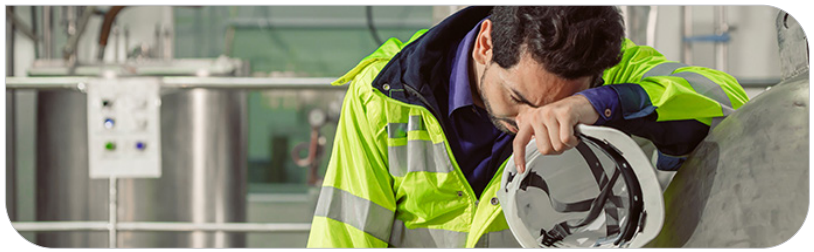
Online Training
RELIABILITY MATTERS

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

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

109 – Rigging Safety

109-01	Rigging Safety

110 – Scaffolding Safety

110-01	Scaffolding Safety

111 – Scissor Lift Safety

111-01	Scissor Lift Operations and Safety

112 – Crane and Hoist Safety

112-01	Crane and Hoist Safety

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113 – Forklift Safety

113-01	Forklifts and Powered Industrial Trucks Safety

114 – 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	Storm water 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
160-08	Fall Protection for Construction
160-09	Ladder Safety for Construction

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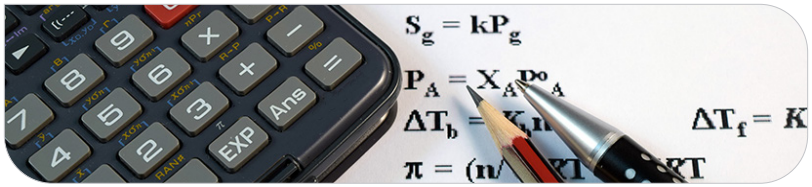
170 – Industrial Mathematics

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

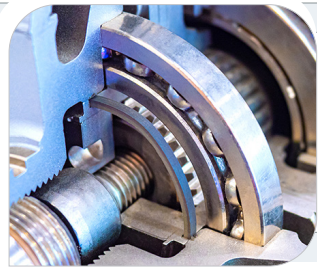
201-01	Working Principles of Simple Machines
201-02	Hand Tools, Part 1
201-03	Hand Tools, Part 2
201-04	Portable Power Tools
201-05	Torque Wrenches

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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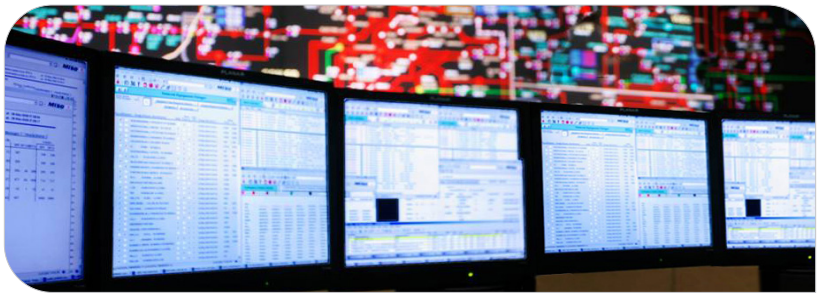
300 – Electrical Transmission and Distribution

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	Load Characteristics and Management*
301-07	Principles of Revenue Metering
301-08	Single and Poly-Phase Metering*
301-09	Intro to Distribution Systems
301-10	Distribution Design and Resource Planning
301-11	Distribution Substation Equipment
301-12	Distribution Protection
301-13	Overvoltage Protection
301-14	SCADA and EMS
301-15	Service Entrance Equipment
301-16	Normal Operations
301-17	Emergency Operations
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
301-37	Distribution System Components
301-38	Overhead and Underground Facilities
301-39	System Protection and Coordination
301-40	Distribution Operations
301-41	Safety for Distribution Systems
301-42	Distribution Control Center and Smart Devices

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*

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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*

375 – Resource and Demand Balancing

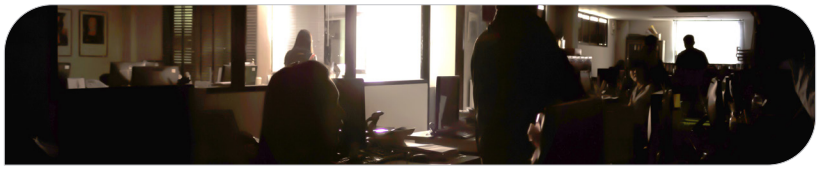
375-12	Real Power Balancing Control Performance (BAL-001)*
375-13	Disturbance Control Performance (BAL-002)*
375-14	Inadvertent Interchange (BAL-003/BAL-005)*
375-15	Area Control Error Equation*
375-16	Evaluation and Implementation of Interchange Transaction*
375-17	Generation*
375-18	Real Power Balancing Concepts

376 – Communication

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

377-06	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

378-09	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

381-07	IRO-001, IRO-006, IRO-008, and IRO-009 Reliability Coordinator Responsibilities*
381-08	IRO-002, IRO-010, IRO-014, IRO-017, and IRO-018 Reliability Coordinator Data Needs*

387 – System Operations

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*
387-12	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*
387-37	Human Performance for System Operators - Error Prevention*

388 - Active and Reactive Power

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

395 - NERC Compliance Training

395-10	Compliance Awareness - Blackout Events
395-11	Compliance Awareness - NERC Functional Entities
395-12	Compliance Awareness - Internal Control Evaluation
395-13	Compliance Awareness - NERC Program Development
395-14	Compliance Awareness - Awareness of Standards and Their Impact

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 Kirchhoff'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
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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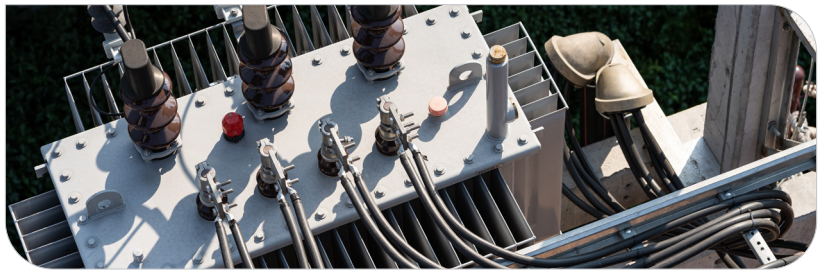
415 – Transformers

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



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

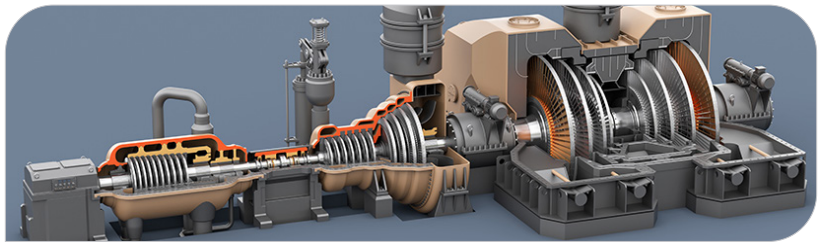
427 – Freeze Protection

427-01	Electrical Freeze Protection Components and Application

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

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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

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

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
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

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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

560 – Plant Electrical Systems

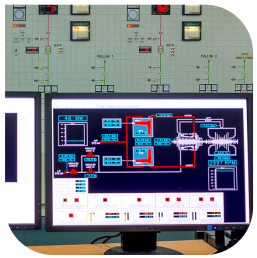
560-01	Main Transformers
560-02	Station Service System
560-03	Fuses and Circuit Breakers
560-04	Protective Relays and Instrument Transformers
560-05	Equipment Disconnects and Grounding

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
582-12	Combined Cycle Instrument and Control Air System
582-13	Control Loops in a Combined Cycle Plant
582-14	Combined Cycle Services and Fire Water Systems

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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

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)
588-02	Battery Energy Storage System Design

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

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
605-09	Loop Calibrators

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

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
611-21	Introduction to Engineering Drawings

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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

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	Sweetening
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

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707 – Process Heaters

707-01	Features and Operation of Process Heaters

709 – Process Tanks

709-01	Features and Uses of Process Tanks

711 – Distillation

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

713 – Process Separators

713-01	Introduction to Process Separators

715 – Process Reactors

715-01	Introduction to Process Reactors

717 – Reforming and Synthesis

717-01	Introduction to Naphtha Reforming

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

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

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

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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NERC Online Courses

		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	--	--	--
312-07	Formulas for Voltage and Current Division	1.0	--	--	--
312-08	Inductance, Capacitance, and Phase and Power Angles	1.0	--	--	--
312-09	Phasors, Capacitance, Inductance, and Symmetrical Components	1.0	--	--	--
312-10	Electromagnetism, Induction, Transformers, and Conductors	1.0	--	--	--
312-11	Generators, Torque Angle, and Synchronizing	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	1.0	--	--	--
350-09	Bus Protection	1.5	--	--	--
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	--	--	--
375-18	Real Power Balancing Concepts	2.5	2.0	--	--
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	--	--	--
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	--	--	--
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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		CEH	STD	SIM	EO
378-11	Loss of Control Center and Geomagnetic Disturbance Operation (EOP-008, EOP-010)	1.5	1.5	--	✓
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	2.0	--	--
381-07	Reliability Coordinator Responsibilities (IRO-001, IRO-008, IRO-009)	2.0	--	--	✓
381-08	Reliability Coordinator Data Needs (IRO-002, IRO-010, IRO-014, IRO-018)	1.5	1.5	--	✓
387-03	Economic Power System Operations	1.0	--	--	--
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	--	--	--
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	--	--	--
387-37	Human Performance for System Operators - Error Prevention	2.0	0.5	--	--
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	--	--

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

HSI and HSI_SOS_001 are recognized by the North American Electric Reliability Corporation as a continuing education provider who adheres to NERC Continuing Education Program Criteria.

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

hsi

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Instructor-Led Courses

	DURATION	CEH	STAND	SIM	EO
Advanced Distribution Concepts	2 day	N/A	–	–	–
Adequate Level of Reliability	4 hrs	4	–	3	–
Analyzing and Mitigating Contingencies: Operational Situational Awareness	1 day	8	1	6	Y
Balancing, Voltage Control, and Congestion Management	1 day	8	2	4	–
Communication, Relay Protection and Emergency Operations	1 day	8	2	4	–
Distribution Systems	3 day	N/A	–	–	–
Effective On-the-Job Training	2 day	N/A	–	–	–
Emergency Operations and Communication	1 day	8	2	3	Y
Emergency Operations Overview	4 hrs	4	3	3	Y
Frequency Response and Balancing	4 hrs	4	2	3	–
Human Performance for System Operators	2 day	16	–	11	Y
Integrating Renewable Energy Resources	4 hrs	4	–	1	–
Managing Power System Reliability	4 hrs	4	–	4	–
NERC Certification: Exam Preparation Instructor-led	3.5 day	28 ‡	19	–	Y
Power System Frequency Impacts and Control	1 day	8	4	4	Y
Presentation Skills	2 day	N/A	–	–	–
Principles for System Reliability	2 day	16	3	6	Y
Procedure Writing	1 day	N/A	–	–	–
Real Power Balancing and Congestion Management	1 day	8	2	3	Y
Relay Protection for System Operation	1 day	8	–	2	–
SAT Complete	3 day	N/A	–	–	–
System Restoration	4 hrs	4	1	3	–
System Restoration	1 day	8	1	6	Y
Voltage Control 1 & 2	2 day	16	4	8	–
Voltage Control 1	1 day	8	3	4	–
Voltage Control 2	1 day	8	1	4	–
Voltage Control and Relay Protection	1 day	8	3	2	Y
Voltage Control Overview	4 hrs	4	2	3	–

‡ NERC Certified Operators with a NERC Certification Number earn the credits/hours shown. All Non-certified Operators are eligible for EO and Professional hours only.

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DISTRIBUTION OPERATIONS TRAINING helps operators understand the increasingly complex distribution system. Our training provides a working knowledge of how distribution systems are configured and function while addressing electrical fundamentals, reliability control, smart devices, and safety.

Distribution Control Center Operations Training – Level 1

Basic Distribution

301-09	Introduction to Distribution Systems
301-10	Distribution Design and Resource Planning
301-11	Distribution Substation Equipment
301-12	Distribution Protection
301-13	Overvoltage Protection
301-14	SCADA and EMS
301-15	Service Entrance Equipment
301-16	Distribution Normal Operations
301-17	Distribution Emergency Operations

Electrical Safety

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

Fundamentals of System Protection

387-03	Interconnected Power System Operations
375-17	Generation
387-31	Transmission, Substation, and System Protection
387-32	Control Center Operations and Governance

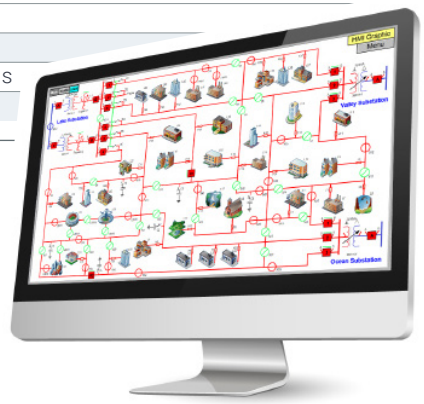
Distribution Control Center Operations Training – Level 2

Advanced Distribution

301-23	Distribution Reliability
301-24	Power Quality
301-25	Planned Maintenance and Test Equipment
301-26	Smart Grid System

INSTRUCTOR-LED DISTRIBUTION TRAINING

- Advanced Distribution Concepts
- Distribution Systems
- Electric Power System Operations
- Electrical Safety



Distribution Simulation

10 Scenario Bundle

- Simulator Orientation Tutorial
- Isolating Equipment – Valley Feeder Breaker
- Isolating Equipment – Lake Regulator 2
- Fault – Lake Feeder 4
- Isolating Equipment – Valley Transformer 3
- Fault – Ocean Feeder 3
- Isolating equipment – Lake Transformer 1
- Fault – Lake Feeder 4, Version 2
- Fault – Lake Feeder 6, Unguided
- Fault – Valley Feeder 2, Unguided

5 Scenario Bundle

- Fault – Lake Feeder 4, Unguided
- Restoring System – Lake Transformer 1
- Fault #2 – Lake Feeder 4, Unguided
- Isolated Lake Regulator 2, Unguided
- Isolated Valley Transformer3, Unguided

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DISTRIBUTION TECHNICIAN TRAINING provides training to help your team minimize maintenance downtime and get equipment running again quickly after an outage. The training focuses on the processes and equipment distribution technicians work with every day and makes sure they understand how to keep themselves and their coworkers safe.

Qualified Electric Worker

140-01	General Concepts and Job Briefings
140-02	Enclosed Spaces
140-09	Electrical Clearances
140-11	Mechanical Equipment
140-18	Dog Bite Prevention

Electrical Transmission and Distribution

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

Electrical Maintenance

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

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

Power Quality

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

Industrial Motors

409-01	AC Induction Motors
409-02	AC Generators
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

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

AC Drives

413-01	AC Drives Overview

Transformers

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

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Batteries, Battery Chargers, and UPS

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

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

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

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

Wiring Installations

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

Cable Splicing

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

Troubleshooting Electrical Circuits

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

Freeze Protection

427-01	Electrical Freeze Protection Components and Application

Distribution Operations

301-37	Introduction to Distribution Systems
301-38	Overhead and Underground Facilities
301-39	System Protection and Coordination
301-40	Distribution Operations
301-41	Safety for Distribution Systems
301-42	Distribution Control Center and Smart Devices

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