

GE

# Energy Connections

## Customer Training

For Engineering and  
Maintenance Personnel

- Drives and Controls
- Power Delivery
- Electrical Safety





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## General Information

- \* Our courses are unique in that they are designed and taught by GE's technical experts. Our instructors have vast experience installing and maintaining electrical equipment and systems that are the subjects of the training courses.
- \* As a student, you receive insightful, practical knowledge that you can readily relate to and apply.
- \* Recording devices are not allowed. The contents of our classes are fully copyrighted and cannot be recorded or duplicated without our permission.

## Classroom Training

- \* Scheduled dates are based on meeting the minimum enrollment. If the minimum enrollment requirements are not satisfied, the course may be offered at an additional cost for each student, or the course would be delayed or cancelled.

## On-Site Training

- \* We offer a broad range of industrial training for industrial, utility and commercial operations. Our programs feature curricula tailored to each customer's particular needs. These personalized programs provide world-class, site-specific training for owners and operators of Drives & Controls and Power Delivery equipment.
- \* Site training is an economical approach to minimize living and transportation expenses.
- \* Course offerings are structured to balance theory, hands-on application and engineering concepts for maintenance and operation personnel. Note: For hands-on training on-site, the customer must provide safe access to spares or equipment to use for hands-on/demonstration training; otherwise, training will be limited to classroom training.
- \* Course Durations may vary depending on the individual customer, and scope of training

## Contact Us

- \* Contact your local Account Manager or Service Manager for a quote or to inquire about enrollment.



# GE Energy Management Technical Training

## Industrial Services External Training Schedule

Course Title	Location	Duration	Price/student*	Date *
DC2100e Drives	Pittsburgh, PA TBD Salem, VA	3 days	\$3,000	Feb 21-23, 2017 May 9-11, 2017 Sept 6-8, 2017
LV7000 Drives	Salem, VA	2 days	\$2,000	March 1-2 , 2017 Sept 12-13, 2017
P80i Software	Pittsburgh, PA	2 days	\$2,000	March 7-8, 2017
AC/DC 2000	Salem, VA	3 days	\$3,000.00	March 14-16, 2017 Sept 19-21, 2017
Innovation Series Controller	Salem, VA	3 days	\$3,000.00	March 21-23, 2017 Sept 26-28, 2017
Power Systems Engineering	Salem, VA	4.5 days	\$4,500.00	May 1-5, 2017
Low Voltage Switchgear Maintenance	Salem, VA	4.5 days	\$4,500.00	May 8-12, 2017
Med Voltage Switchgear Maintenance	Salem, VA	4.5 days	\$4,500.00	May 22-26, 2017
Protective Devices-Power Systems Protection	Salem, VA	4.5 days	\$4,500.00	June 5-9, 2017
Motor Training Fundamentals (Theory, Design, Excitation, ESP1, etc.)	Salem, VA	4.5 days	\$4,500.00	June 12-16 , 2017
Electrical Safety and NFPA 70E for Qualified Individuals	Flexible	1 day	Quote upon request	As needed

\* Prices are per student. Prices and scheduled dates are based on meeting the minimum enrollment. If the minimum enrollment requirements are not satisfied, the course may be offered at an additional cost for each student, or the course would be delayed or cancelled.



# GE Energy Management Technical Training

## Industrial Services LV7000 Drives

Prerequisites	Electrical experience/education/PC Skills
Min/Max Number of Students	Min 6; Max 12
Targeted Attendees	<ul style="list-style-type: none"><li>• Maintenance Personnel</li><li>• Engineering Personnel</li><li>• Service Personnel</li></ul>
Duration	2 days
Location	GE Training Facility in Salem, VA

### Course Objectives:

This course is designed for individuals who operate and maintain the LV7000 AC Variable Speed Drive. The course will provide an introduction to AC motor theory, along with the operation of the LV7000 drive. The drive controller electrical and electronic components, cooling system, and interfacing methods will be examined to provide a broader understanding of the operation and maintenance. Hands-on exercises with the drive interface and software will enhance students' ability to monitor and maintain the system, as well as the ability to communicate with service personnel if assistance is required.

### Course Contents:

- LV7000 product range and features/Hardware Introduction
- Hardware details
- Operation/Keypad/Parameters
- LV7000 Load/LV7000 Configurator Software
- Drawing review
- LV7000 unit demonstration/Removal of bridge/Removal of LCL filter
- Motor Tuning
- LV7000 Profinet interface to Innovation Series Controller



# GE Energy Management Technical Training

## Industrial Services DC2100e Drives

Prerequisites	Electrical experience/education/PC Skills
Min/Max Number of Students	Min 6; Max 8
Targeted Attendees	<ul style="list-style-type: none"><li>• Maintenance Personnel</li><li>• Engineering Personnel</li><li>• Service Personnel</li></ul>
Duration	2 days
Location	GE Training Facility in Salem, VA

### Course Objectives:

This course is designed for individuals who operate and maintain the DC2100e DC Drive. The course will provide an introduction to operation of the DC2100e drive, and include an overview of the DC2100e hardware, software, and installation. Troubleshooting of the DC2100e will also be discussed, and include labs to enhance students' ability to monitor and maintain the system.

### Course Contents:

- DC2100e Hardware Overview: RXi, PIBe, PCGA, Snubber Board, Core Panel, QuickPanel, Power Module, Digital Front End, Beckhoff I/O, Options, Ground Fault, Brake
- Software Overview: CORE Resource, Navigation (Documents vs. Task), Tasks descriptions (P80i Tasks tab), PROC Resource, Quickpanel operation, Drive sequence states
- Installation: Power connections, I/O Interface,
- Troubleshooting: Fault diagnostics, Troubleshooting labs



# GE Energy Management Technical Training

## Industrial Services P80i Software Training

Prerequisites	Electrical experience/education/PC Skills
Min/Max Number of Students	Min 6; Max 12
Targeted Attendees	<ul style="list-style-type: none"><li>• Maintenance Personnel</li><li>• Engineering Personnel</li><li>• Service Personnel</li></ul>
Duration	3 days
Location	Pittsburgh, PA/Salem, VA/Flexible

### Course Objectives:

This course is designed as an introduction to the P80i Software application as used to program the HPCi, PEC, EPEC and PECe controller platforms, and is intended for individuals who troubleshoot, maintain, and install these systems. The installation, navigation, and basic functions of P80i are presented, with hands-on exercises. The monitoring of the program execution and collection of data using PERTU and MoniPert is demonstrated.

### Course Contents:

- P80i Application
- Installation P80i
- Application Navigation
- P80i Application Structure
- P80i Edit, Compile, Download
- Program Monitor, PERTU, MoniPert



# GE Energy Management Technical Training

## Industrial Services AC/DC 2000 Drives

Prerequisites	Electrical experience/education/PC Skills
Min/Max Number of Students	Min 6; Max 12
Targeted Attendees	<ul style="list-style-type: none"><li>• Maintenance Personnel</li><li>• Engineering Personnel</li><li>• Service Personnel</li></ul>
Duration	3 days
Location	GE Training Facility in Salem, VA

### Course Objectives:

This course is designed for engineering and maintenance personnel who configure and maintain the AC/DC 2000 drive. Topics include drive application, drive power components, circuit cards and their descriptive operation, elementaries, SCR, IGBT and related information. The keypad operation will be covered extensively as a means of troubleshooting and interrogating the drive. This course would also be used by personnel to understand how to use the features of the Control System Toolbox running under the Windows system, which applies to the AC/DC 2000 drive in order to operate, maintain and troubleshoot the drive. Software topics include AC/DC 2000 overview, AC/DC 2000 hardware, terminology, block diagram, I/O programming, serial monitor commands, trending and circular lists.

### Course Contents:

- AC/DC 2000 Overview (hardware & terminology)
- Block Diagrams
- I/O programming
- Maintenance and Troubleshooting
- GE Control System Toolbox™, Utilizing the Drives Pattern, including:
  - a. Trend Recorder (Real time trending)
  - b. Circular lists (Background trending)



# GE Energy Management Technical Training

## Industrial Services Innovation Series Controller

Prerequisites	Electrical experience/education/PC Skills
Min/Max Number of Students	Min 6; Max 12
Targeted Attendees	<ul style="list-style-type: none"><li>• Maintenance Personnel</li><li>• Engineering Personnel</li><li>• Service Personnel</li></ul>
Duration	3 days
Location	GE Training Facility in Salem, VA

### Course Objectives:

This course is designed for engineering and maintenance personnel who are responsible for configuring, maintaining or troubleshooting a system that includes the Innovation Series Controller (ISC) also known as Unit Controller 2000 (UC2000) with or without the operator's console. Through a series of lectures and hands-on exercises the student will learn to use the many functions and features of the controller, including software changes, I/O modifications, trending, diagnostics, and troubleshooting techniques using the Control System Toolbox. The student will feel confident in using these tools for monitoring, and diagnosing a system that utilizes the Innovation Series Controller.

### Course Contents: By the end of this module, the student will be able to:

- Identify boards and modules essential for ISC in a minimal configuration.
- Identify major hardware (UCVA-G, Flatpack)
- Briefly explain the function of Signal Database and Signals associated with the ISC.
- Monitor the controller, read block-ware via Toolbox.
- Briefly explain the tuning and forcing of variables in an ISC.
- Install the software into a suitable computer and utilize it to open and startup an ISC.
- Define Macros, Modules in the Innovation Series Controller.
- Determine and setup the protective functions in the Innovation Series Controller.
- Briefly explain on how to write code and add signals
- Briefly explain typical failures & solutions of boards or modules associated with the ISC.





# GE Energy Management Technical Training

## Low Voltage Switchgear Maintenance

Prerequisites	1 day of Face-Face Training on Lockout/Tagout 1 day of Face-Face Training NFPA70E/Electrical Safety Electrical/Electronic/PC Skills
Min/Max Number of Students	Min 6; Max 12
Targeted Attendees	<ul style="list-style-type: none"><li>• Maintenance Personnel</li><li>• Engineering Personnel</li><li>• Service Personnel</li></ul>
Duration	4.5 days
Location	GE Training Facility in Salem, VA

### Course Objectives:

This course is designed for personnel responsible for engineering, maintenance, testing and troubleshooting Low Voltage power circuit breakers, protective relays, breaker trip devices and switchgear panels. Topics include switchgear construction, switchgear diagrams, trip devices, low voltage power circuit breakers, testing, and maintenance. Hands-on exercises are based on AKD 5, 8, 10, and 20 switchgear, though the techniques would be applicable all air circuit breakers across various OEMs, to enhance students' ability to provide service across a range of Low Voltage equipment.

### Course Contents:

- Introduction
- AK & AKD Breakers
- AKR & WavePro Breakers
- Legacy Trip Devices
- EntelliGuard Trip Devices
- Entellisys Switchgear
- EntelliGuard G & Power Break II Breakers
- Print Reading & LV Switchgear Maintenance



# GE Energy Management Technical Training

## Medium Voltage Switchgear Maintenance

Prerequisites	1 day of Face-Face Training on Lockout/Tagout 1 day of Face-Face Training NFPA70E/Electrical Safety Electrical/Electronic/PC Skills
Min/Max Number of Students	Min 6; Max 12
Targeted Attendees	<ul style="list-style-type: none"><li>• Maintenance Personnel</li><li>• Engineering Personnel</li><li>• Service Personnel</li></ul>
Duration	4.5 days
Location	GE Training Facility in Salem, VA

### Course Objectives:

This course is designed for personnel responsible for engineering, maintenance, testing and troubleshooting power circuit breakers, contactors, protective relays, trip devices, switchgear panels, and starters on Medium Voltage Equipment. Lecture topics include switchgear diagrams, breaker control, switchgear enclosures, protective relays, medium voltage induction and synchronous motor starters, testing, maintenance and operation of medium voltage equipment. Primary equipment covered in labs are Power-Vac breakers, Magne-Blast breakers and Limitamp Motor Starters and Transformers, though the techniques would be applicable to air and vacuum type equipment across various OEMs, and enhance students' ability to provide service across a range of Medium Voltage equipment.

### Course Contents:

- Introduction to Medium Voltage Equipment
- Magne-Blast (AM) Breakers
- Power/Vac ML-17, ML-18
- Review Power/Vac VB/4 Powell
- Line Isolation Switch with Seco VB
- Limitamp-Medium Voltage Motor Starter
- Prints
- Lab Projects
- SECO VB-2+
- Power Transformer Overview



# GE Energy Management Technical Training

## Industrial Services Power Systems Engineering

Prerequisites	Basic Electrical/Electronic/PC Skills
Min/Max Number of Students	Min 6; Max 16
Targeted Attendees	Maintenance Personnel Engineering Personnel Service Personnel
Duration	4.5 days
Location	Flexible

### Course Objectives:

This course is designed for Field Engineers and Power Systems Engineers responsible for industrial or commercial power systems planning, designs for reliability and overall system performance. The purpose is to provide the knowledge & techniques to allow students to solve general Industrial Power System Engineering problems, in the areas of Short Circuit Calculations, Protective Device Coordination, Modern Protective Systems, and Arc Flash Level Reduction, utilizing power systems analysis software.

### Course Contents:

- Introduction
- Fundamentals
- Short Circuit Calculations
- Basic Protective Systems
- Protection, Control, & Power Management
- Power System Coordination
- Arc Flash Basics
- Arc Flash Mitigation



# GE Energy Management Technical Training

## Industrial Services Power Systems Protection/Protective Devices

Prerequisites	Basic Electrical/Electronic/PC Skills
Min/Max Number of Students	Min 6; Max 12
Targeted Attendees	<ul style="list-style-type: none"><li>• Maintenance Personnel</li><li>• Engineering Personnel</li><li>• Service Personnel</li></ul>
Duration	4.5 days
Location	GE Training Facility in Salem, VA

### Course Objectives:

This course is designed for Field Engineers and Power Systems Engineers responsible for industrial or commercial power systems planning, designs for reliability and overall system performance. The purpose is to provide the knowledge & techniques to allow students to understand how protective devices work, how settings are developed, how to program, and how to verify settings and program are working correctly.

### Course Contents:

- Fuses and Electro-Mechanical Devices
- Protection Fundamentals
- Feeder Protection
- Motor Protection
- Generator Protection
- Transformer Protection
- Relay Testing
- Basic & Advanced Elements



# GE Energy Management Technical Training

## Motor Training

Prerequisites	1 day of Face-Face Training on Lockout/Tagout 1 day of Face-Face Training NFPA70E/Electrical Safety Electrical/Electronic/PC Skills
Min/Max Number of Students	Min 6; Max 12
Targeted Attendees	<ul style="list-style-type: none"><li>• Maintenance Personnel</li><li>• Engineering Personnel</li><li>• Service Personnel</li></ul>
Duration	4.5 days
Location	GE Training Facility in Salem, VA

## Course Objectives:

This course is designed for personnel responsible for engineering, maintenance, and testing of motors. This course provides practical theory, specialized information on construction, testing, operation, maintenance and troubleshooting of electric motors. Topics include fundamentals of motors, ac induction, ac synchronous; ac wound rotor, and dc machines, motor application, and an overview of vibration, alignment, and bearings.

## Course Contents:

- Motor Theory, Design, Construction (i.e. motor components), Testing, Maintenance
- Motor Protection
- Synchronous Machine Exciter Theory and Operation
- Motor Labs that explain the theory and practical application of ac and dc machines



# GE Energy Management Technical Training

## Electrical Safety and NFPA 70E (2015) for Qualified Individuals

Prerequisites	Prior knowledge of electrical equipment and systems, personal protective equipment and Lockout/Tagout training.
Min/Max Number of Students	Min 6; Max 12
Targeted Attendees	Any individual who will be working near energized equipment and has the need to determine the degree and extent of the hazard and the personal protective equipment to perform a given task safely.
Duration	1 day (8 hours)
Location	Flexible

### Course Content:

Course content includes safety around electrical systems; effects of current on the body; Personal Protective Equipment (PPE) for working near energized equipment; additional PPE that is required for applying Lockout/Tagout (LOTO) to equipment that is to be de-energized; electrical power tool safety; temporary protective grounding, and equipment potential hazards. (If purchased with a GE Arc Flash Hazard Study, this course will be customized to incorporate explanations of selected results detailing potential issues and recommendations.) This course meets the electrical section of OSHA requirements of 29 CFR 190.269, 29 CFR 1910.303, through 29 CFR 1910.333. Reference GEA14582 for additional information.

### Course Objectives:

- Explain the fundamentals of electrical accidents
- Define proper procedures for identifying energized equipment and working on de-energized electrical equipment safely
- Explain how to recognize electrical safety hazards
- Recognize defined appropriate safe work distances to energized equipment
- Explanation of "Equipotential" and Step Potential
- Selection of test equipment for identifying energized equipment
- Understand the limitations of test equipment
- Selection of PPE for individuals at risk of an electrical arc or explosion
- Proper method for identifying and applying electrical safety grounds
- Apply inspection guidelines for PPE and test equipment
- Understand arc-flash hazard PPE categories and their application in a number of situations