – Diesel Power Plant Operations

581-01	Diesel Engines for Power Generation
581-02	Diesel Engine Support Systems
581-03	Diesel Powered Generation
581-04	Diesel Power Plant Operations
581-05	Diesel Plant Control Systems and Protective Devices
581-06	Diesel Plant Routine Maintenance

582 – Combined Cycle Power Plant Operations

582-01	Combined Cycle Power Plants
582-02	Combined Cycle Power Plant Components
582-03	HRSG – Flow Path and Major Equipment
582-04	HRSG – Auxiliary Equipment and Systems
582-05	HRSG - Basic Operating Concerns and Conditions
582-06	Combined Cycle Steam and Feedwater Operating Principles
582-07	Combined Cycle Condensate and Circulating Water Systems
582-08	Combined Cycle Auxiliary Systems
582-10	Steam Turbines in a Combined Cycle Plant
582-13	Control Loops in a Combined Cycle Plant



583 – Hydroelectric Power Plant Operations

583-01	The Hydroelectric Role in the Power System
583-02	Hydroelectric Power Stations
583-03	Water Management
583-04	Hydroelectric Generators
583-05	Generator Monitoring and Control
583-06	Hydroelectric Plant Auxiliaries
583-07	Operating Electrical Equipment in a Hydroelectric Plant
583-08	Mechanical Governor
583-09	Electric Governor

584 – Biomass Energy

584-01	Introduction to Biomass Power Plants
584-02	Biomass and Waste to Energy Power Plants

585 – Wind Energy

585-01	Basic Wind Turbine Design
585-02	Wind Farm Development
585-03	Horizontal Wind Turbine Design and Operation
585-04	Wind Energy Production

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586 – Reciprocating Engine Power Plants

586-01	Introduction to Reciprocating Engine Power Plants
586-03	Fundamentals of Reciprocating Engine Design
586-05	Reciprocating Engine Auxiliary Systems
586-06	Reciprocating Engine Electrical and Control Systems
586-07	Reciprocating Engine Operations
586-09	Generator Control in Reciprocating Engine Power Plants
586-11	Reciprocating Engine General Inspection

587 – Nuclear Energy

587-01	Nuclear Power Principles and Designs
587-02	PWR and BWR Operation and Design

588 – Battery Energy Storage Systems (BESS)

588-01	Introduction to Battery Energy Storage Systems (BESS)
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589 – Solar Energy

589-01	Introduction to Solar Energy
589-03	Solar Energy - Photovoltaic
589-05	Solar Energy – Thermal Applications

600 – Instrumentation and Control

603 – Process Control Variables

603-01	Instrumentation and Control Overview
603-02	Principles of Temperature
603-03	Principles of Pressure
603-04	Principles of Level
603-05	Principles of Flow
603-06	Temperature Instruments
603-07	Pressure Measuring Devices
603-08	Level Measuring Devices
603-09	Flow Measuring Devices
603-15	Weight Measuring Devices



611 – Prints and Drawings

611-01	P&ID Basics
611-02	Reading a P&ID
611-03	Electrical Drawings
611-04	Logic Diagrams
611-05	Industrial Print Reading Overview

613 – Automated Control

613-01	Introduction to Automated Control
613-02	Pneumatic Control Systems
613-03	Introduction to Switches
613-04	Electronic Control Systems

615 – Signal Transmission and Conversion

615-01	Signal Transmission
615-02	Basic Principles of Industrial Transmitters
615-03	Smart Transmitters
615-04	Transducers

617 – Controllers and Final Control

617-01	Controller Control Modes
617-02	Operation of Automatic-Manual Transfer Stations
617-03	Final Control Elements

619 – Electronics Fundamentals

619-01	Introduction to Industrial Electronics
619-07	Digital Electronics and Microprocessors

605 – Test Equipment

605-01	Multimeter
605-02	Oscilloscopes
605-03	Power Supplies
605-04	Signal Generators
605-05	Temperature Calibrators
605-06	Manometers
605-07	Pressure and Vacuum Calibrators
605-08	Megohmmeter



607 – Analyzers

607-01	Analytical Instruments
607-02	Introduction to Analytical Testing

609 – Calibration and Troubleshooting

609-01	Calibration Overview, Part 1
609-02	Calibration Overview, Part 2
609-03	Introduction to Troubleshooting
609-04	Instrument Troubleshooting



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621 – Programmable Logic Controllers

621-01	Introduction to Programmable Logic Controllers (PLC)
621-02	Input/Output (I/O) Processing
621-03	Inputs and Outputs
621-04	PLC (Programmable Logic Controllers) Programming Instructions, Part 1
621-05	PLC (Programmable Logic Controllers) Programming Instructions, Part 2
621-06	PLC (Programmable Logic Controllers) Networks
621-07	PLC Network Protocols



670 – Heating & Cooling Fundamentals

670-01	Air Conditioning Fundamentals
670-02	Ductless Air Conditioning
670-03	Introduction to Industrial and Commercial Refrigeration
670-05	Refrigerant System Troubleshooting
670-06	Chiller Design and Maintenance
670-09	Ducting and Air Movement for HVAC Systems
670-15	District Energy Basics
670-17	Package Boiler Fundamentals
670-19	Package Boiler Design
670-21	Package Boiler Startup, Operation, Shutdown and Maintenance
670-23	Package Chiller Fundamentals
670-25	Package Chiller Design
670-27	Package Chiller Startup, Operation, Shutdown and Maintenance

700 – Process Systems and Operations

701 – Petroleum Refining

701-01	Introduction to Petroleum Refining
701-02	Basic Petroleum Chemistry
701-03	OSHA's Process Safety Management Standard
701-04	History of Refining
701-05	Introduction to Crude Oil
701-06	Operator Qualifications in Refining
701-07	Maintenance Requirements in Petroleum Refining
701-08	Predictive and Reactive Maintenance



705 – Refining Operations

705-01	Refinery Overview and Configuration
705-03	Crude Unit
705-05	Catalytic Reformer
705-07	Fluid Catalytic Cracking
705-09	Coker Operations
705-11	Gasoline Blending
705-12	Diesel and Other Fuels
705-13	Sweeting
705-15	Sulfuric Acid Plant
705-17	Finishing Processes and Hydrotreating
705-19	Support Plants and Regulations
705-21	Natural Gas Refining
705-23	Lubricants
705-25	Asphalt

707 – Process Heaters

707-01	Features and Operation of Process Heaters
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709 – Process Tanks

709-01	Features and Uses of Process Tanks
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711 – Distillation

711-01	Introduction to Distillation
711-02	Operation of a Distillation Column

713 – Process Separators

713-01	Introduction to Process Separators
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715 – Process Reactors

715-01	Introduction to Process Reactors
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717 – Reforming and Synthesis

717-01	Introduction to Naphtha Reforming
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719 – Process Safety Systems

- 719-01 Safety Alarm Systems and Instrumentation
- 719-02 Overpressure Safety Systems

721 – Process Utilities Systems

- 721-01 Process Utilities Systems, Part 1
- 721-02 Process Utilities Systems, Part 2

800 – Industrial Machining and Welding

801 – Precision Measurement

- 801-01 Intro to Measuring and Care of Measuring Tools
- 801-02 Measuring Rules and Tapes
- 801-03 Micrometers
- 801-04 Fixed Gauges
- 801-05 Measuring with Calipers
- 801-06 Dial Indicators
- 801-07 Telescoping Gauges

803 – Layout and Bench Work

- 803-01 Layout and Bench Work
- 803-02 Threading and Tapping

805 – Vertical Milling Machine

- 805-01 Vertical Milling Machine

807 – Engine Lathe

- 807-01 Engine Lathe

809 – Surface Grinder

- 809-01 Surface Grinder

811 – Pedestal Grinder

- 811-01 Pedestal Grinder

813 – Band Saw

- 813-01 Band Saw



723 – Process Product Movement and Storage

- 723-01 Process Product Movement and Shipment
- 723-02 Tanks and Vessels Used for Storage

725 – Process Sampling and Testing

- 725-01 Sampling Principles and Methods
- 725-02 Testing Principles and Procedures

815 – Drill Press

- 815-01 Drill Press

820 – Rigging, Lifting, and Elevated Work Surfaces

- 820-01 Scaffold Erection and Components
- 820-02 Rigging, Part 1
- 820-03 Rigging, Part 2
- 820-04 Rigging, Part 3
- 820-05 Ladders
- 820-06 Overhead Cranes
- 820-07 Aerial Lift Devices

841 – Welding and Cutting for Maintenance

- 841-01 Safe Welding and Cutting Practices
- 841-02 Weldability of Metals
- 841-03 Shielded Metal Arc Welding (SMAW)
- 841-04 Gas Metal Arc Welding (GMAW)
- 841-05 Tungsten Inert Gas (TIG) Welding
- 841-06 Oxyacetylene Welding (OAW)



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		CEH	STD	SIM	EO
301-02	Electrical Distribution System Fundamentals	2.0	--	1.0	--
301-06	Load Characteristics and Management	1.5	1.0	--	--
301-08	Single and Poly-Phase Metering	1.0	--	--	--
312-01	Basic Electricity	1.0	--	--	--
312-02	Laws of Electricity	1.0	--	--	--
312-03	AC, DC, and Circuit Interactions	1.0	--	--	--
312-04	Three-Phase AC Connections and Effects	1.5	--	--	--
312-05	Electric Devices	1.0	--	--	--
312-06	Ohm's Law, Energy Formulas, Basic Concepts, Circuits	1.0	1.0	--	--
312-07	Formulas for Voltage and Current Division	1.0	1.0	--	--
312-08	Inductance, Capacitance, and Phase and Power Angles	1.0	1.0	--	--
312-09	Phasors, Capacitance, Inductance, and Symmetrical Components	1.0	1.0	--	--
312-10	Electromagnetism, Induction, Transformers, and Conductors	1.0	1.0	--	--
312-11	Generators, Torque Angle, and Synchronizing	1.0	1.0	--	--
320-01	Market Concepts	1.0	--	--	--
320-02	Regulators, RTOs, ISOs, Long Term Power Supply	1.5	--	--	--
320-03	Near Term, Day Ahead, Hour Ahead, Real Time Power Supply	1.0	--	--	--
320-04	Ancillary Services	1.0	--	--	--
320-05	Risk Protection	1.0	--	--	--
345-01	NERC Overview and Application for Generator Operators	2.0	--	--	--
345-10	FERC Standards of Conduct (SOC)	1.0	--	--	--
350-01	Elements of System Protection	2.5	1.0	--	--
350-02	Types of Protective Relays	2.5	0.5	--	--
350-03	Monitoring System Conditions	2.5	0.5	--	--
350-04	Disturbance Monitoring Equipment	2.0	1.0	--	--
350-05	Line Protection	1.0	0.5	--	--
350-06	Transformer Protection	1.0	--	--	--
350-07	Pilot Protection	1.5	--	--	--
350-09	Bus Protection	1.0	--	--	--

		CEH	STD	SIM	EO
350-10	Generator Protection	2.5	2.0	--	--
350-11	Protection System Misoperation	1.5	1.0	--	--
350-12	Protection Systems Maintenance Programs	2.0	1.0	--	--
350-14	General Relay Operations and Categories and Input	1.5	--	--	--
350-15	Auxiliary Relays	1.0	1.0	--	--
350-16	Fault Analysis, Relay Coordination, and Back-up Protection	1.5	--	--	--
350-17	Breaker Operations	1.5	--	--	--
350-18	Protection and Control	2.0	2.0	--	--
350-19	Protection and Switching	2.0	--	--	--
350-20	Remedial Action Schemes	1.0	--	--	--
375-12	Real Power Balancing Control Performance (BAL-001)	1.0	1.0	--	--
375-13	Disturbance Control Performance (BAL-002)	1.0	1.0	--	--
375-14	Inadvertent Interchange	1.5	1.0	--	--
375-15	Area Control Error (ACE) Equation	1.5	--	--	--
375-16	Evaluation and Implementation of Interchange Transaction (INT-006)	1.0	1.0	--	✓
375-17	Generation	1.0	--	--	--
376-04	Communications (COM-001, COM-002)	1.5	1.5	--	✓
376-05	Principles of Synchrophasors	1.0	--	--	✓
376-06	Application of Synchrophasors	1.5	--	--	✓
376-07	Overview	1.0	1.0	--	--
376-08	Effective Verbal Communication	1.0	1.0	--	--
376-09	Effective Written Communication	1.0	1.0	--	--
376-10	Effective Communication Strategies and Best Practices	1.5	1.0	--	--
377-06	Critical Infrastructure Protection Overview	1.0	1.0	--	--
377-07	CIP Physical and Electronic Access	1.5	1.5	--	--
377-08	CIP Incident Response and Recovery and Supply Chain Risk Management	1.0	1.0	--	--
378-09	Event Reporting and Emergency Operations (EOP-004, EOP-011)	1.0	1.0	--	✓
378-10	System Restart from Blackstart and System Restoration Coordination (EOP-005, EOP-006)	1.0	1.0	--	✓



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378-11	Loss of Control Center and Geomagnetic Disturbance Operation (EOP-008, EOP-010)	1.5	1.0	--	✓
378-12	Energy and Weather Events	1.5	1.5	--	✓
378-13	Energizing and Restoring the Electric System	1.0	1.0	--	✓
378-14	Identifying and Responding to Blackouts	1.0	1.0	--	✓
378-15	Performing System Restoration	1.0	1.0	--	✓
378-18	Blackout Events	1.0	--	--	--
378-19	Geomagnetic Disturbances	2.5	2.5	--	--
381-07	Reliability Coordinator Responsibilities (IRO-001, IRO-008, IRO-009)	2.0	1.5	--	✓
381-08	Reliability Coordinator Data Needs (IRO-002, IRO-010, IRO-014, IRO-018)	1.5	1.5	--	✓
387-03	Economic Power System Operations	2.0	--	--	✓
387-05	Interconnected Energy Accounting	2.0	--	--	✓
387-07	Supervisory Control and Data Acquisition Systems (SCADA)	2.0	--	--	--
387-11	Basics of Power System Operations	1.0	--	--	--
387-12	Human Performance for System Operators	1.5	--	--	--
387-13	Renewable Energy Integration	1.0	1.0	--	✓
387-14	Solar, Hydro, Tidal, Geothermal, and Variable Generation	1.5	--	--	--
387-15	Wind Generation	1.0	--	--	--
387-16	Operations Planning, Monitoring, Analysis (TOP-002, TOP-003, TOP-010)	1.0	1.0	--	--
387-17	Transmission Operations (TOP-001)	1.0	1.0	--	--
387-18	Power System Concepts	1.5	--	--	--
387-19	Transmission and Distribution Operations	2.0	--	--	--
387-20	Emergency Response Application with Simulation	1.0	--	0.5	--
387-21	Transmission Stations and Switchyards	1.0	--	--	--
387-22	Transformer Principles	1.0	--	--	--
387-23	Circuit Breakers and Disconnects	1.0	--	--	--
387-24	Transmission Lines, Station Protection, and Monitoring and Control	1.5	--	--	--
387-25	Distribution and Shift Factors	1.0	--	--	--

		CEH	STD	SIM	EO
387-27	Contingency Analysis with Simulation	1.5	--	0.5	--
387-29	Advanced Human Performance for System Operators	1.0	1.0	--	--
387-30	Overview, Interconnected Power System Operations	1.5	--	--	--
387-31	Transmission, Substations, and System Protection	1.5	--	--	--
387-32	Control Center Operations and Governance	1.0	--	--	--
387-33	Basic Electricity Concepts for System Operators	1.0	--	--	--
387-34	Transmission Application with Simulation	1.5	--	0.5	--
387-35	Math for System Operators	1.0	--	--	--
388-08	Reactive Power Fundamentals	1.0	1.0	--	✓
388-09	Reactive Power Production Equipment	1.0	1.0	--	✓
388-10	Power Control Scenarios	1.0	1.0	--	✓
388-11	Electric Power Principles	1.0	--	--	--
388-12	Voltage and Reactive Control	1.5	1.0	--	--
388-13	Generators and Transmission Lines	1.0	--	--	--
388-14	Generation Operations for Maintaining Network Voltage Schedules	1.0	1.0	--	--
388-15	Voltage and Power Control Equipment	1.5	1.0	--	✓
505-02	Steam Turbine Control and Operation	1.5	--	--	✓
507-01	Generator and Auxiliary Systems' Functions	1.0	1.0	--	✓
507-03	Generator Construction and Process Control	1.0	1.0	--	--

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✓ For PER compliance, EO training must be applicable to each individual organization. Please check with your compliance group for eligibility.



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