GE Grid Solutions l Grid Automation

Montpellier Technical Institute

Training Course Guide

GE Grid Solutions
www.gegridsolutions.com

Digital Substation
& Protection and Control

The aim of this learning program is to provide a flexible learning methodology to learn all about our products, services and protection and control solutions offerings in creating protection and control schemes.
We cover all our protection and automation devices and protection elements including IEC 61850, and much more.

All the information you need in one place to make an informed training selection.

Digital Substation
& Protection and Control

MiCOM Px40

Operation

Duration
2 days

Audience
Engineers from application and control department, project managers, technicians and operators

PROP002

Objectives

- Have a comprehensive overview of selected MiCOM Px40 relays
- Have a detailed insight into the MiCOM support software, MiCOM S1 Agile
- Have a detailed overview of the relay construction, application, programming, and communication

Course topics

Typically, based on customers selected relays, the course will give a comprehensive insight into the product's application in the field, its settings and methods of remote interrogation

- Settings creation and upload/download
- Event extraction and interrogation
- Disturbance record extraction and interrogation
- Programmable scheme logic creation and upload/download
- Measurements monitoring
- Menu text editing
- In-depth training on the MiCOM relay setting software MiCOM S1 Agile

Learning path

Prerequisite
Basic understanding of electrical network and protection principles
Knowledge of Microsoft Windows® an asset.

PROP002
40% theoretical
60% practical
This class includes Instructor lead examples/exercises using sample MiCOM products where applicable.

GET MORE
This training can be provided on site at your own convenience.

MiCOM P14x / Agile P14D and P14N

Overcurrent and feeder protection

Duration
2 days

Audience
Electrical engineers, technicians, operators, maintenance engineers, protection design engineers

PROP120

Objectives

• Operate and maintain the overcurrent and feeder protection relay (MiCOM P14x / Agile P14D, P14N)

Course topics

• Reminder on overcurrent and feeder protection application
• MiCOM P14x / Agile P14D, P14N functionalities
• Product characteristics
• Relay exploitation: front panel, LEDs, push-buttons, navigation through front panel
• Alarms & acknowledgement
• MiCOM S1 Agile software
• Parameter file creation, upload and download
• PSL file creation, upload and download
• Disturbance, fault, event records
• Detailed presentation of MiCOM P14x / Agile P14D, P14N functions
• Product connection
• Test with current injection MiCOM P14x / Agile P14D, P14N hardware
• Maintenance
• Hands-on to test various functions

Learning path

Prerequisite
Good knowledge of electrical substations, overcurrent and feeder protection principles.
Knowledge of Microsoft Windows® an asset.

PROP120
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

MiCOM P24x

Motor protection

Duration
2 days

Audience
Electrical engineers, operators, maintenance engineers, protection design engineers

PROP121

Objectives

• Operate and maintain the MiCOM P24x motor protection relay

Course topics

• Reminder on motor protection application
• P24x functionalities
• Product characteristics
Operation: front panel, LEDs, push-buttons, navigation through front panel
• Alarms & acknowledgement
• MiCOM S1 Agile software parameter file creation, upload and download
• PSL file creation, upload and download
• Disturbance, fault, event records
• Detailed presentation of P24x functions
• Test with current injection
• P24x hardware
• Maintenance
• Hands-on to test the various functions

Learning path

Prerequisite
PROG104
Good knowledge of electrical substations and motor protection principles.
Knowledge of Microsoft Windows® an asset.

PROP121
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

MiCOM P34x

Generator protection

Duration
3 days

Audience
Electrical engineers, operators, maintenance engineers, protection design engineers

PROP122

Objectives

• Operate and maintain of the MiCOM P34x generator protection relay

Course topics

• Reminder on generator protection application
• P34x functionalities
• Product characteristics
• Relay MMI: front panel, LEDs, push-buttons, navigation through front panel
• Alarms & acknowledgement
• MiCOM S1 Agile
• Parameter and PSL file creation, upload and download
• Disturbance, fault, event records
• Detailed presentation of P34x functions
• Product connection
• Test with current injection
• P34x hardware
• Maintenance
• Hands-on to test the various functions

Learning path

Prerequisite
PROG106
Good knowledge of electrical substations, generator and protection principles.
Knowledge of Microsoft Windows® an asset.

PROP122
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

MiCOM P44x

Distance protection

Duration
4 days

Audience
Electrical engineers, operators, maintenance engineers, protection design engineers

PROP123

Objectives

• Operate and maintain the MiCOMP44x distance protection relay

Course topics

• Reminder on distance protection application
• P44x functionalities
• Product characteristics
• Relay MMI: front panel, LEDs, push-buttons, navigation through front panel
• Alarms & acknowledgement
• MiCOM S1 Agile software
• Parameter and PSL file creation, upload and download
• Disturbance, fault, event records
• Detailed presentation of P44x functions
• Product connection
• Test with current injection
• P44x hardware
• Maintenance
• Hands-on to test the various functions

Learning path

Prerequisite
PROG017
Good knowledge of electrical substations and distance protection principles.
Knowledge of Microsoft Windows® an asset.

PROP123
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

MiCOM P54x

Line differential protection

Duration
3 days

Audience
Electrical engineers, operators, maintenance engineers, protection design engineers

PROP124

Objectives

• Operate and maintain the MiCOM P54x line differential protection relay

Course topics

• Reminder on line differential protection application
• P54x functionalities
• Product characteristics
• Communication between relays
• Relay MMI: front panel, LEDs, push-buttons, navigation through front panel
• Alarms & acknowledgement
• MiCOM S1 Agile software
• Parameter and PSL file creation, upload and download
• Disturbance, fault, event records
• Detailed presentation of P54x functions
• Product connection
• Test with current injection
• P54x hardware
• Maintenance
• Hands-on to test the various functions

Learning path

Prerequisite
PROG107
Good knowledge of electrical substations and line differential protection principles.
Knowledge of Microsoft Windows® an asset.

PROP124
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

MiCOM P64x

Transformer protection

Duration
3 days

Audience
Electrical engineers, operators, maintenance engineers, protection design engineers

PROP127

Objectives

• Operate and maintain the MiCOM P64x differential transformer protection device

Course topics

• Reminder on transformer protection application
• P64x functionalities
• Product characteristics
• Relay MMI: front panel, LEDs, push-buttons, navigation through front panel
• Alarms & acknowledgement
• MiCOM S1 Agile software
• Parameter file creation, upload and download
• Disturbance, fault, event records
• Detailed presentation of P64x functions
• Product connection
• Test with current injection
• P64x hardware
• Maintenance
• Hands-on to test the various functions

Learning path

Prerequisite
PROG105
Good knowledge of electrical substations and transformer protection principles.
Knowledge of Microsoft Windows® an asset.

PROP127
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

MiCOM P74x

Digital differential bus bar protection

Duration
4 days

Audience
Electrical engineers, operators, maintenance engineers, protection design engineers

PROP130

Objectives

• Operate and maintain the MiCOM P74x digital differential bus bar protection system

Course topics

• Reminder on P74x application and busbar protection application
• P74x functionalities
• P74x system architecture, presentation of the different modules, communication between modules
• System characteristics
• Topology: principles, examples, configuration, virtual feeder
• Module MMI: front panel, LEDs, push-buttons, navigation through front panel
• Alarms & acknowledgement
• MiCOM S1 Agile software
• Parameter and PSL file creation, upload and download
• Disturbance, fault, event records
• Detailed presentation of P74x functions
• Product connection
• Test with current injection
• P74x hardware
• Maintenance
• Hands-on to test the various functions

Learning path

Prerequisite
Good knowledge of electrical substations and protection principles.
Knowledge of Microsoft Windows® an asset.

PROP130
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

MiCOM P847 PMU

Phasor Measurement Unit

Duration
2 days

Audience
Electrical engineers, operators, maintenance engineers, protection design engineers

PROP126

Objectives

• Operate and maintain the MiCOM P847 Phasor Measurement Unit

Course topics

• Introduction to Wide Area Monitoring and Synchrophasor technology
• P847 functional overview
• Product characteristics
• User Interface: front panel, LEDs, push-buttons, navigation through front panel
• MiCOM S1 Agile software
• Setting file and PSL creation, upload and download
• Event and Disturbance records
• Phasor Terminal software and system integration
• Detailed presentation of P847 functions
• Product connection and data acquisition
• GPS Synchronizing Unit
• PMU Applications
• P847 hardware
• Maintenance
• Hands-on to test the various functions

Learning path

Prerequisite
Good knowledge of electrical substations and protection principles.
Knowledge of Microsoft Windows® an asset.

PROP126
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

MiCOM P94V Agile

Voltage and frequency protection

Duration
2 days

Audience
Electrical engineers, operators, maintenance engineers, protection design engineers

PROP125

Objectives

• Operate and maintain the MiCOM P94V Agile - voltage and frequency protection relay

Course topics

• Reminder on voltage and frequency protection application
• P94V Agile functionalities
• Product characteristics
• Relay MMI: front panel, LEDs, push-buttons, navigation through front panel
• Alarms & acknowledgement
• MiCOM S1 Agile software
• Parameter and PSL file creation, upload and download
• Disturbance, fault, event records
• Detailed presentation of P94V Agile functions
• Product connection
• Test with current injection
• P94V Agile hardware
• Maintenance
• Hands-on to test the various functions

Learning path

Prerequisite
Good knowledge of electrical substations and protection principles.
Knowledge of Microsoft Windows® an asset.

PROP125
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

MiCOM M57x / M87x

Disturbance and power quality recorder

Duration
2 days

Audience
Electrical engineers, operators, maintenance engineers, protection design engineers

PROP131

Objectives

• Operate, maintain and parameter various function of the MiCOM M571/M572, M871/M872 recorder equipment

Course topics

• Reminder on disturbance and power quality principles M57x/M87x functionalities
• Product characteristics
• Detailed description of product functions
• Parameterizing using M57x/M87x configurator tool
• Data understanding
• Product connection
• Communication
• Alarms & acknowledgement
• Maintenance
• Hands-on

Learning path

Prerequisite
Good knowledge of electrical substations and protection principles.
Knowledge of Microsoft Windows® an asset.

PROP131
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

MiCOM Px40 series / Agile series

Configuration of IEC 61850 communication

Duration
2.5 days

Audience
Technicians and engineers from design or control department, protection engineering staff, commissioning engineers

SCS020

Objectives

- Operate the IEC 61850 communication facility from MiCOM Px40 series
- Use the IED configurator tool from MiCOM S1 Agile
- Have a thorough knowledge in IEC 61850 standards to substation automation projects

Course topics

- Overview of IEC 61850 Protocol
- IEC 61850 concepts
- Services
- Modelling
- Network architecture
- IED Configurator software
- Configuration files and basic parameters
- Time synchronization management
- GOOSE and reports
- Controls
- Hands-on to understand basic configuration

Learning path

Prerequisite
SCS003
SCS004
Experience in MiCOM Px40 operation and MiCOM S1 software

SCS020
60% practical
40% theoretical

GET MORE
This training can be provided on site at your own convenience.

Digital Instrument Transformers

Introduction

Duration
1 day

Audience
Consulting and protection engineers and technicians, project managers and field design

SCS021

Objectives

- Understand digital instrument transformers, their technology and environment
- Knowledge on product's main characteristics and advantages
- Discover possible applications in existing or future networks

Course topics

Digital Technology
- Operation principles of DIT and new level of accuracy
- 61850-9-2 standard Protocol for communication between IT & electronic device
- Technology comparison with conventional equipment
- Perspective for HV and UHV network
- DIT solutions commercially available to meet new networks challenges
- COSI CT – Optical Current Transformer
- COSI CM – Combined Metering Unit
- COSI CT-F3 Flexible Optical Current Transformer
- Merging Unit

Learning path

Prerequisite
Basic knowledge of electrical substations and protection principles

SCS021
100% theoretical

GET MORE
This training can be provided on site at your own convenience.

Application on IEC 61850 communication Protocol

Basic understanding

Duration
2.5 days

Audience
End users and system integrators who want to specify and/or follow-up an IEC 61850 project, system architects and consultants.

SCS003

Objectives

- Move from the 1000+pages of the IEC 61850 standard to real substation automation projects
- Discuss application through real products and projects
- Understand IEC 61850 standards to substation automation projects
- Understand future evolutions of the substation automation applications

Course topics

Overview
- IEC 61850 concepts
- Services
- Modelling
- Substation configuration language
- Conformance tests

Going for real projects
- Architectures
- Distributed functions
- Retrofit cases
- System configuration
- Interoperability tests

Learning path

Prerequisite
Substation environment, protection and control current applications

SCS003
100% theoretical

Next step
SCS004
SCS020
All trainings on DS Agile Digital Control System

GET MORE
This training can be provided on site at your own convenience.
GE's DCS is structured under IEC 61850 Protocol.

Application on IEC 61850 communication Protocol

Advanced

Duration
4 days

Audience
End users and system integrators who want to specify and/or follow-up an IEC 61850 project, system architects and consultants.

SCS004

Objectives

- Improve knowledge on communication services.
- Interpret standard organization.
- Understand the use of the standard in Digital Substation.

Course topics

- Modeling of data exchange and object in SCL language
- Operation and implementation of communication services
- Network frame analysis for goose, report, control…
- Structure of the standard and associated documentation provided by constructors.
- Use of 61850 standards in digital Substations
- Networking aspect like PRP and HSR redundancy
- Cyber security for 61850 networks

Learning path

Prerequisite
SCS003
Substation environment, protection and control current applications

SCS004
100% theoretical

Next step
SCS020
All trainings on DS Agile Digital Control System

GET MORE
This training can be provided on site at your own convenience.
GE's DCS is structured under IEC 61850 Protocol.

MiCOM C264

Compact Remote Terminal Unit (RTU)

Duration
4 days

Audience
Technicians and engineers from design or control departments, project managers, operation and maintenance

SCS006

Objectives

- Understand and use the compact RTU MiCOM C264
- Understand how the new compact RTU allows decentralized control and monitoring
- Give operation and maintenance teams autonomy in their daily jobs

Course topics

- New functionalities of the compact RTU
- The MiCOM C264: field area/functionalities/architecture
- RTU: hardware and software architecture
- Man-Machine interface
- Configuration tools
- Maintenance: 1st level/error messages
- Hands-on

Learning path

Prerequisite
Basic knowledge of electrical substations and operation.
Knowledge of Microsoft Windows® an asset.

SCS006
40% theoretical
60% practical

Next step
All trainings on DS Agile Digital Control System

GET MORE
This training can be provided on site at your own convenience.
GE's DCS is structured under IEC 61850 Protocol.

DS Agile - Digital Substation

Fundamentals

Duration
3 days

Audience
Technicians and engineers from design or control departments, project managers, operation and maintenance staff managers

SCS007

Objectives

- Understand the Digital Substation
- Understand the corresponding advantages and application applied on DS Agile
- Have an overview of operation & maintenance in a DS Agile system

Course topics

- Introduction to the Digital Substation
- Global overview of the DCS architectures, communication principles, interfaces and components
- Introduction to IEC61850 communication standard
- DCS specification principles
- DS Agile architecture, components, communication principles, operation principles
- DS Agile software tools
- MiCOM C264 bay computer
- DS Agile operator interface, alarm, control, security
- DS Agile maintenance tools and process
- Hands-on

Learning path

Prerequisite
SCS003
Basic knowledge of electrical substations and operation.
Knowledge of Microsoft Windows® an asset.

SCS007
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.
GE's DCS is structured under IEC 61850 Protocol.

DS Agile - Digital Substation

Operation

Duration
3 days

Audience
Operators, electrical staff of DS Agile system

SCS008

Objectives

• Operate the DS Agile system

Course topics

• DS Agile architecture, components, communication principles, operation principles
• DS Agile operator interface, electrical and system views, alarm, log, control, command, security
• Hands-on at DS Agile operator interface
• MiCOM C264 bay computer
• Operation at bay level (MiCOM C264)
• Hands-on

Learning path

Prerequisite
SCS003
Basic knowledge of electrical substations and operation.
Knowledge of Microsoft Windows® an asset.

SCS008
40% theoretical
60% practical

Next step
SC009

GET MORE
This training can be provided on site at your own convenience.
GE's DCS is structured under IEC 61850 Protocol.

DS Agile - Digital Substation

Architecture, Operation and Maintenance

Duration
5 days

Audience
Technicians and engineers from design or control departments, project managers, operation and maintenance technicians

SCS009

Objectives

- Understand the advantages and application of the DS Agile digital control system
- Give operation and maintenance teams autonomy in their daily jobs

Course topics

- Introduction to the Digital Substation
- Field area/ functionalities/ architecture
- DS Agile operator interface: Man Machine Interface/alarm monitoring/ control/ security
- C264 bay computer: functionalities/ hardware overview/ maintenance / troubleshooting & commissioning
- Database of the system/Configuration process/Database management
- DS Agile Gateway for SCADA communication
- Hands-on

Learning path

Prerequisite
SCS003
Basic knowledge of electrical substations and operation.
Knowledge of Microsoft Windows® an asset.

SCS009
40% theoretical
60% practical

Next step
SC010

GET MORE
This training can be provided on site at your own convenience.
GE's DCS is structured under IEC 61850 Protocol.

DS Agile - Digital Substation

Architecture, Operation, Maintenance and Basic Configuration

Duration
10 days

Audience
Technicians and engineers from design or control departments, project managers, operation and maintenance technicians

SCS010

Objectives

- Understand the advantages and application of the DS Agile Digital Control System
- Give operation and maintenance teams' autonomy in their daily jobs
- Perform some common modifications in DS Agile using the SCE Configurator

Course topics

- Introduction to the Digital Substation
- Field area/ functionalities/architecture
- DS Agile operator interface: Man Machine interface/alarms monitoring/control/security
- C264 bay computer: functionalities/hardware overview/Maintenance
- Database of the system/Configuration process/Database management
- System software installation
- System Configuration Editor/ Basic configuration changes:
  label changes, alarm on/off, event set up, graphical changes, scheme logic changes
- DS Agile Gateway for SCADA communication
- System Maintenance/System Management Tool/troubleshooting & commissioning
- Hands-on

Learning path

Prerequisite
SCS003
Basic knowledge of electrical substations and operation.
Knowledge of Microsoft Windows® an asset.

SCS010
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.
GE's DCS is structured under IEC 61850 Protocol.

Introduction to Protection High Voltage Networks

Basic level

Duration
4 days

Audience
Maintenance and commissioning engineers, protection engineers, protection design engineers, project managers

PROG012

Objectives

- Understand the protection schemes of distribution and transmission electrical networks
- Gain a better understanding of protection principles used on distribution, generation or transmission system

Course topics

- Electrical network, substation and protection systems
- Basic principles of protection schemes
- Short-circuit currents and neutral point treatment
- Overview of the different types of protection:
    - Overcurrent protection/ Directional protection
    - Line protection
    - Distance protection
    - Differential protection
    - Motor protection
    - Generator protection
    - Bus bar protection
- Application to transmission and distribution networks
- Current and voltage transformers
- Examples of protection plan

Learning path

Prerequisite
Basic knowledge of electrical networks
Electro-technical and mathematical basis

PROG012
100% theoretical

GET MORE
This training can be provided on site at your own convenience.

HV/MV Power Systems

Advanced Level

Duration
4 days

Audience
Maintenance and commissioning engineers, protection engineers, protection design engineers, project managers.

PROG013

Objectives

- Understand the key principles of protection in HV and MV transmission networks
- Have a better knowledge of electrical network principles to understand HV system requirements

Course topics

- Fundamental principles on protective relay use
- Fundamentals on protection principles
- Earthing mode/Short circuit current
- Current and voltage transformers
- Overcurrent protection/directional protection

Learning path

Prerequisite
Knowledge of HV and MV electrical networks
Electro-technical and mathematical basis

PROG013
100% theoretical

Next step
PROG014

GET MORE
This training can be provided on site at your own convenience.

HV/MV Protection Systems

Advanced Level

Duration
4 days

Audience
Maintenance and commissioning engineers, protection engineers, protection design engineers, project managers.

PROG014

Objectives

- Enhance knowledge and understanding of transmission network protection principles
- Realize an optimal specification of a protection scheme

Course topics

- Topology and architecture of power transmission networks
- Distance protection and Tele-action schemes
- Line differential protection
- Specific applications for transmission system:
    - breaker failure, recloser, check-synchro, power swing,
    - fault locator, fuse detection,
    - CT & VT supervision, trip circuit supervision
- Bus Bar protection & Bus Bar differential schemes
- Power transformer protection
- Generator/Motor protection

Learning path

Prerequisite
PROG013
Knowledge of HV and MV electrical networks
Electro-technical and mathematical basis

PROG014
100% theoretical

Next step
PROG015

GET MORE
This training can be provided on site at your own convenience.

Utility Transmission Power System Protection

Expert level

Duration
4 days

Audience
Maintenance and commissioning engineers, protection engineers, design engineers, project managers

PROG015

Objectives

- Understanding of phenomena and constraints influencing HV and MV
- Build HV system protection schemes
- Realize an optimal specification of a protection scheme
- Improve efficiency of protection scheme

Course topics

- Advanced module on short-circuit currents and Selectivity
- Protection grading, HV & MV Protection plan, study cases
- Power system stability
- Study Case:
    - stability on auto-reclose sequence
    - stability on load shedding sequence

Learning path

Prerequisite
PROG014
Knowledge of HV & MV electrical networks

PROG015
100% theoretical

GET MORE
This training can be provided on site at your own convenience.

Selection of a Neutral-Earthing System for HV Networks

Fundamentals

Duration
2 days

Audience
Technicians and engineers of control engineering consulting firms, project management heads, and operation

PROG102

Objectives

• Understand the various neutral-earthing system used in electricity networks
• Select the best neutral-earthing system according to the application and the consequences from the installations protection point of view

Course topics

• Various Earthing modes presentation
• Influence on the fault current, mathematical basis
• Description according to the current standards
• Various neutral-Earthing systems (upsides and downsides) comparison
• Neutral-earthing system choice criteria
• Neutral-earthing system influence on the protection layout
• Constraints due to the change from an existing neutral-earthing system (EDF MALTEN application)

Learning path

Prerequisite
Electro-technical and mathematical basis

PROG102
100% theoretical

GET MORE
This training can be provided on site at your own convenience.

Selection of the CT/VT Measurements Regulating Switch

Fundamentals

Duration
2 days

Audience
Maintenance and commissioning engineers, protection engineers, protection design engineers, project managers

PROG103

Objectives

• Understand the nature of the parameters occurring in the provisioning of a current (CT) and voltage (VT, TCT) measurement transformer

Course topics

• Current Transformers (CT) presentation: description, connecting, CT types, main characteristics, current international standards, measurement classes
• Voltage Transformers (VT) presentation: description, connecting, VT and TCT types, main characteristics, current international standards, classes of measurement
• CT specification method for protection winding for adaptation on protection features such as: time-overcurrent or volt-metric, distances and differential
• Application and calculation examples
• Constraints to be taken into account according to the protections technology to be linked

Learning path

Prerequisite
Electro-technical and mathematical basis

PROG103
100% theoretical

GET MORE
This training can be provided on site at your own convenience.

Motor Protection

Protection principles

Duration
2 days

Audience
Technicians and engineers of control engineering consulting firms, project management heads, and operation

PROG104

Objectives

• Understand the engine protections context and environment

Course topics

• Reminder on the element to be protected: engine functioning and conception principles
• Applications
• Protection principles and solutions
• Measurement sensors associated with protections
• Presentation of the GE solutions for the engine's protection
• MiCOM P24x protections introduction
• Field case study and demo with a protection

Learning path

Prerequisite
Electro-technical and mathematical basis

PROG104
100% theoretical

Next step
PROP121

GET MORE
This training can be provided on site at your own convenience.

Transformer Protection

Protection principles

Duration
2 days

Audience
Technicians and engineers of control engineering consulting firms, project management and operation

PROG105

Objectives

• Understand transformer protections context and environment

Course topics

• Reminder on the element to be protected: transformer functioning and conception principles
• Applications
• Protection principles
• Measurement sensors associated with protections
• Presentation of the GE solutions for the transformer's protection
• MiCOM P64x transformer protection introduction
• Max I (short circuit back up, earth-frame leakage, earth-fault protection, MiCOM P14 Agile introduction
• Field case study and demo with a protection

Learning path

Prerequisite
Electro-technical and mathematical basis
Knowledge of Microsoft Windows® an asset.

PROG105
100% theoretical

Next step
PROP127

GET MORE
This training can be provided on site at your own convenience.

Generator Protection

Protection principles

Duration
3 days

Audience
Technicians and engineers of control engineering consulting firms, project management and operation technicians

PROG106

Objectives

• Understand generator protections context and environment

Course topics

• Reminder on the element to be protected: generator functioning and conception principles
• Applications: faults which can alter the functioning of the element to be protected
• Principles, protection techniques
• Machines stability
• Generator-transformer block protection
• Trigger matrices
• Measurement sensors associated with protections
• Presentation of the GE solutions for the generator's protection
• MiCOM P34x and MX3IPG generator protections introduction
• Field case study and demo with a protection

Learning path

Prerequisite
Electro-technical and mathematical basis
Knowledge of Microsoft Windows® an asset.

PROG106
100% theoretical

Next step
PROP122

GET MORE
This training can be provided on site at your own convenience.

Lines and Cables Protection

Protection principles

Duration
3 days

Audience
Technicians and engineers of control engineering consulting firms, project management heads, and operation technicians

PROG107

Objectives

• Understand subterranean cables and high voltage overhead feeder protection context and environment

Course topics

• Reminder on the element to be protected
• Cables and high voltage lines functioning and conception principles
• Applications: faults which can alter the functioning of the element to be protected
• Protection principles
• Protection techniques and measurement sensors associated to relays
• Presentation of the GE solutions for the line's protection
• Field case study and demo with a protection

Learning path

Prerequisite
Electro-technical and mathematical basis
Knowledge of Microsoft Windows® an asset.

PROG107
100% theoretical

Next step
PROP124

GET MORE
This training can be provided on site at your own convenience.

Power Networks Stability Principles

Fundamentals

Duration
2 days

Audience
Technicians and engineers of control engineering consulting firms, project management heads, and operation technicians

PROG108

Objectives

• Understand power networks stability principles, cogenerations case and oil and gas sites
• Detect and master power network stability problem

Course topics

• Technical terms related to the stability phenomena reminder
• Network disturbances and stability: origins and consequences, voltage and frequency stability, network stability improvement
• Static stability: limit of stability
• Transient stability: loopback phenomenon, rotor angle supervision, eras criterion, stability improvement
• CYME type power networks software simulation
• Application to cogeneration
• Application to power management (MW, MVar) on oil and gas type sites (Oils and Gas)

Learning path

Prerequisite
Electro-technical and mathematical basis
Knowledge of Microsoft Windows® an asset.

PROG108
100% theoretical

GET MORE
This training can be provided on site at your own convenience.

Fault Current Calculation

Symmetric components theory, basics and applications

Duration
2 days

Audience
Technicians and engineers of control engineering consulting firms, project management heads, and operation technicians

PROG109

Objectives

• Understand symmetric current modelling applied to power networks elements
• Interpret each quantity

Course topics

• Symmetric current theory
• Types, origins and characteristics of the faults
• Physical consequences on the equipment
• Importance of the impact of every quantity (positive, negative, zero-sequence) on the equipment and machines functioning
• Equipment sizing constraints
• Impedances transformation
• Main mentioned equipment short circuit impedances calculation
• Application and digital computing examples, orders of magnitude

Learning path

Prerequisite
Electro-technical and mathematical basis
Knowledge of Microsoft Windows® an asset.

PROG109
100% theoretical

GET MORE
This training can be provided on site at your own convenience.

Selectivity study

Medium and High Voltage

Duration
2 days

Audience
Technicians and engineers of control engineering consulting firms, project management heads, and operation technicians

PROG110

Objectives

• Understand the importance of discrimination studies in power network and used terms

Course topics

• Fault eradication general principles
• Discrimination purposes
• Available means to insure discrimination in a master station and high voltage system
• Compulsory data for configuration study and analysis
• Description of a discrimination study
• Field case study: protections definition, phase and ground fault currents calculation, phase and ground discrimination curves layout
• Interpretation of results: non-discrimination risk analysis

Learning path

Prerequisite
Electro-technical and mathematical basis
Knowledge of Microsoft Windows® an asset.

PROG110
100% theoretical

GET MORE
This training can be provided on site at your own convenience.

MULTILIN

Operation and Maintenance of the GE MULTILIN relays

(customized course as per customer needs)

Duration

Depending on the relay(s)

Audience

Technician and electrician within electrical utility, industrials & system integrators who need to learn the product hardware, software interface, the setting files download & upload, how to retrieve the events and waveform records, the basic protection elements

Objectives

• Build a knowledge and understanding of the product hardware, software and configuration and its application

Course topics

FOR EACH PROTECTIVE RELAY

• General presentation of the relay
• Reminder on MULTILIN relay application
• Hardware presentation
• Detailed presentation of the relay functions
• Relay HMI
    - LED's
    - Push-buttons & Navigation through front-panel
    - Alarm messages & alarm acknowledgement
    - Practical exercises / hands-on
• ENERVISTA software
• Relay connection
• Test of the functions with injection box / hands-on
• Setting file management, Download & Upload setting file / hands-on
• Maintenance & Error messages
• Event Recorder

Learning path

Prerequisite

Basic understanding of electrical network and protection principles
Fundamentals of Modern Protective Relaying is highly recommended
Knowledge of Microsoft Windows® an asset.

40% theoretical
60% practical

GET MORE

This training can be provided on site at your own convenience.

UR Platform

Universal Relay global presentation

Duration
4 days

Audience
Technician and electrician within electrical utility, industrials & system integrators who need to learn the UR hardware, software interface, the setting files download & upload, how to retrieve the events and waveform records, the basic protection elements

TRNG-URPL

Objectives

• Build a knowledge and understanding of UR hardware, software and configuration and its application within the smart grid

Course topics

• UR hardware overview
• Enervista software
• Protection elements
• I/O configuration
• Flexlogic software
• Diagnostic tools
• Specific UR application
• Hands-on

Learning path

Prerequisite
Basic understanding of electrical network and protection principles
Fundamentals of Modern Protective Relaying is highly recommended
Knowledge of Microsoft Windows® an asset.

TRNG-URPL
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

8S Platform

8 Series global presentation

Duration
4 days

Audience
Technician and electrician within electrical utility, industrials & system integrators who need to learn the UR hardware, software interface, the setting files download & upload, how to retrieve the events and waveform records, the basic protection elements

TRNG-8SPL

Objectives

• Build a knowledge and understanding of 8 Series hardware, software and configuration and its application within the smart grid

Course topics

• 8 Series hardware overview
• Enervista software
• Protection elements
• I/O configuration
• Flexlogic software
• Diagnostic tools
• Specific 8 Series application
• Hands-on

Learning path

Prerequisite
Basic understanding of electrical network and protection principles
Fundamentals of Modern Protective Relaying is highly recommended
Knowledge of Microsoft Windows® an asset.

TRNG-8SPL
40% theoretical
60% practical

GET MORE
This training can be provided on site at your own convenience.

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