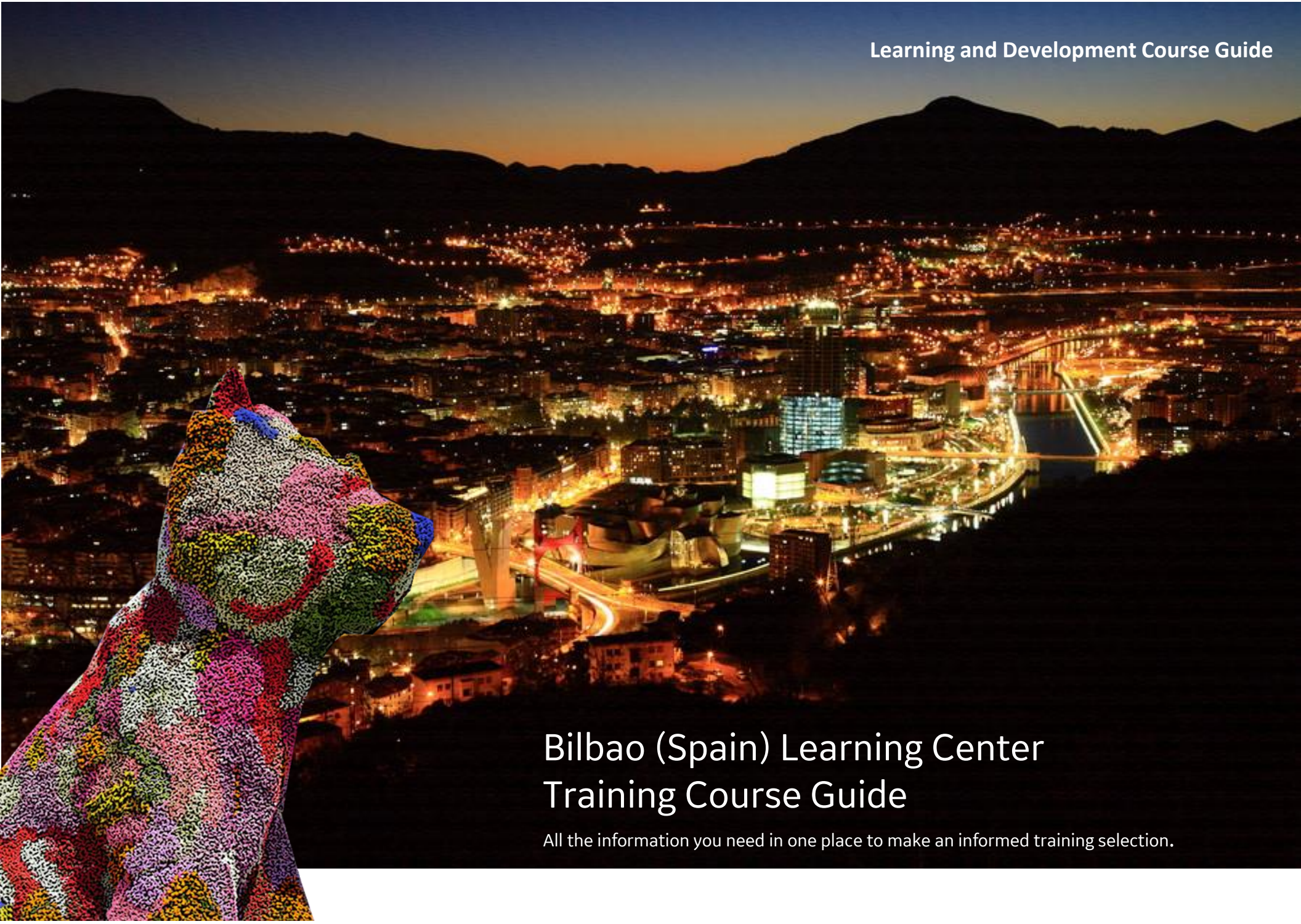

Bilbao (Spain) Learning Center Training Course Guide

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

GE Grid Solutions
www.gegridsolutions.com

L&D
Learning & Development

GE Grid Solutions l Grid Automation Learning & Development

Bilbao Training Course Guide

Welcome to our integrated learning program, its aim 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, HardFiber, Cyber Security and much more.

Our objective is not to simply look at specific products, but look more towards integrated systems and so while the program starts off with building product knowledge. This is only done so that we are building a knowledge foundation upon which to build out integrated systems capability.

Learning is done through a blend of e-learning modules, classical classroom sessions and practical workshops with knowledge testing throughout.

Page numbers at right are clickable hyperlinks to take you to key pages quickly.

03/ contact/resource info

04/ TRNG-FMPR-BIO Fundamentals of Modern Protective Relaying

05/ TRNG-GEN-BIO Generation Essentials

07/ TRNG-F650-BIO F650 Feeder Protection

09/ TRNG-MM300-BIO Motors Essentials

11/ TRNG-UR-BIO Universal Relay Essentials

13/ TRNG-8S-BIO 8 Series Essentials

15/ TRNG-61850-BIO 61850 Communications Essentials

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Welcome to Learning & Development

Lets Start With Some Useful Information

What is being offered and when? Visit our website.

It is a useful place to find more information about our training offerings including other course guides etc. You can also download our Curriculum Guide from there.

http://www.gegridsolutions.com/multilin/support/training/

Need to access free learning videos? Visit our YouTube channels.

Did you know that we have a dedicated You Tube channel where you can find e-learning training videos at no cost. Here you can find how2 videos, training webinars and training course modules for self learning.

https://www.youtube.com/c/LDforProtectionandControl

Contact Us

Need more information, have questions about our offerings, want to follow up with us on any training related issue, then contact us through our training email.

services.bilbao@ge.com

+34 94 485 88 60

What type of training is offered by GE?

- no cost training videos are available on our youtube channels
- standard schedule courses are available to book on the online store
- on demand courses at your place or ours, email: services.bilbao@ge.com

Where do I find resource info? Visit our resources page.

Did you know here you can find a multitude of useful resources to assist your learning about our products services and solutions.

http://www.gegridsolutions.com/resources.htm

Grid Learning Center's - *Discover the Difference*

Course Code | TRNG-FMPR-BIO - Fundamentals of Modern Protective Relaying

who should attend

Managers, Consultants, Engineers and System Integrators responsible for power delivery in either utility or industrial sectors..

learning outcome

Students acquire basic knowledge on the fundamentals of today's technology in various applications.
The objective is to ensure that Students have the basic knowledge to make future GE courses attendance effective.

prerequisites

Basic electrical knowledge, there are no GE course prerequisites.

workshop hardware needs

None

what's covered

- Power System Overview
- Generator Protection
- Transmission Line Protection
- Busbar Protection
- Distribution Protection
- Transformer Protection
- Motor Protection

learning contact hours

- 32 hours over 4 days

COURSE CONTENT & TIMING

MONDAY	TUESDAY	WEDNESDAY	THURSDAY
Power Systems Overview	Generator Protection	Transformer Protection	Feeder Protection
Power System Protection	Busbar Protection	Transmission Line Protection	Motor Protection

Protection & Control

Course Code | TRNG-GEN-BIO - Generation Essentials

note 1: timeline is generic may vary dependent on scheduling logistics

who should attend

Engineering Staff within electrical utility, industrials & system integrators who need to design protection and control systems using GE products in non- 61850 and 61850 configurations.

learning outcome

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

Application Labs will give the students an opportunity to apply their knowledge.

prerequisites

Fundamentals of Modern Protection Relaying is highly recommended or with certain UR working experiences.

timeline note 1

Registration Deadline

4 weeks prior to workshop

course notices sent out

3 weeks prior to workshop

e-learning

To be reviewed prior to workshop

Workshop

week zero

workshop hardware needs

All equipment is provided as part of the workshop.

what's covered

- Configuration of G60 generator protection relays.
- Diagnostic Tools
- I/O Configuration
- Protection Elements
- FlexLogic
- IEC61850

learning contact hours

• Workshop:	32 hours
• **Total :**	**32 hours**

e-learning playlist | Generator Protection

https://www.youtube.com/watch?v=coU24s0ZHEU&t=1s

Module	Name
FMPR-104	Generator Protection v1

TRNG-GEN-BIO – Generation Essentials | Practical Workshop

Workshop

Prerequisites

Students **should** read through the equipment operating manuals to familiarize themselves with the technology & equipment terminology.

Learning Objective

On completion of the Practical Workshop students should be able to identify, assemble, integrate and operate configure UR G60 relay where they can then hone their skills through further applications.

MONDAY	TUESDAY	WEDNESDAY
AM | Hardware Setup	AM | Protection and Controls Function	AM | Hands-on lab – secondary injection tests of protection functions
PM | Software Interface	AM | Events & Oscillography	AM | SLD Editor
PM | Protection and Control Functions	PM | Hands-on lab – secondary injection tests of protection functions	PM | 61850 configuration
		PM | hands-on lab - 61850 Goose exchange

Course Note

Workshop activities are a mix of presentation based and demonstration instruction, followed by student hands on activities.

The detailed content of each module is introduced on the proceeding slides.

Learning content is provided via USB at the beginning of the training.

Course Code | TRNG-F650-BIO - F650 Feeder Protection

note 1: timeline is generic may vary dependent on scheduling logistics

who should attend

Engineering Staff within electrical utility, industrials & system integrators who need to design protection and control systems using GE products in non- 61850 and 61850 configurations.

learning outcome

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

Application Labs will give the students an opportunity to apply their knowledge.

prerequisites

TRNG-FMPRV is highly recommended to attend.

timeline note 1

Registration Deadline

4 weeks prior to workshop

course notices sent out

3 weeks prior to workshop

e-learning

To be reviewed prior to workshop

Workshop

week zero

workshop hardware needs

All equipment is provided as part of the workshop.

what's covered

- Configuration and Feeder Protection Elements of F650 Protection Relays.
- Switchgear Configuration
- Protection Elements
- IEC61850

learning contact hours

• E-learn: (F650 Platform)	5 hours
• Workshop:	24 hours
• **Total :**	**29 hours**

e-learning playlist | F650 Platform

https://www.youtube.com/watch?v=m8M7pk6iHOQ&list=PLZPuItIGPYLPy1TzDLCc6vPtJlH4Q51ty

Module	Name
F650-101	Feeder Protection Theory v2
F650-102	Hardware v2
F650-103	Software v2
F650-104	Protection v3
F650-105	Communications v2
F650-106	PLC Editor v2

TRNG-F650-BIO F650 Feeder Protection | Practical Workshop

Workshop

Prerequisites

Students **should** read through the equipment operating manuals to familiarize themselves with the technology & equipment terminology.

Learning Objective

On completion of the Practical Workshop students should be able to identify, assemble, integrate and operate configure F650 relays where they can then hone their skills through further applications.

DAY 1	DAY 2	DAY 3
AM | Hardware Setup	AM | Events & Oscillography	AM | SLD Editor
PM | Software Interface	AM | Hands-on lab – switchgear configuration	PM | 61850 configuration
PM | Protection and Control Functions	PM | Hands-on lab – secondary injection tests of protection functions	PM | hands-on lab - 61850 Goose exchange

Course Note

Workshop activities are a mix of presentation based and demonstration instruction, followed by student hands on activities.

The detailed content of each module is introduced on the proceeding slides.

Learning content is provided via USB at the beginning of the training.

Protection & Control

Course Code | TRNG-MM300-BIO - Motors Essentials

note 1: timeline is generic may vary dependent on scheduling logistics

who should attend

Engineering Staff within electrical utility, industrials & system integrators who need to design protection and control systems using GE products in non- 61850 and 61850 configurations.

learning outcome

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

Application Labs will give the students an opportunity to apply their knowledge.

prerequisites

TRNG-FMPRV is highly recommended to attend.

timeline note 1

Registration Deadline

4 weeks prior to workshop

course notices sent out

3 weeks prior to workshop

e-learning

To be reviewed prior to workshop

Workshop

week zero

workshop hardware needs

All equipment is provided as part of the workshop.

what's covered

Configuration and Motor Protection Elements of MM300 Motor Protection Relays.

learning contact hours

- E-learn: 2 hours (Motor Protection)
- Workshop: 24 hours
- **Total: 26 hours**

e-learning playlist | Motor Protection

https://www.youtube.com/watch?v=snJ7uRv9nxo&list=PLZPuItIGPYLO9BOUz2AQQeINPOiM0PoQE&index=6

Module	Name
FPMR-2002	Motor Protection Technical Webinar v1
FPMR-109 pt1	Motors Protection v1
FPMR-109 pt2	Motors Protection v1
FPMR-109 pt3	Motors Protection v1

TRNG- TRNG-MM300-BIO - Motors Essentials | Practical Workshop

Workshop

Prerequisites

Students **should** read through the equipment operating manuals to familiarize themselves with the technology & equipment terminology.

Learning Objective

On completion of the Practical Workshop students should be able to identify, assemble, integrate and operate configure MM300 relays where they can then hone their skills through further applications.

DAY 1	DAY 2
AM | Hardware Setup	AM | Events & Oscillography
PM | Software Interface	AM | Hands-on lab – secondary injection tests of protection functions
PM | Protection and Control Functions	

Course Note

Workshop activities are a mix of presentation based and demonstration instruction, followed by student hands on activities.

The detailed content of each module is introduced on the proceeding slides.

Learning content is provided via USB at the beginning of the training.

Protection & Control

Course Code | TRNG-UR-BIO - Universal Relay Essentials

note 1: timeline is generic may vary dependent on scheduling logistics

who should attend

Engineering Staff within electrical utility, industrials & system integrators who need to design protection and control systems using GE products in non- 61850 and 61850 configurations.

learning outcome

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

Application Labs will give the students an opportunity to apply their knowledge.

prerequisites

Fundamentals of Modern Protection Relaying is highly recommended or with certain UR working experiences.

timeline note 1

Registration Deadline

4 weeks prior to workshop

course notices sent out

3 weeks prior to workshop

e-learning

To be reviewed prior to workshop

Workshop

week zero

workshop hardware needs

All equipment is provided as part of the workshop.

what's covered

- Diagnostic Tools
- I/O Configuration
- Protection Elements
- FlexLogic
- IEC61850
- Application design
- Integration

learning contact hours

• E-learn: (playlist e-952)	6 hours
• Workshop:	24 hours
• **Total :**	**30 hours**

Learning contact hours quoted are our estimate of time to complete, actual is very much dependent on students prior knowledge.

e-learning playlist | e-952 https://www.youtube.com/watch?v=xqVAPEpBAJc&list=PLZPuItIGPYLO1fCxzayw-W4s6GRMmOTEK

Module	Name
UR-100	UR Platform Overview
UR-101	UR Platform Hardware
UR-102	UR Platform Software
UR-103	UR Platform FlexLogic
UR-104	UR Platform Protection
UR-107	UR Platform IEC61850 ed2
UR-110	UR Platform AC Input Configuration
UR-118	Graphical Front Panel
UR-140	UR7.0 Release Introduction
UR-141	UR7.3 Release Introduction

TRNG-UR-BIO Essentials | Practical Workshop

Workshop

Prerequisites

Students **should** read through the equipment operating manuals to familiarize themselves with the technology & equipment terminology.

Learning Objective

On completion of the Practical Workshop students should be able to identify, assemble, integrate and operate configure UR relays where they can then hone their skills through further applications.

DAY 1	DAY 2	DAY 3
AM | Hardware Setup	AM | Protection and Controls Function	AM | Hands-on lab – secondary injection tests of protection functions
PM | Software Interface	AM | Events & Oscillography	AM | SLD Editor
PM | Protection and Control Functions	PM | Hands-on lab – secondary injection tests of protection functions	PM | 61850 configuration
		PM | hands-on lab - 61850 Goose exchange

Course Note

Workshop activities are a mix of presentation based and demonstration instruction, followed by student hands on activities.

The detailed content of each module is introduced on the proceeding slides.

Learning content is provided via USB at the beginning of the training.

Protection & Control

Course Delivery Offerings | Workshop

Course Code | TRNG-8S-BIO - 8 Series Essentials

note 1: timeline is generic may vary dependent on scheduling logistics

who should attend

Engineering Staff within electrical utility, industrials & system integrators who need to design protection and control systems using GE products in non- 61850 and 61850 configurations.

learning outcome

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

Application Labs will give the students an opportunity to apply their knowledge.

prerequisites

Fundamentals of Modern Protection Relaying is highly recommended or with certain 8 Series relay working experiences.

workshop hardware needs

All equipment is provided as part of the workshop.

what's covered

- Diagnostic Tools
- I/O Configuration
- Protection Elements
- FlexLogic
- IEC61850
- Application design
- Integration

learning contact hours

- E-learn: (playlist e-953) 6 hours
- Workshop: 24 hours
- **Total: 30 hours**

Learning contact hours quoted are our estimate of time to complete, actual is very much dependent on students prior knowledge.

timeline note 1

Registration Deadline

4 weeks prior to workshop

course notices sent out

3 weeks prior to workshop

e-learning

To be reviewed prior to workshop

Workshop

week zero

e-learning playlist | e-953 https://www.youtube.com/watch?v=W9UmresoQL8&list=PLZPuItIGPYLNnwwa7wtobsq8F2fx4j7HT

Module	Name
8SP-100	8 Series Relay Overview
8SP-101	8 Series Hardware
8SP-102	8 Series Software Inteface
8SP-103	S Series Software Setpoints
8SP-104	8 Series Protections
8SP-105	8 Series Control & Monitoring
8SP-106	8 Series FlexLogic
8SP-107	8 Series IEC61850 Configurator

TRNG-8S-BIO Essentials | Practical Workshop

Workshop

Prerequisites

Students **should** read through the equipment operating manuals to familiarize themselves with the technology & equipment terminology.

Learning Objective

On completion of the Practical Workshop students should be able to identify, assemble, integrate and operate configure 8 series relays where they can then hone their skills through further applications.

DAY 1	DAY 2	DAY 3
AM | Hardware Setup	AM | Protection and Controls Function	AM | Hands-on lab – secondary injection tests of protection functions
PM | Software Interface	AM | Events & Oscillography	AM | SLD Editor
PM | Protection and Control Functions	PM | Hands-on lab – secondary injection tests of protection functions	PM | 61850 configuration
		PM | hands-on lab - 61850 Goose exchange

Course Note

Workshop activities are a mix of presentation based and demonstration instruction, followed by student hands on activities.

The detailed content of each module is introduced on the proceeding slides.

Learning content is provided via USB at the beginning of the training.

Protection & Control

Course Code | TRNG-61850-BIO, 61850 Communications Essentials

note 1: timeline is generic may vary dependent on scheduling logistics

who should attend

Managers, Consultants, Engineers and System Integrators responsible for power delivery in either utility or industrial sectors.

learning outcome

Students acquire basic knowledge on the fundamentals of today's technology in various applications.
The objective is to ensure that Students have the basic knowledge to make future GE courses attendance effective.

prerequisites

Fundamentals of Modern Protection Relaying is highly recommended or with certain UR working experiences.

timeline note 1

Registration Deadline

4 weeks prior to workshop

course notices sent out

3 weeks prior to workshop

e-learning

To be reviewed prior to workshop

Workshop

week zero

workshop hardware needs

All equipment is provided as part of the workshop.

what's covered

- Network Protocols
- GOOSE Messages
- MMS Messages
- SCL, CID, ICD, IID Configuration
- Applications

learning contact hours

• E-learning: (playlist IEC-61850)	8 hours
• Workshop:	16 hours
• **Total :**	**24 hours**

e-learning playlist | IEC-61850 https://www.youtube.com/watch?v=6i8PG3ZmPik&list=PLZPuItIGPYLMhpy1q5XCsdafKJWRiiUoe

Module	Name
61850-101	IEC61850 Essentials v1
61850-102	IEC61850 Introduction v1
61850-103	PRP with D400 and UR v1
UR-107	IEC61850 Edition 2 v1
UR-2007	IEC61850 Ed2 Technical Webinar v1
61850-107	IEC61850 Edition 2 Overview v1
61850-1001	Highlights of IEC61850 Edition 2 v1
61850-1002	Differences GOOSE and R GOOSE v1
61850-1003	IEC61850 Security v1
61850-1004	GOOSE Testing v1
61850-1005	GOOSE Simulation Bit v1
61850-1006	Mirroring Control Information v1
61850-1007	Differences IEC61850 Ed1 vs Ed2 v1

Course Code | TRNG-61850-BIO, 61850 Communications Essentials

Prerequisites

No pre-requisites for this course.

Learning Objective

On completion of this course, the students should be able to identify different types of communication protocols used in industrial and utilities, understand the concepts of PTP, PRP, IRIG-B, 1588, VLAN, SV, MMS and GOOSE.

DAY 1	DAY 2
AM l 61850 Introduction	AM l 61850 Relay MMS configuration
PM l 61850 Relay GOOSE configuration	PM l Hands-on tests - 61850 Client/Server MMS Communication test
PM l Hands-on tests - 61850 Relay GOOSE exchange test	

Course Note

Workshop activities are a mix of presentation based and demonstration instruction, followed by student hands on activities.

The detailed content of each module is introduced on the proceeding slides.

Learning content is provided via USB at the beginning of the training.

Course Code | TRNG-P40-BIO – P40 Agile Essentials

note 1: timeline is generic may vary dependent on scheduling logistics

who should attend

Engineering Staff within electrical utility, industrials & system integrators who need to design protection and control systems using MiCOM P40.

learning outcome

At the end of this course you will have the essentials of the MiCOM P40 platform hardware software and configuration, using the P14x relay. To be able to program feeder protection and operate with auto-reclose.

prerequisites

Fundamentals of Modern Protection Relaying is highly recommended or with certain P40 working experiences.

timeline note 1

Registration Deadline

4 weeks prior to workshop

course notices sent out

3 weeks prior to workshop

Workshop

week zero

workshop hardware needs

All equipment is provided as part of the workshop.

what's covered

- Overview of the of MiCOM P40 relays and applications,
- Hardware, front panel navigation of P14x relay, communication setup with MiCOM P40 software, Settings creation, upload, download, event extraction, interrogation, disturbance record extraction and interrogation.
- PSL (Programmable scheme logic) file creation and upload/download.
- Hands on tests of overcurrent and various functions with RTT test set.

learning contact hours

• Workshop:	24 hours
• **Total :**	**24 hours**

TRNG-P40-BIO Essentials | Practical Workshop

Workshop

Prerequisites

Students **should** read through the equipment operating manuals to familiarize themselves with the technology & equipment terminology.

Learning Objective

On completion of the Practical Workshop students should be able to identify, assemble, integrate and operate configure P40 series relays where they can then hone their skills through further applications.

DAY 1	DAY 2	DAY 3
AM | Hardware Setup	AM | Protection and Controls Function	AM | Hands-on lab – secondary injection tests of protection functions
PM | Software Interface	AM | Events & Oscillography	PM | 61850 configuration
PM | Protection and Control Functions	PM | Hands-on lab – secondary injection tests of protection functions	PM | hands-on lab - 61850 Goose exchange

Course Note

Workshop activities are a mix of presentation based and demonstration instruction, followed by student hands on activities.

The detailed content of each module is introduced on the proceeding slides.

Learning content is provided via USB at the beginning of the training.