# Power

UNIHOUSE®
Building Your Capabilities

TTC
TULIB TRAINING & CONSULTING

TECHNO TRAIN
by UniHouse

# Welcome Letter

Welcome to TechnoTrain! We are proud to be recognized by The Daily Telegraph for our innovative approach to training and development. TechnoTrain is UniHouse's professional training brand, created specifically to build strong, skilled, and safe workforces within the oil and gas industry.

With over 25 years of experience, we have partnered with leading companies worldwide, including BP, Shell, Hyundai Engineering, JGC Japan, Shimizu Japan, Gazprom, PetroChina, Lukoil, SONANGOL, and UNDP. Our expertise in engineering, management, and oil and gas enables us to deliver comprehensive training solutions tailored to support the success and growth of companies across this critical industry.

TechnoTrain's programs cover all essential areas for a successful career, from technical skills to essential soft skills, addressing all major oil and gas competencies. Our team of trainers comprises seasoned professionals from various backgrounds and nationalities, enriching each course with a diverse wealth of knowledge.

We proudly partner with some of the world's top learning and research centers in the UK, the US, and Canada. Our training facilities are equipped with the latest technology, allowing participants to learn and practice on state-of-the-art industry equipment.

At UniHouse, we prioritize customer satisfaction, welcoming every client as part of our family. We are committed to offering customized programs, whether for a small group or hundreds of employees, no matter where in the world you are located. TechnoTrain provides individual courses or complete training programs to help clients achieve their goals.

**What We Offer**

TechnoTrain's globally accredited programs are trusted in over eighty countries and support career growth across numerous industries. Our services include:

- Curriculum Design & Development
- Training & Capacity Building
- Framework Design for Training and Quality Assurance
- Technical Knowledge Transfer
- Managing Technical Training Centers
- Vocational Training & Competency Building
- Engineering Standards Training
- On-the-Job Training

Our courses cover areas like Power, Upstream & Downstream, Mechanical, Supply Chain, Health & Safety, and Soft Skills, addressing the needs of technical staff and management alike. TechnoTrain is more than just training; it is a pathway to success for every level within the oil and gas sector.

Join us at TechnoTrain to take the next step toward a successful and sustainable future in the oil and gas industry.

Sincerely,

*The UniHouse Team*

# Safety & Risk Prevention

Power

The courses in this section are designed for participants at the basic and intermediate levels. They provide an overview of all aspects in each domain.

The course overview will help training managers to determine the appropriate courses for setting up training plans for staff members to build upon existing knowledge and skills.

## Section Courses

1. Electrical Risk Prevention Tools
2. Electrical Safety for Non-Electricians
3. Electrical Safety for Electricians Working at Low Voltages
4. Electrical Safety for Electricians Working at Low, Medium & High Voltages
5. Safety in Explosive Atmospheres for Workers
6. Safety in Explosive Atmospheres for Managers and Supervisors

# Electrical Risk Prevention Tools

UNPSRP001

Duration
1 Day

Level
Basic



This course aims to enable participants in developing their knowledge and skills in electrical risk prevention tools. The learner will refresh their knowledge on the fundamentals of electrical risk, and learn the common international rules regarding electrical risk prevention. The course is designed by international safety experts, and is kept up-to-date according to active regulations.

This course is designed for health & safety managers, and any person working in an environment with electrical risks; as well as managers whose teams work in such environments.

## Course Objectives:

At the end of this course participants will be able to:

- Have a refreshed knowledge on the fundamentals of electrical risk.
- Know a number of common international rules concerning electrical risk prevention.
- Pass quick and efficient self-assessment on these topics.

## Course Content:

- Overview of electrical risks
- Practical application

## Related Courses:

- Electrical Safety for Electricians Working at Low Voltages

## Programme Schedule

### Day 1

### Overview of Electrical Risks

1. Module 1: Learn about electrical risks
2. Module 2: Learn how to prevent electrical risks
3. Module 3: Comply with safety procedures (to lock out – tag out)

### Practices and Reviews

1. Self-assessment
2. Various interactive learning
3. Activities
4. Summaries
5. Easy user navigation

Duration
3 Days

Level
Basic

# Electrical Safety for Non-Electricians

UNPSRP002



This course aims to enable non-electrician participants in developing their knowledge and skills in electrical safety. The learner will acquire a basic knowledge of working with electricity to be informed of dangers they may encounter working in an electrical environment. The course is taught by experienced trainers, including a half day of practical work. Upon completion of the course, participants will receive a certificate demonstrating the safety level that they have achieved.

This course is designed for non-electricity specialists who have basic access to electrical sites.

## Course Objectives:

At the end of this course the participants will be able to:

- Have a basic knowledge of working with electricity, so that the trainees are aware of the dangers that they may encounter in an electrical environment.
- Act and react according to the working environment.

## Course Content:

- Introduction to electrical works
- Practical experiments
- Safety and protection

## Related Courses:

- Electrical Safety for Electricians Working at Low, Medium & High Voltages
- Electrical Safety for Electricians Working at Low Voltages

## Programme Schedule

### Day 1

**Introduction to Electrical Works**

1. Electricity definition
2. Electricity benefits, uses, and dangers
3. Types of electrical works

### Day 2

**Risks and Practical Experiments**

1. Risks of electrical works for non-electricians
2. Real examples of accidents
3. Solutions and avoidance

### Day 3

**Safety and Protection**

1. The safety rules for electrical work
2. Types of protection
3. Summary

Duration
3 Days

Level
Basic

# Electrical Safety for Electricians Working at Low Voltages

UNPSRP003

This course aims to enable participants in developing their knowledge and skills in electrical safety at low voltages. The learner will master working safely while carrying out low voltage electrical work with instruction from an experienced trainer. The course includes a day dedicated to practical work, and role-play exercises demonstrating the importance of safe conduct. Upon completion of the course, participants will receive a certificate demonstrating the electrical safety level that they have achieved.

This course is designed for workers who have direct involvement in low voltage electrical work.

## Course Objectives:

At the end of this course the participants will be able to:

- Work safely when carrying out low voltage electrical work, such as installation and measurement.

## Course Content:

- Introduction to electrical works at low voltages
- Risks and practical experiments
- Safety and protection

## Related Courses:

- Electrical Safety for Non-Electricians
- Electrical Safety for Electricians Working at Low, Medium & High Voltages

## Programme Schedule

### Day 1

**Introduction to Electrical Works at Low Voltages**

1. Electricity definition
2. Electricity benefits, use and dangers
3. Overview of working at low voltages

### Day 2

**Risks and Practical Experiments**

1. Risks of low voltages works
2. Real examples of accidents
3. Solutions and avoidance

### Day 3

**Safety and Protection**

1. General safety instructions for dealing with low voltage electrical works
2. Types of protection
3. Summary

Duration
3 Days

Level
Intermediate

# Electrical Safety for Electricians Working at Low, Medium & High Voltages

UNPSRP004

This course aims to enable participants in developing their knowledge and skills in electrical safety at low, medium, & high voltages. The learner will develop the skills necessary to protect themselves from hazards when working with these electrical voltages. This course is taught by an experienced trainer, to small groups of trainees to allow for a smooth evaluation of the trainees' progression. It includes a day and a half dedicated to practical work, and upon completion of the course, participants will receive a certificate demonstrating the electrical safety level that they have achieved.

This course is designed for electrical staff working in low to high voltages, including: non-managerial electricians, work supervisors, lockout supervisors, or operation supervisors.

## Course Objectives:

At the end of this course the participants will be able to:

- Evaluate the danger of electricity.
- Execute some specific operations on LV & HV installations in safe conditions.

## Course Content:

- The three types of electricity
- Risks and practical experiments
- Safety and protection

## Related Courses:

- Electrical Safety for Electricians Working at Low Voltages
- Safety in Explosive Atmospheres for Workers

## Programme Schedule

### Day 1

#### Introduction

1. Electricity definition
2. Electricity benefits, use and dangers
3. What is LV, HV, and EHV?
4. Testing electricity at low and medium voltages

### Day 2

#### Risks and Practical Experiments

1. Risks of each type
2. Real examples of accidents
3. Solutions and avoidance

### Day 3

#### Safety and Protection

1. General safety instructions for working with LV, HV, and EHV
2. Types of protection
3. Summary

Duration
2 Days

Level
Basic

# Safety in Explosive Atmospheres for Workers

UNPSRP005

This course aims to enable participants in developing their knowledge and skills in safety in explosive atmospheres. The learner will develop the skills necessary to work safely in potentially explosive atmospheres using the ATEX approach. The course includes theoretical training and exercises with an INERIS-certified trainer. The course concludes with an evaluation by questionnaire, and upon successful completion participants will receive a Competence Certificate issued by INERIS.

This course is designed for persons supervising installation, operation, or maintenance in a hazardous area concerned by the risks of explosive atmospheres (ATEX).

## Course Objectives:

At the end of this course the participants will be able to:

- Have gained the knowledge required for the design, achievement and maintenance of electrical and mechanical installations (equipment) in (ATEX) potentially explosive atmospheres, according to the required standards.
- Ensure that equipment repair does not downgrade its safety level.
- Provide traceability of repair.

## Course Content:

- Introduction to ATEX
- Risks and protection

## Related Courses:

- IOSH Working Safely

## Programme Schedule

### Day 1

### Introduction to ATEX

1. The Explosive Atmosphere (ATEX) definition
2. Generalities on Explosive Atmospheres (ATEX), gas and dust
3. The mechanism of an explosion

### Day 2

### Risks and Protection

1. Exploding risk area classification (gas and dust)
2. The different types of protection for mechanical ATEX equipment (d, c, k…)
3. The different types of protection for electrical ATEX equipment (d, m, ia, ib…)
4. The marking of the equipment
5. Incidences for use and maintenance
6. Intervention in ATEX hazardous areas

Duration
**4 Days**

Level
**Intermediate**

# Safety in Explosive Atmospheres for Managers and Supervisors

UNPSRP006

This course aims to enable participants in developing their knowledge and skills in safety in explosive atmospheres. The learner will develop the skills necessary to work safely in potentially explosive atmospheres using the ATEX approach. The course includes theoretical training and exercises with an INERIS-certified trainer, including a practical test performed in the INERIS laboratories (60kms north of Paris) with several explosion tests in gas, dust, and electrostatic conditions. The course concludes with an evaluation by questionnaire, and upon successful completion participants will receive a Competence Certificate issued by INERIS.

This course is designed for engineering persons technically responsible for an installation in an explosive area (ATEX), project and design managers, and supervisors responsible for workers in an explosive area.

## Course Objectives:

At the end of this course the participants will be able to:

- Have gained the knowledge required for the design, achievement and maintenance of electrical and mechanical installations (equipment) in (ATEX) potentially explosive atmospheres, according to the required standards.
- Ensure that equipment repair does not downgrade its safety level.
- Make all operators aware of their responsibilities.
- Supervise workers in an explosive atmosphere, and ensure the traceability of repairs.
- Issue the permit to work in an explosive atmosphere.

## Course Content:

- ATEX overview
- ATEX risks and analysis
- ATEX rules
- Protection

## Related Courses:

- ATEX Preparation Course
- IOSH Managing Safely

## Programme Schedule

### Day 1

**Introduction to ATEX**

1. The Explosive Atmosphere (ATEX) definition
2. Generalities on Explosive Atmospheres (ATEX), gas and dust
3. The mechanism of an explosion

### Day 2

**ATEX Risks and Analysis**

1. Exploding risk area classification (gas and dust)
2. Risk analysis according to area and equipment
3. The marking of the equipment
4. Incidences for use and maintenance

### Day 3

**ATEX Rules**

1. The rules applicable to gas (G) ATEX equipment
2. The rules applicable to dust (D) ATEX equipment
3. The rules for design, achievement, and maintenance of installations in explosive atmospheres

### Day 4

**Protection**

1. The different types of protection for mechanical ATEX equipment (d, c, k…)
2. The different types of protection for electrical ATEX equipment (d, m, ia, ib…)
3. Health and safety protection from explosive atmosphere hazards

# Technical Fundamentals

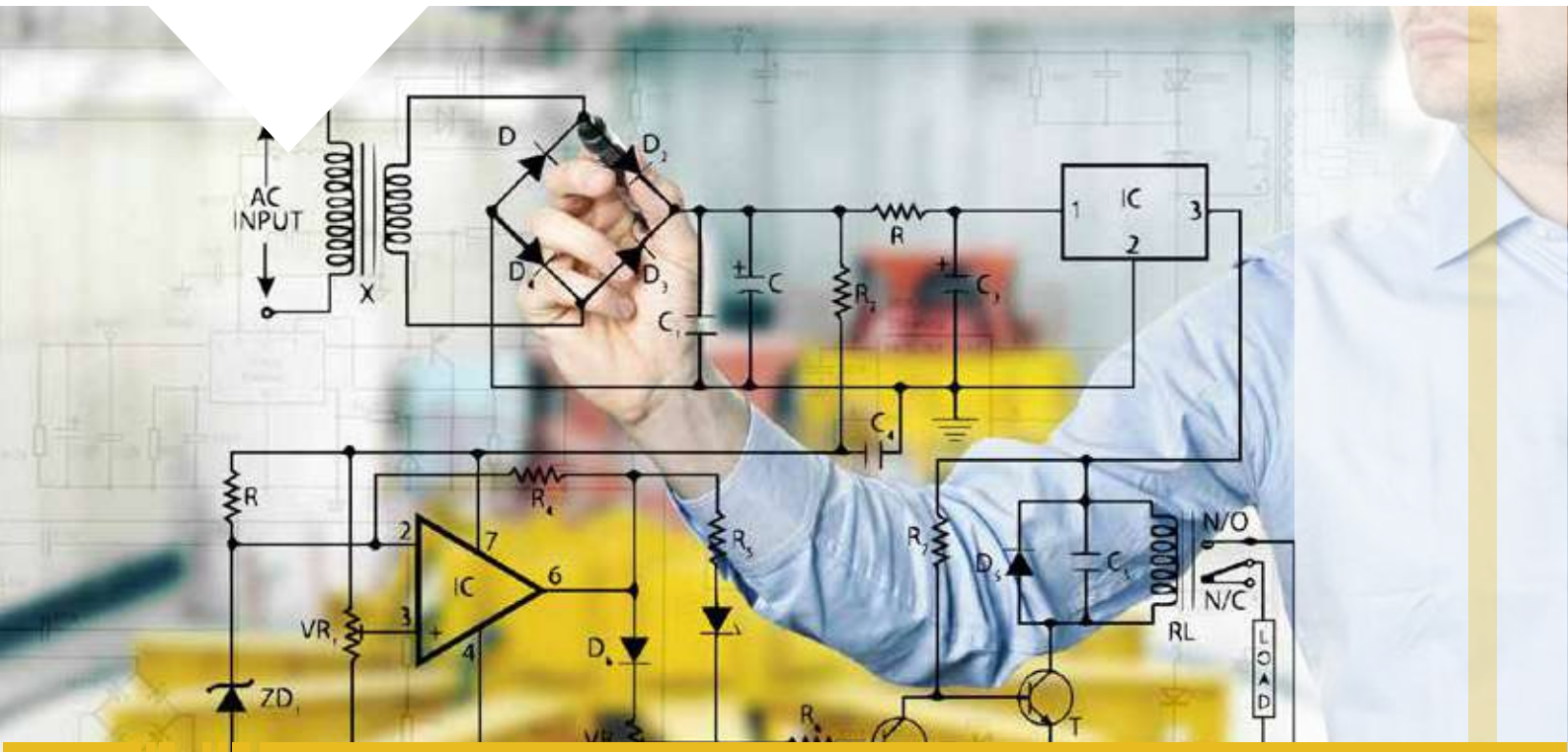
Power

The courses in this section are designed for participants at the basic and intermediate levels. They provide an overview of all aspects in each domain.

The course overview will help training managers to determine the appropriate courses for setting up training plans for staff members to build upon existing knowledge and skills.

## Section Courses

1. Electrical Energy Essentials
2. Power System Engineering
3. Voltage Stability
4. Fundamentals of Power System Protection
5. Grid Connection Protection
6. Medium Voltage Industrial Installation Design
7. Fundamentals of Power Transformers
8. Instrument Transformers
9. Digital Instrument Transformers (DIT)
10. Fundamentals of High Voltage Circuit Breakers
11. Basic HVDC Training
12. Application of Industry Power System Protections
13. Application of Utility Power System Protections
14. Application of Protective Relaying to Transmission Systems
15. Application of Overcurrent Grading and Commissioning
16. Introduction to Protection Scheme Philosophy for MV and HV Networks
17. Utility Transmission Power System Protections (Basic)
18. Utility Transmission Power System Protections (Intermediate)
19. Power Network Essentials
20. First Line System Maintenance
21. Introduction to Smart Grid
22. Telecommunications in a Power Network



# Electrical Energy Essentials

UNPTF001

This course aims to enable participants in developing their knowledge and skills in electrical energy essentials. The learner will develop the skills necessary to understand the primary functions of power system components. Upon completion of this course, participants will be able to understand high-level power system components and interactions within the electric energy industry. Participants are expected to acquire the required knowledge to better contribute and be more informed in workplace situations through completion of this course.

This course is designed for management and staff who will benefit from knowledge of power systems in the electric energy domain; and is helpful as managers are expected to be comfortably conversant in this industry and be appropriately equipped to make informed decisions.

## Course Objectives:

At the end of this course the participants will be able to:

- Give an overview of the electrical power network from its generation to its distribution (primary functions of power system components).
- Explain some aspects of regulation, deregulation, trading, safety, and environment of the electrical energy industry.
- Describe the principles involved in operation of interconnected power systems, economic considerations for interchanging power between systems, control methods, and reliability considerations.

## Course Content:

- Introduction to electrical energy
- Electrical generation overview

## Related Courses:

- Power System Engineering

Duration
**2 Days**

Level
**Basic**

## Programme Schedule

### Day 1

#### Introduction to Electrical Energy

1. Definition and fundamentals
2. Types of electrical energies, including renewable
3. Blackouts and their societal impact

### Day 2

#### Electrical Generation Overview

1. The environmental impact of generating electricity and its economic considerations
2. Aspects of policies and their implications
3. In-depth look at generation, transmission, distribution, and their interdependencies

# Power System Engineering

UNPTF002

This course aims to enable participants in developing their knowledge and skills in power system engineering. The learner will develop the skills necessary to understand high-level power system components and interactions within the electric energy industry. At the end of the course, participants will have attained the required knowledge to improve their contributions to their work.

This course is designed for anyone seeking basic knowledge of electrical engineering.

## Course Objectives:

At the end of this course the participants will be able to:

- Have a refreshed and updated knowledge of electrical engineering.

## Course Content:

- Power systems
- Three-phase current network

## Related Courses:

- Power Energy Essentials

**Duration**
**2 Days**

**Level**
**Basic**

## Programme Schedule

### Day 1

#### Power Systems

1. Basic power system technology
2. Short-circuits
3. Physical phenomena

### Day 2

#### Three-Phase Current Network

1. Definition
2. Fundamentals and usage
3. Capital assets' characteristics
4. Energy transference in the three-phase current network

# Voltage Stability

UNPTF003

Duration
**2 Days**

Level
**Basic**

This course aims to enable participants in developing their knowledge and skills in voltage stability. The learner will develop the skills necessary to understand the methods of voltage control in detail, as well as reactive planning in transmission networks.

This course is designed for management and staff who will benefit from having a high-level knowledge of situational awareness in control centers.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand a comprehensive overview of voltage stability problems.
- Implement methods to effectively address problems in the planning, design and operation of electric power systems.

## Course Content:

- Basic concepts
- Machines and types of instability

## Programme Schedule

### Day 1

#### Introduction and Basic Concepts

1. Definition and classification of power system stability
2. Conceptual relationship between power system stability, security, and reliability
3. Active power and reactive power
4. Characteristics of the voltage stability phenomenon
5. Equipment impacting voltage stability

### Day 2

#### Machines and Types of Instability

1. Synchronous machines
2. Excitation systems
3. AC transmissions
4. Power system loads
5. Methods of voltage control
6. Long-term voltage instability
7. Short-term voltage instability

# Fundamentals of Power System Protection

UNPTF004

This course aims to enable participants in developing their knowledge and skills in the fundamentals of power system Protection. The learner will develop the skills necessary to be aware of the protection principles needed to understand system requirements, and understand the basics of electrical theory. This course gives participants the confidence to maintain systems, and suits all profiles.

This course is designed for people with little or no previous experience in protection.

## Course Objectives:

At the end of this course the participants will be able to:

- Have a basic understanding of applying protection to systems and plants, such as: lines, transformers, generators & motors.

## Course Content:

- Introduction to power system protection
- Protection types

## Related Courses:

- Grid Connection Protection

**Duration**
**2 Days**

**Level**
**Basic**

## Programme Schedule

### Day 1

**Introduction to Power System Protection**

1. Definition
2. Fundamentals
3. Application principles

### Day 2

**Protection Types**

1. Over-current protection
2. Differential protection
3. Generator protection

# Grid Connection Protection

UNPTF005

This course aims to enable participants in developing their knowledge and skills in grid connection protection. The learner will develop the skills necessary to understand grid connection protection and its landing protection relays and their settings. Participants will get ideas on basic commissioning procedures and operation of grid interconnection relays.

This course is designed for engineers/technicians, including commissioning or test engineers.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand grid connection protection (G59) environment and context.

## Course Content:

- Overview of protection
- Procedures and operations
- Types of protection

## Related Courses:

- Power System Protection

**Duration**
**1 Day**

**Level**
**Basic**

## Programme Schedule

### Day 1

1. Grid connection protection overview
2. Protection relays: define the main protection relays and their settings
3. Alstom Grid solution presentation
4. Introduction to grid connection protection MiCOM P341
5. MiCOM P341 basic commissioning procedures and operation

# Medium Voltage Industrial Installation Design

UNPTF006

This course aims to enable participants in developing their knowledge and skills in medium voltage industrial installation design. The learner will develop the skills necessary to design, study, modify, and maintain and operate medium voltage industrial installations. This course allows customization of the solutions for troubleshooting (malfunctioning and/or fault mode) and modifications or extensions, depending on the client's needs.

This course is designed for engineers and technicians involved in the design, study, modification, maintenance and operation of MV industrial installations.

## Course Objectives:

At the end of this course the participants will be able to:

- Design a MV electrical installation.
- Estimate the value of short circuit currents.
- Select the appropriate switchgear.
- Select the appropriate electrical ductwork.

## Course Content:

- Introduction to mv
- Current-using equipment and various power sources
- Estimation of short circuit currents
- Selection of switchgear and wiring systems
- Protection systems

## Related Courses:

- Fundamentals of Power Transformers

**Duration**
**5 Days**

**Level**
**Intermediate**

## Programme Schedule

### Day 1

#### Introduction to MV

1. Definition
2. Principles and standards
3. Equipment
4. The difference between LV, MV, and HV
5. Selection of neutral point connections

### Day 2

#### Current-Using Equipment and Various Power Sources

1. Motors
2. Definitions of the switchgear symbols
3. Distribution networks, transformers, and generator sets

### Day 3

#### Estimation of Short Circuit Currents

1. Three-phase short-circuits at one point on the network
2. Two-phase short-circuits

### Day 4

#### Selection of Switchgear and Wiring Systems

1. Isolator switch, load break switch, contractors' fuses, or breakers
2. Steady state operating conditions, transient operating conditions
3. Industrial networks
4. Connection to the grid, compensation for reactive energy
5. Structures, neutral point connections, earthing faults

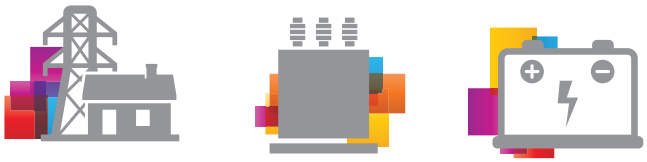
### Day 5

#### Protection Systems

1. Protection systems' selectivity: current, time delay, and logic relays
2. Protection of power transformers

# Fundamentals of Power Transformers

UNPTF007



This course aims to enable participants in developing their knowledge and skills in the fundamentals of power transformers. The learner will develop the skills necessary for the design and application of transformers in both transmission and industrial situations. Participants will gain a wide overview of what power transformers are today, and what the future entails through new solutions. The course includes one year of access to S3601 e-Learning training programs, accessible 24/7 through our LMS (if required).

This course is designed for engineers involved in the design and application of transmission networks, or graduate engineers entering the industry.

## Course Objectives:

At the end of this course the participants will be able to:

- Become conversant in the fundamentals of transformer design, and their application in transmission systems and industrial applications.

## Course Content:

- Introduction
- Transformer operations
- Oil and manufacturing
- Special types of transformers

## Related Courses:

- Instrument Transformers

**Duration**
**4 Days**

**Level**
**Basic**

## Programme Schedule

### Day 1

**Introduction to Power Transformers**

1. Definition
2. Principles, core, windings, losses
3. Cooling modes
4. Stresses and failure modes

### Day 2

**Transformer Operations (Connections, Construction, Protection and Testing)**

1. Delta, star, zigzag
2. Tanks, conservators, bushings, cable boxes, current transformers, dehydrating breathers
3. Buchholz relay, PRV, sudden pressure relay, OTI, WTI
4. Factory and field testings

### Day 3

**Transformer Oil and Manufacturing & the Assembling Process**

1. Oil quality tests
2. DGA
3. Core, windings, bushings and other accessory assemblies

### Day 4

**Special Transformers**

1. Phase shifting transformers
2. HVDC transformers
3. Rectifier and furnace transformers
4. Shunt and smoothing reactors
5. Trackside transformers
6. Continuously Emergency Rated (CER)

Duration
**2 Day**

Level
**Basic**

# Instrument Transformers

UNPTF008

This course aims to enable participants in developing their knowledge and skills in instrument transformers. The learner will develop the skills necessary to work effectively with instrument transformers. Whatever the size or design; current transformers, voltage transformers, and combined current-voltage transformers are an essential link to the safety of your network, and this training will open up their secrets.

This course is designed for consulting and protection engineers and technicians, and project managers and field technicians.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand instrument transformers, their technology, and their environment.
- Optimize instrument transformers integration in HV and MV networks.
- Specify and select the appropriate solutions in instrument transformers.

## Course Content:

- Types of instrument transformers
- Insulation techniques
- Design parameters
- Commissioning and maintenance

## Related Courses:

- Power Transformers
- Digital Instrument Transformers

## Programme Schedule

### Day 1

#### Types of Instrument Transformers

1. Current Transformers – CT
2. Voltage Transformers – VT
3. Combined Metering Units – CMU
4. Capacitor Voltage Transformer – CVT

#### Insulation Techniques

1. Paper-oil insulation
2. Resin insulation
3. SF6 insulation

### Day 2

#### Design Parameters

1. Current transformer: nominal ratio, short circuit current, accuracy class and burden, transient performance
2. Inductive type voltage transformer: nominal ratio, accuracy class and burden, thermal power
3. Capacitor voltage transformer: nominal ratio, accuracy class and burden, thermal power
4. Special site & environmental conditions

#### Commissioning and Maintenance

1. Instructions for erection & commissioning, recommendations for maintenance, accessories

# Digital Instrument Transformers (DIT)

UNPTF009

This course aims to enable participants in developing their knowledge and skills in Digital Instrument Transformers (DIT). The learner will develop the skills necessary to understand the transformers, their technology and their environment. DIT's reduced size and weight are attractive benefits over conventional instrument transformers, allowing for easy placement in compact substations or in retrofit applications. Their broad, dynamic range makes them particularly suited for applications where extreme accuracy, at both full power output and station service draw, is demanded. DIT is the future-ready solution for HV and UHV networks, with a complete new approach of the instrument transformers' use.

This course is designed for consulting and protection engineers, project managers, and field technicians.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand Digital Instrument Transformers, their technology, and their environment.
- Know a product's main characteristics and advantages.
- Discover possible applications in existing or future networks.

## Course Content:

- Digital technology
- DIT commercial solution for networks challenges

## Related Courses:

- Instrument Transformers

**Duration**
**1 Day**

**Level**
**Basic**

## Programme Schedule

### Day 1

#### Digital Technology

1. Operation principles of DIT and new level of accuracy
2. 61850-9-2 standard protocols for communication between IT & electronic devices
3. Technology comparison with conventional equipment
4. Perspective for HV and UHV networks

#### DIT Commercial Solution for Networks Challenges

1. NXCT – Optical current transformer
2. NXCM – Combined metering unit
3. NXCT-F3 Flexible optical current transformer
4. Merging units

# Fundamentals of High Voltage Circuit Breakers

UNPTF010

This course aims to enable participants in developing their knowledge and skills in the fundamentals of high voltage circuit breakers. The learner will develop the skills necessary to gain confidence in the correlation between high voltage network parameters and the associated key switchgear parameters in the compilation of switchgear specifications.

This course is designed for engineers involved in the design and application of transmission networks, and graduate engineers entering the industry.

## Course Objectives:

At the end of this course the participants will be able to:

- Become conversant in the fundamentals of high voltage circuit breakers.
- Know the main elements of switchgear design, construction and testing.

## Course Content:

- Types of disturbances on power systems
- Insulation, interruption medium, and interrupter design
- Circuit breaker interrupters and operating mechanisms
- Circuit breaker types
- Capacitor and reactor switching
- Circuit breaker testing and interpretation
- Operations

**Duration**
**3 Days**

**Level**
**Basic**

## Programme Schedule

### Day 1

#### Types of Disturbances on Power Systems

1. Short-circuit theory
2. Circuit interruption
3. Symmetrical/asymmetrical conditions
4. Arcing
5. Transient phenomena

#### Insulation, Interruption Medium and Interrupter Design

1. Air and oil
2. Vacuum and Sulphur hexafluoride (SF6)

### Day 2

#### Circuit Breaker Interrupters and Operating Mechanisms

1. Interrupter principles and types
2. Mechanisms

#### Circuit Breaker Types

1. Dead Tank and Live Tank (AIS)
2. Gas-Insulated Switchgear (GIS)
3. Mixed Technology Switchgear (MTS)

#### Capacitor and Reactor Switching

1. Capacitor switching; reactor switching
2. Point on wave switching

#### Circuit Breaker Testing and Interpretation

1. List of testing according to standards

### Day 3

#### Operations

1. Installation
2. Commissioning maintenance
3. Condition monitoring
4. Decommissioning
5. Time based
6. Condition based
7. Monitoring devices

# Basic HVDC Training

UNPTF011

Duration
**3 Days**

Level
**Basic**

This course aims to enable participants in developing their basic knowledge and skills in HVDC converter equipment. The learner will develop their knowledge and understanding of the benefits and scope of HVDC transmission, their awareness of HVDC technology and applications, a technical understanding of HVDC equipment, and the scope of HVDC scheme specification.

This course is designed for power transmission and distribution engineers.

## Course Objectives:

At the end of this course the participants will be able to:

- Describe the development and fundamentals of HVDC converter equipment.
- Describe HVDC converter schemes' equipment.

## Course Content:

- Overview of HVDC
- Thyristor valves
- Control and protection

## Related Courses:

- Electrical Safety for Electricians Working at Low, Medium & High Voltages

## Programme Schedule

### Day 1

**Introduction to HVDC**

1. What is HVDC?
2. Fundamentals
3. Single line diagram
4. Civil engineering station

### Day 2

**HVDC Thyristor Valves**

1. Definition
2. Components
3. Harmonics and filters
4. Insulation coordination

### Day 3

**Control and Protection of HVDC Systems**

1. HVDC controls
2. HVDC protection types

# Application of Industry Power System Protections

UNPTF012

This course aims to enable participants in developing their knowledge and skills in the application of industry power system protections. The learner will develop their understanding of the aspects of protection most commonly found in distribution for medium and low voltage networks in the oil & gas, petroleum, steel, mining and metal industries.

This course is designed for engineers or managers who already have experience in protection principles, but want to expand or update their knowledge in the area of distribution and generation power systems.

## Course Objectives:

At the end of this course the participants will be able to:

- Gain a comprehensive understanding of the selection and application principles of the most common types of protection found in distribution: MV/LV networks for oil & gas, petroleum companies, steel, mining & metal industries.

## Course Content:

- General topics
- Protection types

## Related Courses:

- Application of Utility Power System Protections
- Application of Protective Relaying to Transmission Systems

**Duration**
**5 Days**

**Level**
**Intermediate**

## Programme Schedule

### Day 1
**Fault Analysis Tutorials**

### Day 2
**Detailed Overcurrent Grading/Coordination**

### Day 3
**Current Transformer Requirements for Protective Relaying**

### Day 4
**Protection Types**

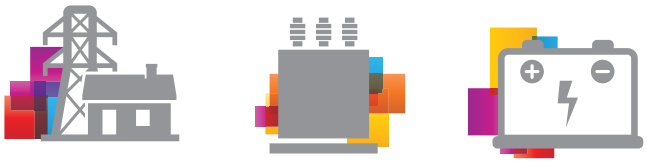
1. Pilot wire differential protection
2. Power transformer protection

### Day 5
**Protection Types - Following**

1. Generator protection
2. Motor protection
3. Busbar protection

# Application of Utility Power System Protections

UNPTF013



This course aims to enable participants in developing their knowledge and skills in the application of utility power system protections. The learner will develop their understanding of the most common types of protection found in distribution, transmission, and sub-transmission power systems. This course will reinforce your company's expert knowledge, reduce your maintenance costs and downtime, and handle your system operations effectively in all situations. Upon completion of this course, participants will sustain the success of their company by enhancing employee efficiency and morale.

This course is designed for engineers and managers who already have experience in protection principals, but want to expand or update their knowledge in the areas of generation, transmissions, and distribution power systems.

## Course Objectives:

At the end of this course the participants will be able to:

- Gain a comprehensive understanding of the principles of selection and application in the most common types of protection found in distribution, transmission and sub-transmission power systems.

## Course Content:

- General topics
- Protection types

## Related Courses:

- Application of Industry Power System Protections
- Application of Protective Relaying to Transmission Systems

**Duration**
**5 Days**

**Level**
**Intermediate**

## Programme Schedule

### Day 1
**Fault Analysis Tutorials**

### Day 2
**Detailed Overcurrent Grading/Coordination**

### Day 3
**Protection Types**

1. Pilot wire differential protection
2. Power transformer protection

### Day 4
**Protection Types - Following**

1. Distance protection
2. Busbar protection

### Day 5
**Current Transformer Requirements for Protective Relaying**

# Application of Protective Relaying to Transmission Systems

UNPTF014

This course aims to enable participants in developing their knowledge and skills in the application of protective relaying to transmission systems. The learner will develop their understanding of protection settings and application of transmission protections. This course will reinforce your company's expert knowledge, reduce your maintenance costs and downtime, and handle your system operations effectively in all situations. Upon completion of this course, participants will sustain the success of their company by enhancing employee efficiency and morale.

This course is designed for engineers who wish to gain more experience in protection settings and application of transmission protections.

## Course Objectives:

At the end of this course the participants will be able to:

- Address the principles of selection and application in the most common types of relay found in transmission systems.
- Give presentations and examples on distance protection, busbar protection, auto-reclosing and system stability.

## Course Content:

- Overview of system application
- Auto-reclosing
- System stability

## Related Courses:

- Application of Overcurrent Grading and Commissioning

**Duration**
**2 Days**

**Level**
**Basic**

## Programme Schedule

### Day 1

#### Overview of System Application

1. Application principles and setting procedures of: distance protection, and distance protection schemes
2. Application principles and setting procedures of busbar protection
3. Application examples and tutorials

### Day 2

#### Auto-Reclosing and System Stability

1. Auto-reclose on distribution systems
2. Auto-reclose on transmission systems
3. System stability

# Application of Overcurrent Grading & Commissioning

UNPTF015

Duration
**4 Days**

Level
**Basic**

This course aims to enable participants in developing their knowledge and skills in the application of overcurrent grading and commissioning. The learner will develop their understanding of fault and grade overcurrent, and basic commissioning techniques. This course will reinforce your company's expert knowledge, reduce your maintenance costs and downtime, and handle your system operations effectively in all situations. Upon completion of this course, participants will sustain the success of their company by enhancing employee efficiency and morale.

This course is designed for delegates who require more tutorial time on fault calculations and application of overcurrent relays, together with knowledge of basic relay testing.

## Course Objectives:

At the end of this course the participants will be able to:

- Analyze fault and grade overcurrent.
- Understand basic commissioning techniques.
- Test overcurrent, differential, motor, generator and distance protection relays.

## Course Content:

- Fault analysis tutorials
- Detailed overcurrent grading/coordination tutorial
- Basic commissioning and maintenance techniques
- Hands-on testing of overcurrent, differential, motor, generator and distance protection relays

## Related Courses:

- Application of Protective Relaying to Transmission Systems

## Programme Schedule

**Day 1**
**Fault Analysis Tutorials**

**Day 2**
**Detailed Overcurrent Grading/Coordination Tutorial**

**Day 3**
**Basic Commissioning and Maintenance Techniques**

**Day 4**
**Hands-on Testing of Overcurrent, Differential, Motor, Generator and Distance Protection Relays**

Duration
**5 Days**

Level
**Basic**

# Introduction to Protection Scheme Philosophy for MV and HV Networks

UNPTF016

This course aims to provide participants with an introduction to the protection scheme philosophy for medium voltage and high voltage networks. The learner will develop their understanding of protection schemes in industrial, distribution, and generation transmission electrical networks; as well as digital control systems for high and medium voltage substations.

This course is designed for maintenance and commissioning engineers, especially those involved in protective relays, as well as protection engineers, protection design engineers, and project managers.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand the protection schemes of industrial, distribution, generation or transmission electrical networks.
- Understand digital control system for MV/HV substations.

## Course Content:

- General fundamentals
- Earthing mode
- Types of protection
- Transformers and practical examples
- Digital control system

## Related Courses:

- Application of Industry Power System Protections

## Programme Schedule

### Day 1
**Introduction and Fundamentals**

1. Electrical network topology
2. Electrical substation type & topology
3. Basic principles of protection schemes

### Day 2
**Earthing Mode/Short Circuit Current and Fault Calculation**

### Day 3
**Types of Protection**

1. Overcurrent protection/directional
2. Transformer protection
3. Line protection
4. Distance protection
5. Differential protection
6. Motor protection
7. Generator protection
8. Busbar protection

### Day 4
**Transformers and Practical Examples**

1. Current transformers, voltage transformers
2. Application examples for the specification of protection schemes

### Day 5
**Digital Control System**

1. Definition
2. Usage
3. Principles
4. Components

# Utility Transmission Power System Protections (Basic)

UNPTF017

This course aims to enable participants in developing their basic knowledge and skills in transmission power system protections. The learner will develop their understanding of the key principles of protection in high voltage and extra high voltage transmission networks. This course will reinforce your company's expert knowledge, reduce your maintenance costs and downtime, and handle your system operations effectively in all situations. Upon completion of this course, participants will sustain the success of their company by enhancing employee efficiency and morale.

This course is designed for maintenance and commissioning engineers, especially those involved with protective relays, as well as protection engineers, protection design engineers, and project managers.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand the key principles of protection in HV and EHV transmission networks.

## Course Content:

- General fundamentals
- Types of protection

## Related Courses:

- Utility Transmission Power System Protections (Intermediate)

**Duration**
**4 Days**

**Level**
**Basic**

## Programme Schedule

### Day 1
**General Fundamentals**

1. Fundamental principles of protective relay use
2. Fundamentals of protection principles

### Day 2
**Short Circuit Currents**

### Day 3
**Types of Protection**

1. Power transformers and transformer feeder protection
2. Line protection principles

### Day 4
**Types of Protection - Following**

1. Distance protection
2. Tele-action schemes
3. Line differential protection

# Utility Transmission Power System Protections (Intermediate)

UNPTF018

This course aims to enable participants in developing their knowledge and skills in utility transmission power system protections at an advanced level. The learner will develop their understanding of high voltage and extra high voltage transmission network protection principles. The participants will attain a high level of understanding in HV/EHV protection schemes, and be able to realize an optimal specification of a protection scheme.

This course is designed for maintenance and commissioning engineers, especially those involved with protective relays, as well as protection engineers, protection design engineers, and project managers.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand HV and EHV transmission network protection principles.

## Course Content:

- Overview of power transmission
- Specific applications for transmission systems
- Busbar
- Earthing
- Short circuit currents

**Duration**
**5 Days**

**Level**
**Intermediate**

## Programme Schedule

### Day 1

**Overview of Power Transmission**

1. Topology and architecture of power transmission and distribution networks
2. Advanced module on power transformer protection

### Day 2

**Specific Applications for Transmission Systems**

1. Breaker failure
2. Recloser
3. Check-synchro
4. Power swing
5. Fault locator
6. Fuse detection
7. CT & VT supervision
8. Trip circuit supervision

### Day 3

**Busbar**

1. Busbar protection
2. Busbar differential schemes

### Day 4

**Earthing Systems**

### Day 5

**Advanced Module on Short-Circuit Currents**

# Power Network Essentials

UNPTF019

This course aims to enable participants in developing their basic knowledge and skills in power network essentials. The learner will develop their understanding of electrical power networks, so that managers may be comfortably conversant in this industry and better equipped to make informed decisions, as well as ensuring that staff members have the knowledge necessary to better contribute and be more informed within the workplace.

This course is designed for engineers who do not have a background in electrical engineering but are working, or are associated with, the electrical power industry.

## Course Objectives:

At the end of this course the participants will be able to:

- Describe the electrical power network or grid generation, transmission and distribution.
- Have further knowledge of each stage within the power flow and its components.
- Have in-depth knowledge of the electrical power system operations.
- Understand the economic aspects of the electricity industry, such as deregulation and trading.

## Course Content:

- Introduction
- Transmission lines
- Power systems
- Control and protection

## Related Courses:

- First Line System Maintenance

**Duration**
**4 Days**

**Level**
**Intermediate**

## Programme Schedule

### Day 1

#### Introduction to Power Networks

1. The growth of electric power systems in the industry
2. Components of power systems
3. Environmental impact of power systems
4. Series of impendence of transmission

### Day 2

#### Transmission Lines

1. Definition
2. Capacitance
3. Current and voltage
4. Modeling and network calculation

### Day 3

#### Power Systems

1. Overview
2. Types
3. Economic operations
4. Interconnection failures and blackouts
5. Maintenance and troubleshooting
6. Stability and power quality

### Day 4

#### Control and Protection

1. Automatic control
2. System protection

# First Line System Maintenance

UNPTF020

This course aims to enable participants in developing their basic knowledge and skills in first line system maintenance. Upon completion of this course, students will have a good understanding in regards to the maintenance of the EMS-SCADA System.

This course is designed for personnel in charge of maintenance and maintenance engineers.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand hardware architecture (EMS – SCADA).
- Do basic hardware troubleshooting.
- Do preventive system maintenance.
- Do daily maintenance on hardware and software.

## Course Content:

- Architecture part
- Support part

**Duration**
**2 Days**

**Level**
**Basic**

## Programme Schedule

### Day 1

**Architecture**

1. Hardware (Tempo consulting)
2. Software (OS…) (ARES)
3. Network LAN/WAN

### Day 2

**Support**

1. Ghosting
2. System and data back up
3. Log activities

# Introduction to Smart Grid

UNPTF021

This course aims to enable participants in developing their basic knowledge and skills in Smart Grid. The learner will gain insight into issues surrounding the current grid; understand major issues driving the Smart Grid and how it may affect an individual organization; know possible roadblocks of the Smart Grid; and become knowledgeable about Smart Grid solutions.

This course is designed for individuals interested in issues related to the Smart Grid.

## Course Objectives:

At the end of this course the participants will be able to:

- Be knowledgeable of the current status of the Smart Grid: what it is and what it is not, its components, its challenges, and the opportunities it presents for our future.

## Course Content:

- Introduction to smart Grid
- Smart Grid components
- Smart Grid general issues

## Related Courses:

- Telecommunications in a Power Network

**Duration**
**3 Days**

**Level**
**Basic**

## Programme Schedule

### Day 1

### Introduction to Smart Grid

1. Historical context of today's grid
2. Today's struggling grid
3. What is Smart Grid?
4. Benefits of Smart Grid

### Day 2

### Smart Grid Components

1. Components of the envisioned Smart Grid
2. Putting together the components of a Smart Grid
3. Delivery of major Smart Grid components

### Day 3

### Smart Grid General Issues

1. Issues driving the progress of the Smart Grid
2. Roadblocks to Smart Grid
3. The current grid capacity and the future Smart Grid
4. Alstom Grid's Smart Grid Solutions

# Telecommunications in a Power Network

UNPTF022

This course aims to enable participants in developing their knowledge and skills in telecommunication in a power network. The learner will develop their understanding of telecom solutions, management, services, and principles. Upon completion of this course, managers will not only have attained a comprehensive view of telecom architectures in power networks, but they also will have acquired the knowledge to differentiate the services that may be required and that can be supported within his/her organization.

This course is designed for personnel in charge of the operation or the maintenance of telecommunications networks, as well as engineers and designers responsible for integrating equipment into networks.

## Course Objectives:

At the end of this course the participants will be able to:

- Give an exhaustive view of the different methods for exploiting historical data.

## Course Content:

- Telecom solutions and network management
- Basic aspects of telecommunication in a power network

## Related Courses:

- Introduction to Smart Grid

**Duration**
**1 Day**

**Level**
**Basic**

## Programme Schedule

### Day 1

1. Presentation of operator's needs
2. Constraints
3. Telecom solutions
4. Telecom network management
5. Telecom actual and future services
6. Telecom network principles and examples

# Transmission Equipment

Power

The courses in this section are designed for participants at the basic and intermediate levels. They provide an overview of all aspects in each domain.

The course overview will help training managers to determine the appropriate courses for setting up training plans for staff members to build upon existing knowledge and skills.

## Section Courses

1. Transformer Technology, Features and Applications
2. Power Transformers' Operation & Maintenance
3. On Load Tap Changers' Operation & Maintenance
4. Vertical-break, Center-break and Pantograph Disconnectors and Earthing Switches from 52 kV to 550 kV

# Transformer Technology, Features and Applications

UNPTE001

This course aims to enable participants in developing their knowledge and skills in the features and applications of transformer technology. The learner will develop their understanding of the various technologies related to substations.

This course is designed for individuals who wish to enhance their T&D working knowledge, especially those looking to improve their technical understanding of transformers.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand the various transformer technologies related to substations.
- Know how transformers step-up or step-down voltages, and adjust network voltages.
- Know the differences between transformer types.

## Course Content:

- HV substations
- Power transformers
- Role of transformers
- Instrument transformers
- Distribution transformers

## Related Courses:

- Power Transformers' Operation & Maintenance

**Duration**
**1 Day**

**Level**
**Basic**

## Programme Schedule

### Day 1

### Module 1: HV Substations

1. Arrangement with transformers

### Module 2: Power Transformers

1. Principles
2. Technologies
3. Tap-changers

### Module 3: Role of Transformers

1. A power plant
2. Main transformers
3. Auxiliary transformers

### Module 4: Instrument Transformers

1. Current transformers
2. Voltage transformers

### Module 5: Distribution Transformers

1. Oil-immersed types
2. Dry types
3. Cooling systems
4. Available assessments
5. Easy user navigation
6. Various interactive learning activities
7. Online dictionary on transmission

# Power Transformers' Operation & Maintenance

UNPTE002

This course aims to enable participants in developing their knowledge and skills in the operation & maintenance of power transformers. The learner will develop a broad technical understanding of what transformers are today. At the conclusion of the course, the participants will have attained an increased level of knowledge in the design, operation and maintenance of transformers. The course includes one year of access to S3601, e-Learning training programs, accessible 24/7 through our LMS (if required).

This course is designed for EMS maintenance engineers and members of operation & maintenance teams**.**

## Course Objectives:

At the end of this course the participants will be able to:

- Understand power transformer technology.
- Ensure the operation of transformers.
- Ensure the appropriate test & evaluation of results.
- Ensure appropriate maintenance.

## Course Content:

- Theory, construction and operation
- Indicators and protections
- Manufacturing process
- Transportation, erection and commissioning
- Periodical controls, tests and maintenance
- Troubleshooting

Note: Practical work may differ, depending on the materials available on site and the time available for the chosen training. Please don't hesitate to contact us for more details.

## Related Courses:

- On Load Tap Changers' Operation & Maintenance

Duration
**6 Days**

Level
**Intermediate**

## Programme Schedule

### Day 1

#### Theory, Construction and Operation

1. Theory and operation
2. Electric and Magnetic Field Theory and applications
3. Overvoltages and overcurrents withstands
4. Construction

#### Accessories

1. Tank types, conservator types, and dehydrating breathers
2. Cooling modes
3. Bushings
4. OLTC, OCTC
5. Other accessories

### Day 2

#### Indicators and Protections

1. Indicators and relays
2. Main tank & OLTC pressure devices
3. Other protective devices (differential protection, restricted earth, tank protection…)

### Day 3

#### Manufacturing Process

1. Transformer assembly process in factories
2. Laboratory tests

### Day 4

#### Transportation, Erection and Commissioning

1. Transportation and delivery conditions
2. Field preparations
3. Controls & tests according procedures

### Day 5

#### Periodical Controls, Tests and Maintenance

1. Maintenance plan and inspection
2. Electrical tests
3. Oil quality tests
4. DGA
5. Maintenance principles (removing oil leakages, bushing, radiator, etc…)

### Day 6

#### Protections and Troubleshooting

1. Buchholz relay
2. Other protective devices
3. Failures

Duration
**4 Days**

Level
**Intermediate**

# On Load Tap Changers' Operation & Maintenance

UNPTE003

This course aims to enable participants in developing their knowledge and skills in the operation & maintenance of On Load Tap Changers (OLTC). The learner will develop a broad technical understanding of what power transformers with OLTC are today. At the conclusion of the course, the participants will have attained an increased level of knowledge in the design, operation, and maintenance of OLTC. The course includes one year of access to S3601, e-Learning training programs, accessible 24/7 through our LMS (if required).

This course is designed for EMS maintenance engineers and members of operation & maintenance teams.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand the OLTC technology.
- Ensure the operation of transformers with OLTC.
- Ensure appropriate maintenance according to OLTC types.

## Course Content:

- On Load Tap Changer mechanisms
- Practical work and maintenance – all aspects

Note: Practical work may differ, depending on the materials available on site and the time available for the chosen training. Please don't hesitate to contact us for more details.

## Related Courses:

- Power Transformers' Operation & Maintenance

## Programme Schedule

### Day 1

**On Load Tap Changer Mechanisms**

1. The selector switch
2. The diverter switch
3. The motor drive unit

### Day 2

**Practical Work and Maintenance**

1. Remove the diverter switch (insert) from chamber
2. Replacement of worn mechanical parts (springs, etc…)
3. Maintenance/replacement of electrical contacts
4. Measuring the transition resistors
5. Cleaning devices

### Day 3

**Practical Work and Maintenance - Following**

1. Insert the diverter switch into a chamber
2. Filling with oil
3. TTR measurements
4. Adjusting the axis

### Day 4

**Practical Work and Maintenance - Following**

1. Electrical and mechanical locking control
2. Protective relay/pressure relay and PRV tests

Duration
**3 Days**

Level
**Intermediate**

# Vertical-break, Center-break & Pantograph Disconnectors & Earthing Switches from 52 kV to 550 kV

UNPTE004

This course aims to enable participants in developing their knowledge and skills in vertical-break, center-break, and pantograph disconnectors & earthing switches that range from 52 kilovolts to 550 kilovolts. The learner will develop their understanding of the design and operation of disconnectors and earthling switches, and the course will provide immediate practice of the theoretical knowledge acquired.

This course is designed for installation personnel, foremen and supervisors, and technicians and engineers who are responsible for the installation and operation of high voltage switchgears.

## Course Objectives:

At the end of this course the participants will be able to:

- Be familiar with the design and operation of disconnectors and earthing switches, and with the associated motor and manual drives.

## Course Content:

- Introduction
- Design and operation
- Installation
- Tests

Note: Practical work may differ, depending on the materials available on site and the time available for the chosen training. Please don't hesitate to contact us for more details.

## Related Courses:

- SF6 Circuit Breakers

## Programme Schedule

### Day1

**Introduction to Disconnectors and Earthing Switches**

1. Definitions
2. Fundamentals
3. General aspects

### Day 2

**Design and Operation**

1. Conducting paths
2. Base frames
3. Linkages

### Day 3

**Installation**

1. On-site installation and commissioning safety instructions and procedures
2. Maintenance concept, including inspection
3. Maintenance and repair criteria and scheduling

**Tests**

1. Performance analysis
2. Measurement results

# Protection System Training

Power

The courses in this section are designed for participants at the basic and intermediate levels. They provide an overview of all aspects in each domain.

The course overview will help training managers to determine the appropriate courses for setting up training plans for staff members to build upon existing knowledge and skills.

## Section Courses

1. Protection of Industrial Installations
2. Railway Protection
3. Digital Control Systems
4. Basic Principles of Digital Control Systems
5. Application of IEC 61850 Communication Protocols

Duration
**3 Days**

Level
**Basic**

# Protection of Industrial Installations

UNPPST001



This course aims to enable participants in developing their knowledge and skills in the protection of industrial installations. The learner will develop their understanding of handling protection relays, using a current injection device for tests and simulations.

This course is designed for engineers and technicians involved in the design, study, testing, maintenance and operation of electrical protection systems for medium voltage installations.

## Course Objectives:

At the end of this course the participants will be able to:

- Analyze the faults that may occur on industrial installations.
- Estimate the value of short circuit currents.
- Define the main protection systems and their settings.

## Course Content:

- The distribution network
- Network faults
- Estimation of short circuit currents
- Protection

## Related Courses:

- Railway Protection

## Programme Schedule

### Day 1

#### The Distribution Network

1. Transformer substation, short circuit capacity

#### Industrial Networks

1. Delivery substations, different structures, different power sources
2. Influence of capacitive currents

#### Neutral Points' Connections

1. Network faults
2. Roles and qualities of protection systems

### Day 2

#### Estimation of Short Circuit Currents

1. Transformer sources: three-phase or two-phase short-circuits
2. Generator set sources: three-phase or two-phase short-circuits

#### Phase Protection Plan and Earth Protection Plan

1. Definition and settings of protection system selectivity diagrams

### Day 3

#### Protection

1. Power transformer protection
2. Main protections of motors
3. Protection relays' ranges

# Railway Protection

UNPPST002

Duration
**3 Days**

Level
**Basic**

This course aims to enable participants in developing their knowledge and skills in railway protection. The learner will develop their abilities in fault finding and troubleshooting for protection systems, thus reducing plant shutdown.

This course is designed for engineers involved in the protection of railway electricity; as well as technicians and engineers from application control departments, project managers, technicians, or operators.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand the principles and application of railway protection.

## Course Content:

- Operation and tension conversion
- Railway protection types
- Protection mechanisms and facilities

## Related Courses:

- Protection of Industrial Installations

## Programme Schedule

### Day 1

**Operation and Tension Conversion**

1. Requirements for steam and tension converters for protection applications
2. Operating programs

### Day 2

**Railway Protection Types**

1. Basics of overcurrent applications
2. Basic transformer-differential protection for feeder lines
3. Basic distance protection facilities for overhead line arrangements

### Day 3

**Protection Mechanisms and Facilities**

1. Overcurrent protection mechanisms HP 492, MiCOM P138
2. Transformer protection facilities PQ 792, MiCOM P638
3. Overhead line protection facilities PD 591, MiCOM P436/ P438

# Digital Control Systems

UNPPST003

Duration
**2 Days**

Level
**Basic**



This course aims to enable participants in developing their knowledge and skills in digital control systems. The learner will develop their understanding and gain an in-depth knowledge of operational needs for digital control systems. Staff members completing this course are expected to be able to improve their contribution and be more informed in the workplace. Managers completing this course are expected to be comfortably conversant with the system, project engineering, and be better equipped to make more informed decisions.

This course is designed for engineers and managers working and making decisions in the substation control system environment, who require deeper knowledge on either the operational needs or decision making within said environment.

## Course Objectives:

At the end of this course the participants will be able to:

- Have a comprehensive understanding of the relevance and impact of substation control, and of protection and the functions of distant control.
- Understand project engineering for a digital control system and gain hands-on practical experience using PACiS.
- Understand the basic principles of digital control systems.

## Course Content:

- Introduction to digital control systems
- Construction and application

## Related Courses:

- Basic Principles of Digital Control Systems

## Programme Schedule

### Day 1

**Introduction to Digital Control Systems**

1. Definition
2. Usage and fundamentals
3. Choice of system components
4. Operating level, operating surfaces, operating hierarchy

### Day 2

**Construction and Application**

1. Construction of communication structures
2. Construction of systems
3. Project engineering and service tools, construction and application
4. Expiry and winding-up of a project
5. Case examples/exercises with PACiS

# Basic Principles of Digital Control Systems

UNPPST004

Duration
**1 Day**

Level
**Basic**



This course aims to enable participants in developing their knowledge and skills in the basic principles of digital control systems. The learner will develop their understanding of digital control systems, and this course provides the knowledge necessary to understand their advantages and applications. The end-user is able to choose the most appropriate solutions for their needs and scale it in terms of function, architecture, and services.

This course is designed for substation control system engineers, and decision-making managers in substation control systems.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand architecture and task-setting within the digital control system environment.
- Be knowledgeable on the relevance and impact of control and protection, and the functions of distant control.
- Understand electrical energy essentials.

## Course Content:

- Overview of all principle aspects regarding digital control systems

## Related Courses:

- Digital Control Systems

## Programme Schedule

### Day 1

#### Overview

1. Application features, system structures
2. Components at field level
3. Components at station level
4. Communications overview
5. Leading-engineering functions

Duration
**2 Days**

Level
**Basic**

# Application of IEC 61850 Communication Protocols

UNPPST005

This course aims to enable participants in developing their knowledge and skills in the application of IEF 61850 communication protocols. The learner will develop their understanding of IEC 61850 standards to substation automation projects. End-users and system integrators will know about specifications and have the required knowledge to improve project follow-ups. The system architects and consultants are expected to have gained a better understanding of future evolutions of the substations' automation applications.

This course is designed for end-users and system integrators who want to specify and/or follow-up an IEC 61850 project, as well as system architects and consultants who want to understand future evolutions of substation and network automation applications.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand how to move from the 1000+ pages of IEC 61850 standard documentation to real substation automation projects.
- Know the key concepts and jargon of the IEC 61850 standards.
- Understand what is not defined for a real project and discuss applications through real products and projects.

## Course Topics:

- IEC 61850 overview
- IEC 61850 concepts
- Practical component (real projects)

## Programme Schedule

### Day 1

#### IEC 61850 Overview

1. Definition
2. Fundamentals
3. Usage

#### IEC 61850 Concepts

1. Services
2. Modeling
3. Substation configuration language
4. Conformance tests

### Day 2

#### Practical Component (Real Projects)

1. Architectures
2. Distributed functions
3. Retrofit cases
4. System configuration
5. Interoperability tests
6. Project management

# Network Management

Power

The courses in this section are designed for participants at the basic and intermediate levels. They provide an overview of all aspects in each domain.

The course overview will help training managers to determine the appropriate courses for setting up training plans for staff members to build upon existing knowledge and skills.

## Section Courses

1. SCADA and Alarm Features
2. Managing High Availability Systems
3. Alarm Modeling for Real-time Operations
4. Building a SCADA model
5. Building a Network Model
6. Building a Generation Model
7. Building a DTS Model
8. Building a Substation
9. Network Analysis
10. Protocol Analysis

# SCADA and Alarm Features

UNPNM001

This course aims to enable participants in developing their knowledge and skills in SCADA and its alarm features. At the conclusion of this course, the learner will be able to use SCADA on an operational level, and will also understand the breadth of optional features available in SCADA and its alarm components. This course should be combined with other SCADA courses if the customer wishes trainees to be able to manage a SCADA database, as management of the SCADA database is not an objective of this course.

This course is designed for programmers and operations personnel who use, build, or maintain displays, databases, and alarms for their SCADA system. For engineers, we would recommend "Building a SACA Model" (Course UNPNM004) instead.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand how the SCADA system processes and displays measurements, controls, and alarms on the monitored system.

## Course Content:

- SCADA related applications
- SCADA system functions
- SCADA databases overview

## Related Courses:

- Building a SCADA Model

Duration
**2 Days**

Level
**Basic**

## Programme Schedule

### Day 1

#### SCADA Related Applications

1. Alarm management
2. Historical data recording
3. Tagging
4. Load shed

### Day 2

#### SCADA System Functions

1. Processing of data acquisition
2. Evaluating data quality
3. SCADA alarms
4. Status and analog measurements
5. Pulse accumulators
6. Custom calculations on data

#### SCADA Databases Overview

# Managing High Availability Systems

UNPNM002

This course aims to enable participants in developing their knowledge and skills in maintaining high availability systems. The learner will develop their understanding of the data objects that make up the PROCMAN model, and how they are used to sequence and condition system functions. At the end of the course, they will be able to describe the data objects that make up the CFGMAN model, and explain how they are used to make decisions regarding when and where system functions are enabled. Additionally, they will become familiar with CFGMAN, PROCMAN, and MRS user interfaces during both machine transitions and normal operations. Trainees will also become familiar with the sequence of events during the standard EMS machine startup, and machine transition from standby to enabled.

This course is designed for system administrators and system integrators responsible for the configuration and maintenance of successful, functioning systems in a redundant environment. Also, for application developers who plan to write application codes that will extend or modify Alstom Grid delivered e-terrahabitat based systems.

## Course Objectives:

At the end of this course the participants will be able to:

- Have detailed knowledge about the configuration and operation of service utilities which start, enable, schedule, and condition the process execution of functions in a redundant system environment.
- Understand standard data models and the user interfaces for PROCMAN and CFGMAN, and the operation of Memory Replication Services (MRS).

## Course Content:

- Overview of CFGMAN subsystems
- CFGMAN models
- Overview of PROCMAN subsystems
- PROCMAN model
- Machine transitions and troubleshooting

**Duration**
**5 Days**

**Level**
**Intermediate**

## Programme Schedule

### Day 1

#### Overview of CFGMAN Subsystems

1. What is CFGMAN?
2. Usage and fundamentals
3. Processes
4. Interface with other subsystems

### Day 2

#### CFGMAN Models

1. Models
2. Usage in system component status-checking
3. Role assignments

### Day 3

#### Overview of PROCMAN Subsystems

1. What is PROCMAN?
2. Usage and fundamentals
3. Processes
4. Interface with other subsystems

### Day 4

#### PROCMAN Model

1. Model's data objects
2. Usage to sequence and condition the processing of system functions

#### CFGMAN and PROCMAN User Interfaces

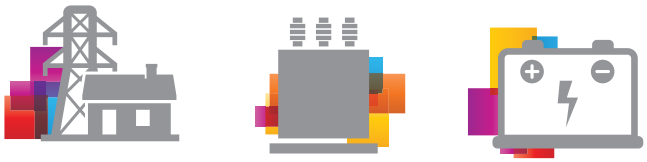
### Day 5

#### Machine Transitions and Troubleshooting

1. MRS processing during machine transitions and redundant operations
2. Troubleshooting startups and machine transitions

# Alarm Modeling for Real-Time Operations

UNPNM003



This course aims to enable participants in developing their knowledge and skills in alarm modeling for real-time operations. The learner will develop their understanding of the customization of alarms, and at the end of the course be able to customize the way alarms are managed on-site.

This course is designed for system integrators, power system integrators, power system modelers, and engineers involved in the creation or maintenance of the alarm model for the monitored power system.

## Course Objectives:

At the end of this course the participants will be able to:

- Have obtained hands-on experience in modeling alarms so the participants can optimize the way events and alarms are managed in an Alstom Grid Energy Management System (EMS).
- Understand the modeling options provided in the alarm databases.
- Focus on possible configurations to support acknowledgement, deletion, sounding and silencing of tones associated with alarms in a real-time operational environment.

## Course Content:

- Introduction to alarms
- Alarms operations

Duration
**2 Days**

Level
**Basic**

## Programme Schedule

### Day 1

#### Introduction to Alarms

1. Terms
2. Definitions
3. Concepts
4. Databases

### Day 2

#### Alarm Operations

1. Event processing
2. Permission areas
3. Configuring sound and silencing tones
4. Acknowledgement and deletion options
5. Global settings
6. Archiving methods
7. Configuring Alarm Viewer to access archive files

# Building a SCADA Model

UNPNM004

This course aims to enable participants in developing their knowledge and skills in building a SCADA model. At the end of the course, the learner will be able to recognize fields and record names in the SCADA database, as is necessary for creating graphic objects that accurately represent the state of monitored objects. Additionally, participants will learn the processing of controls for analogs and status points, and will create calculated data points and understand SCADA topology processing. Furthermore, students will share data via ISD with other systems, and learn how to use the SCADA online editor.

This course is designed for system integrators, power system modelers, and SCADA engineers involved in the creation or maintenance of the monitored power system. This is a complete modeling course for SCADA-only systems, but is also useful for other e-terraplatform customers who need to utilize SCADA data in other applications.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand an overview of the Supervisory Control and Data Acquisition (SCADA) functionality provided by Alstom Grid Energy Management System (EMS) host systems.
- Know how SCADA measurements are processed and stored, and how controls and SCADA alarms are issued in a monitored power system.
- Know the SCADA data model and how to use the e-terramodeler tool to populate that model.
- Use e-terramodeler to develop a SCADA model to obtain the desired SCADA behavior on the system.
- Understand the SCADA online editor's capabilities and limitations.

## Course Content:

- Introduction to the SCADA system
- Processing operations
- Data management

## Related Courses:

- Building a Network Model

**Duration**
**3 Days**

**Level**
**Basic**

## Programme Schedule

### Day 1

#### Introduction to the SCADA System

1. Functions
2. Database organization
3. Status
4. Analog

### Day 2

#### Processing Operations

1. Pulse accumulator measurement processing and storage
2. Processing of controls for analogs and status points
3. SCADA topology processing

### Day 3

#### Data Management

1. Creating calculated data points
2. Recording SCADA data for replay and analysis
3. SCADA system interaction with ALARM (and its various configuration options)
4. Sharing data with other systems via Intersite Data (ISD), using the SCADA online editor

# Building a Network Model

UNPNM005

This course aims to enable participants in developing their knowledge and skills in building a network model. The learner will develop their understanding of the Alstom Grid network data structure and the energy management functions that rely upon it. At the end of the course, students will have knowledge of the breadth of optional processing and display options available in the Alstom Grid network subsystem, and be able to identify which e-terramodeler views, folders, forms, and tabs are used to populate and examine the network database.

This course is designed for system integrators, as well as power system engineers involved in the creation and maintenance of the network topography model.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand an overview of the network analysis functionality to create and maintain a model that best represents your system using the modeling tool, e-terramodeler.
- Know how to use a modeler.
- Be able to differentiate which transmission details are necessary in the model for evaluating the health of the transmission system.
- Understand the network data model, and how to use e-terramodeler to populate it.

## Course Content:

- Introduction to network systems
- Transmission operations and loads

## Related Courses:

- Building SCADA Model
- Building a Generation Model

**Duration**
**2 Days**

**Level**
**Basic**

## Programme Schedule

### Day 1

#### Introduction to Network Systems

1. Functions
2. Database organization

### Day 2

#### Transmission Operations and Loads

1. Lines
2. Switching devices
3. Transmission levels (equipment groups)
4. Transformers, capacitors, and reactors
5. Demand loads, load areas and auxiliary loads

Duration
**2 Days**

Level
**Basic**

# Building a Generation Model

UNPNM006

This course aims to enable participants in developing their knowledge and skills in building a generation model. The learner will develop their understanding of the Alstom Grid Generation software processes, and their general algorithms for processing and presenting AGC and ACE data. Trainees will also gain knowledge of optional processing options for generating units modeled in an Alstom Grid Generation subsystem. By the end of the course, trainees will be able to easily identify which e-terramodeler views, folders, forms, and tabs are used to populate and examine the generation database.

This course is designed for system integrators, power system modelers, and generation engineers involved in the creation or maintenance of the generation control system model. This course is critical for GenCo customers.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand an overview of the generation application functionality provided by Alstom Grid systems.
- Know how to use e-terramodeler's modeling tool to configure the desired generation behavior on the system.
- Understand real-time AGC and ACE processing algorithms, and how to model jointly-owned and combined-cycle generating units.
- Know how to view a generation data model and how to use eterramodeler to populate it.

## Course Content:

- Introduction to generation
- Generation unit data
- AGC
- Incremental heat rate curves

## Related Courses:

- Building a Substation Model
- Building DTS Model

## Programme Schedule

### Day 1

#### Introduction to Generation

1. Application
2. Configuration
3. Options
4. Settings

#### AGC

1. Status
2. Area control error
3. Contributing settings

### Day 2

#### Generating Unit Data

1. Limits
2. Gross/net MW conversion
3. Ramp rate
4. Forbidden zones
5. Types and fuels
6. Incremental heat rate curves, emissions data, and auto selection

# Building a DTS Model

UNPNM007

Duration
1 Day

Level
Basic

This course aims to enable participants in developing their knowledge and skills in building a DTS model. This course serves to ensure that trainees will be able to define appropriate information in DTS models.

This course is designed for system integrators, power system modelers, and SCADA engineers involved in creating or maintaining a model of the monitored power system, and especially the Dispatcher Training Simulator.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand the features and processes associated with the Dispatcher Training Simulator model definition.

## Course Content:

- Training simulator overview
- Models for prime movers
- Models for relays

## Related Courses:

- Building a Generation Model
- Building SCADA Model

## Programme Schedule

### Day 1

**Building a DTS Model**

1. Training Simulator Overview
2. Models for Prime Movers
3. Models for Relays

Duration
**2 Days**

Level
**Basic**

# Building a Substation

UNPNM008

This course aims to enable participants in developing their knowledge and skills in building a substation. This course serves to ensure that trainees will gain sufficient modeling experience to start efficiently modeling their own power system data.

This course is designed for system integrators, power system modelers, and SCADA engineers involved in creating or maintaining the model of the monitored power system.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand the process of modeling a complete substation.
- Understand the skills and the experiences acquired in the previous modeling courses by working with a simple, but realistic, substation; starting from a paper equipment description and station on-line diagram.
- Know the procedure and requirements for modeling the most common power system equipment in different EMP subsystems.

## Course Content:

- Introduction to substations
- Database validation
- Power system data
- Database on-lining procedure

## Related Courses:

- Building a DTS Model
- Building SCADA Model
- Building Generation Model

## Programme Schedule

### Day 1

#### Introduction to Substations

1. Review of navigation and database population methods: equipment creation vs copying
2. Connectivity definition

#### Database Validation

1. Understand validation messages
2. Obtain valid databases
3. Correction

### Day 2

#### Power System Data

1. Consistency check
2. Power flow calculation for the modified data set

#### Database On-Lining Procedure

1. Put the new data online in e-terrasimulator
2. Understand the results of modeling choices

# Network Analysis

UNPNM009

Duration
**2 Days**

Level
**Basic**

This course aims to enable participants in developing their knowledge and skills in network analysis. The learner will develop their understanding of the Alstom Grid network applications, and how they can be used to assess load demand, interchange requirements, generation, network connectivity, and limit violations in both the current and contingent network states. By the end of the course, trainees will be able to troubleshoot solution anomalies, and navigate through the various network applications displays.

This course is designed for utility personnel who will use Alstom Grid network applications to perform network analyses and evaluate solution quality.

## Course Objectives:

At the end of this course the participants will be able to:

- Understand the network applications required to perform basic network analysis.

## Course Content:

- Network analysis overview
- Contingency analysis
- Network schedules

## Related Courses:

- Network Application Features

## Programme Schedule

### Day 1

#### Network Analysis Overview

1. Network analysis displays and navigation
2. Real-Time Network Analysis (RTNET)
3. Obtaining a state solution with RTNET
4. Study Network Analysis (PWRFLOW/ STNET)
5. Obtaining a PWRFLOW solution in STNET and other STNET functions

### Day 2

#### Contingency Analysis

1. Definition
2. Parameters
3. Execution
4. Solution evaluation

#### Network Schedules

1. Limits
2. Monitored elements
3. Alarming

# Protocol Analysis

UNPNM010

This course aims to enable participants in developing their knowledge and skills in protocol analysis. Upon completion of this course, students will have a clear picture of what protocol is, and the tools to detect that impact on an EMS.

This course is designed for personnel in charge of system operation or maintenance (system maintenance engineers) and for those responsible for engineering and design (SCADA engineers).

## Course Objectives:

At the end of this course the participants will be able to:

- Understand communications protocol.
- Use tools for debugging.
- Know input/output signals diagnosis.

## Course Content:

- Introduction to protocol analysis
- Frame analysis

Duration
**2 Days**

Level
**Basic**

## Programme Schedule

### Day 1

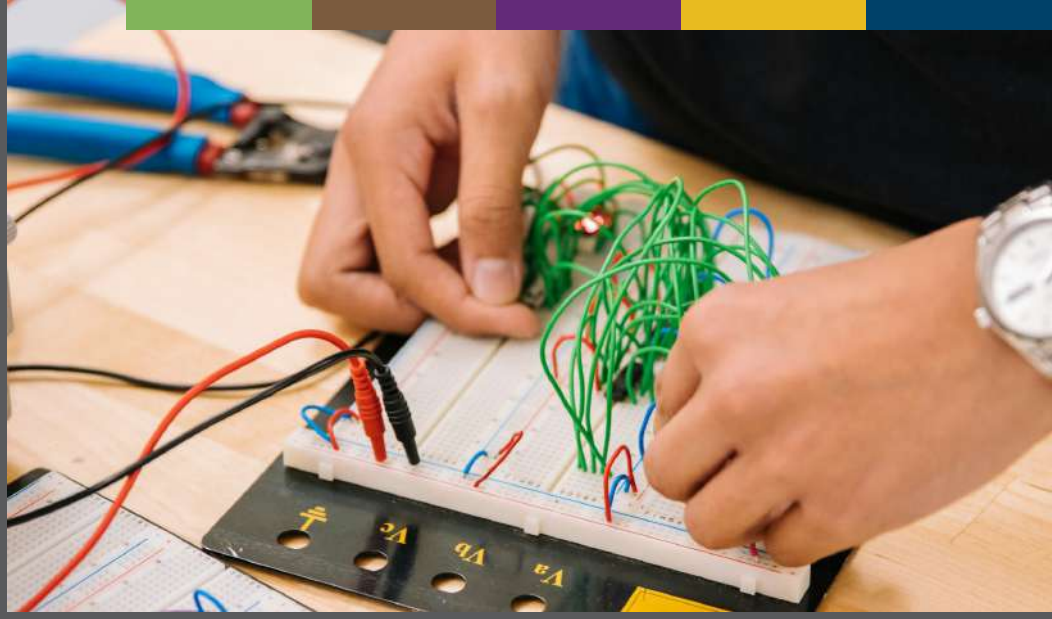
**Introduction to Protocol Analysis**

1. What is the protocol?
2. Fundamentals
3. Usage
4. Overview of protocol applied to EMS

### Day 2

**Frame Analysis**

1. Definition
2. Frame capture
3. Analysis explanation (theory + practice)
4. How to detect defects in frames
5. First diagnosis/analysis applied to EMS

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