Enter the network of expertise

The Siemens Power Academy TD course catalog
Your partner for Power Transmission, Distribution and Smart Grid training

Answers for infrastructure and cities.
Welcome to the worldwide network of energy experts!

Today, continuous change is the most important constant in the energy market. Urbanization, renewable energy and ambitious climate and environmental protection goals are the driving forces behind the constantly changing challenges. Challenges that force us to upgrade our expertise on a regular basis – because expertise is absolutely crucial for ensuring a secure and reliable energy supply in the future.

Master these challenges together with the experts of the Siemens Power Academy TD. We are the specialists for training and continuing education on the subject of power transmission and distribution, the industrial and commercial use of electric energy, and smart grid technology. We convey the expertise you need to constantly upgrade your skills and knowledge, and thus lay the foundation for future success.

Our standard training courses are summarized for you in this catalog. Naturally, we also offer tailored training courses geared specifically to the goals for developing expertise in your company.

The courses of Siemens Power Academy TD impart valuable knowledge, boost your productivity, and strengthen your leadership potential. In short, they’re important building blocks for the active development of your career.

Get started on your path to a successful future – with training courses from Siemens Power Academy TD!

We look forward to welcoming you to our worldwide network of energy experts!

Your Siemens Power Academy

Enter the network of expertise
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Elevate your expertise to the next level:
■ Leading experts certified as trainers
■ Small groups of students
■ Practice-oriented training courses
■ Real-world relevance
■ High-quality, comprehensive course materials

Siemens Power Academy TD – at a glance

Our offer
The Siemens Power Academy TD offers professional training in the areas of power transmission and distribution as well as industrial and commercial power consumption, including smart grids. Siemens Power Academy TD has modern training centers worldwide, with offices in Europe, the United States, South America, Asia, and Africa. Our objective is to provide our customers – regardless of location – with access to Siemens' expert knowledge and capabilities. Move ahead of the competition by entering our network of expertise! Thousands of participants from more than 90 countries have benefited from Siemens' more than 160 years of global experience.

Certified trainers from Siemens businesses employ the latest teaching methods to guarantee you learn practical skills quickly and retain what they learn over the long term. To offer a superior educational experience, we place the utmost importance on ensuring ongoing quality control and constantly developing the quality and content of our training program. Professionally prepared lecture notes, slides and course materials ensure that even after the training is complete, you will always have the key information at your fingertips.

Regular feedback from our participants is a core component of our quality control and the basis for a consistently high quality of continuing education.

Our strength: flexibility
■ Standard training
The ideal starting point: You benefit by learning alongside industry professionals from other companies on fixed dates for optimal cost-effectiveness.

■ Customized training
Maximum personalization: You define the content, the product version and the time and length of the sessions.

■ Practice-oriented workshops
For advanced students: Expand your own basic knowledge of energy technology and learn to use specific products and systems.

■ Training programs (Curricula)
Certified knowledge: Follow an integrated concept to systematically build up your expertise in three levels (Associate, Advanced, Expert) and receive a certificate for each test you pass.

■ Combined technology and business learning
Highly practice-oriented: Interdisciplinary courses are the ideal preparation for applying what you have learned to your day-to-day work.

■ Personal consultation
Evaluate your level of knowledge: We will help you assess where you are now and which training program will benefit you the most.

■ Training development
For curriculum development: We will provide you with expert assistance in developing your own workshops.
Our powerful portfolio
Siemens Power Academy TD offers you a comprehensive training program covering General Power Engineering, Primary and Secondary technology, Software tools as well as various Smart Grid topics.
In addition to our standard training portfolio, which you can find in this catalog, we also offer customized training that will support you in all of your competence development needs. Please contact us and we will be happy to offer you more information.

Our core competence
The right mix of theory and practice
In the Siemens Power Academy TD training programs, theory and practice go hand-in-hand. This means that theoretical approaches are always supplemented by practical exercises on real devices and systems. To make that possible, the training centers use original components, devices, and systems from the Transmission and Distribution product portfolio. This hands-on training principle guarantees a maximum learning effect.

Power System Operation

Power System Simulation Software
PSS®E, PSS®SINCAL

Power System Engineering
Network planning, Smart Grid, Renewable Integration

Secondary Technology
Protection, Substation Automation & Information, Power Quality

Primary Technology
Medium & High Voltage Technology, Transformers

Training portfolio of the Siemens Power Academy TD
Curriculum – our competence development program

Well-trained employees are vital for successful companies. Challenges such as the rapid transformation of economic, environmental and technological advancements require employees to contiguously and systematically improve skills and knowledge. To be a reliable resource and realize our potential, we all must take a personal stake in planning development activities that will contribute to our personal and organization’s success.

To help you and your organization in this effort, Siemens Power Academy TD has designed a competency-based development program to guide your learning plan.

In contrast to simply selecting individual training seminars, our curriculum provides you with incremental learning through a structured, logical combination of classes on a specific topic. This allows the necessary skills and abilities to be systematically developed.

Each curriculum consists of a progressive set of classes with three qualification levels: Associate, Advanced, and Expert. Each level concludes with a learning assessment to ensure that the training was successful.

We offer you a wide variety of curricula including Protection Systems, Substation Automation, Power Systems Technology, Distribution Systems Technology, and PSS® Network Planning and Analysis.

Please visit our website for an overview of our selection of curricula: siemens.com/poweracademy/curricula
How to obtain certification

Step 1
Selection of the required curriculum and qualification level
- Students and supervisors review and select the curriculum content and define the required qualification level. Siemens Power Academy TD is happy to assist with this process.
- Now you are ready to choose your classes. To register for a class, please visit www.siemens.com/poweracademy or contact your regional training center for assistance in booking your training.

Step 2
Participation in training
- Students attend all required classes.
- The order of courses within a qualification level is a recommendation only, and can be altered by the trainee.

Step 3
Testing
- Students register for and complete all tests for the selected level of the required curriculum
- The test can be completed online.
- Students who pass the e-test each certification programs has a minimum achievement levels for e-tests. The qualification certificate can be printed out after the e-test.
- If the student is not able to achieve the required passing grade on their first attempt, they can contact their regional training center to re-test or re-take the course.

Step 4
Certification
- Once the student have completed the requirements for the certification, complete the certificate application form for a final evaluation. Siemens Power Academy TD staff members are available to assist.
- If all the criteria for the curriculum certification have been met, Siemens Power Academy TD issues the certificate. Product and software-based certifications are valid for a specified period of time before refresher courses are required for certification maintenance.
Curriculum

SICAM PAS Substation Automation (CU-PASE)

Associate
- SICAM SCC – Configuring an Operator Station
  Booking code: PAS-S
  e-test: WT-PASC
- SICAM PAS – Parameterization
  Booking code: PAS-P
  e-test: WT-PASP
- DIGSI 4 – Basics
  Booking code: DIGSI4-B
- Telecontrol and Automation – Fundamentals
  Booking code: SAS-TELE

Advanced
- IT Security – Basics
  Booking code: SIT-SECUR1
  e-test: WT-SECUR1
- IT Networks – Automation
  Booking code: SIT-NETW2
- DIGSI 4 – IEC 61850 and GOOSE Configuration
  Booking code: DIGSI4-I
  e-test: WT-DIGSI4I
- SIPROTEC 4 – Engineering of Bay Controllers 6MD66 with IEC 61850-GOOSE Communication
  Booking code: SIP4-6MD66
  e-test: WT-6MD66
- DSGI 4 – Advanced
  Booking code: DIGSI4-A
  e-test: WT-DIGSI4A

Expert
- SICAM PAS – System Diagnosis and Trouble Shooting
  Booking code: PAS-SYS
  e-test: WT-PASSYS
- IT Security – Automation
  Booking code: SIT-SECUR2
  e-test: WT-SECUR2
- IT Networks – Automation
  Booking code: SIT-NETW2
  e-test: WT-NETW2
- IT Networks – Basics
  Booking code: SIT-NETW1
  e-test: WT-NETW1

Courses can be ordered at: www.siemens.com/poweracademy
Courses can be ordered at: www.siemens.com/poweracademy
Courses can be ordered at: www.siemens.com/poweracademy
### SIPROTEC Bay Controller (CU-BAYE)

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<th>Expert</th>
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Booking code: SIP4-6MD66  
e-test: WT-6MD66 | DIGSI 4 – IEC 61850 and GOOSE Configuration  
Booking code: DIGSI4-I  
e-test: WT-DIGSI4I | SICAM PAS – Parameterization  
Booking code: PAS-P  
e-test: WT-PASP |
| DlGSI 4 – Basics  
Booking code: DIGSI4-B  
e-test: WT-DIGSI4B | Communication Networks – Application in Power Transmission & Distribution  
Booking code: SIT-COMPT  
e-test: WT-SITCOMP | DIGSI 4 – CFC  
Booking code: DIGSI4-C  
e-test: WT-DIGSI4C |

Courses can be ordered at: www.siemens.com/poweracademy
Courses can be ordered at: www.siemens.com/poweracademy
SIPROTEC Protection – Service Power Generation and Industry (commissioning, operation, testing, maintenance) (CU-SIPGICE)

- **Associate**
  - SIPROTEC – Guided Exercises
    - Booking code: WS-GUIDE
  - SIPROTEC 4 – Application and Exercises
    - Booking code: SIP4-SYS
    - e-test: WT-SIP4SYS
  - DIGSI 4 – Basics
    - Booking code: DIGSI4-B
    - e-test: WT-DIGSI4B
  - Protection Technology – Principles
    - Booking code: PR-PRIN
    - e-test: WT-PRPRIN
  - Transmission and Distribution Networks – Basics Part II
    - Booking code: PE-TDNET2
  - Transmission and Distribution Networks – Basics Part I
    - Booking code: PE-TDNET1

- **Advanced**
  - DIGSI 4 – IEC 61850 and GOOSE Configuration
    - Booking code: DIGSI4-I
    - e-test: WT-DIGSI4I
  - Protection Systems – Accessory Equipment
    - Booking code: SIP4-ACCES
  - Current and Voltage Transformers – Intensive Course
    - Booking code: SIP-VTI
  - SIPROTEC 4 – Application and Exercises of Generator/Motor Protection
    - Booking code: SIP4-GEN
    - e-test: WT-SIP4GEN
  - SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC
    - Booking code: SIP4-CMC
    - e-test: WT-SIP4CMC
  - DIGSI 4 – Advanced
    - Booking code: DIGSI4-A

- **Expert**
  - SIPROTEC 4 – Machine/Motor Protection 7UM & 7VE
    - Booking code: SIP4-7UMVE
    - e-test: WT-7UMVE
  - SIPROTEC 4 – Distance Protection 7SA
    - Booking code: SIP4-7SA
  - SIPROTEC 4 – Busbar Protection 7SS2
    - Booking code: SIP4-7SS
    - e-test: WT-SIP47SS
  - SIPROTEC 4 – Line Differential Protection 7SD
    - Booking code: SIP4-7SD
    - e-test: WT-SIP47UT
  - SIPROTEC 4 – Transformer Differential Protection 7UT
    - Booking code: SIP4-7UT
    - e-test: WT-SIP47UT
  - SIPROTEC 4 – Overcurrent and Motor Protection 7SJ
    - Booking code: SIP4-7SJ
  - SIGRA 4 – Efficient Interpretation of Fault Records
    - Booking code: SIP4-SIGRA

Courses can be ordered at: www.siemens.com/poweracademy
Courses can be ordered at: www.siemens.com/poweracademy
Courses can be ordered at: www.siemens.com/poweracademy
Siemens Power Academy TD –
Our course portfolio

The Siemens Power Academy TD portfolio consists of five main training categories:
Primary Technology, Secondary Technology, Power System Engineering,

For most of the courses you will find detailed information on learning objectives, content,
and target audiences as well as prerequisites that participants should have in order to get
maximum benefit from the training.

Additional courses are listed with brief descriptions.
For more details on these as well as other courses, please visit our Web site at:
siemens.com/poweracademy.

We are pleased to support you in your professional development,
and to help you determine which training courses will be of the greatest value to you.

We look forward to meeting you at one of our training sessions!

Contact details:

Germany:
E-mail: poweracademy.ic-sg@siemens.com
Phone: +49 911 433 7415

USA:
E-mail: power-academy.us@siemens.com
Phone: +1 518 395 5005

Further local contact details you will find
on page number 90.

Explanation of symbols

Part of a curriculum;
e-test required for the certificate

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<th>Language</th>
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MLFB-Number
Price:
Booking information
HVDC and FACTS – Benefits of Power Electronics

Booking code: HVDC/FACTS

Training objectives
The participant will understand power electronics in high voltage and medium voltage systems with a focus on HVDC and FACTS and their applications. Information on the technical features of different solutions, HVDC and FACTS system behavior, design of components, operation and maintenance requirements will be given.

Target audience
Engineers and managers in utilities, administration, transmission companies, power producers, consultants, design institutes and equipment manufacturers who are responsible for sales and marketing, consulting, planning and design of transmission projects, and all technically interested people in general.

Prerequisites
Basic knowledge of electrical and power engineering.

Main features
- Trends in power systems
- Understanding power transmission
- Power quality – terms and definitions
- Trends in AC and DC transmission
- Introduction in power electronic solutions
- HVDC and FACTS – basics and trends
- VSC Technology for HVDC, FACTS and tractions supplies
- Power electronics for distributions and industrial systems
- Costs of high voltage transmission
- Projects, studies and applications
- Outlook: PEBBs, GIS / HIS, GIL, H 2 and HTSC
- Training on computer and real-time simulator
- Blackouts 2003 – “Lessons Learned?”

HV Switching Technology GIS – Technical Information

Booking code: HV-GIS

Training objectives
By covering the most important technical knowledge on high voltage gas-insulated switchgear, the participants will be able to describe possible faults on SF₆-insulated switchgear and to establish their causes.

Target audience
Persons who participate, should be familiar with design and construction of SF₆-insulated switchgear, e.g. operating and maintenance personnel, field service personnel and engineers.

Prerequisites
Knowledge of switchgear technology would be an advantage.

Main features
- Conveying detailed knowledge of the technology of specific switchgear types – 8D-type
- The following points are discussed in particular:
  - The different types of switchgear
  - Mode of operation / Setup / Arrangement of the individual modules
  - Basic mode of operation of the circuit-breaker interrupter unit
  - The basic mode of operation of the spring drive system
  - Control and monitoring of the switchgear
  - (The limit values and background)
  - The interlocking system of the modules
  - Maintenance and service aspects of the Switchgear
  - Environmental protection aspects of SF₆

HV Switching Technology – 3A

Booking code: HV-3A

Training objectives
By covering the most important technical knowledge on high voltage gas-insulated switchgear (Type 3A), the participant will be able to describe possible faults on SF₆-insulated switchgear and to establish their causes.

Target audience
Persons who, should be familiar with design and construction of power circuit-breakers, e.g. operating and maintenance personnel, field service personnel and engineers.

Prerequisites
Major knowledge of power engineering. Experience with switchgear technology would be advantageous.

Main features
- Conveying detailed knowledge of the technology of specific circuit-breakers – (3AP1, 3AQ, 3AT)
- The individual modules of the switchgear
- Interaction of the individual modules
- Basic mode of operation of the circuit-breaker interrupter unit
- The basic mode of operation of the drive system
- Control and monitoring of the switchgear
- The limit values and background
- The interlocking system
- Maintenance and servicing
- Environmental protection
High Voltage

Metal-Clad GIS – Current 8D Product Range – Operation & Maintenance – Intermediate

Booking code: HV-OMGIS

Training objectives
Acquisition of the “intermediate level” technical knowledge required for operation and maintenance of the above mentioned metal-clad switchgear, in compliance with safety regulations. The trainee will be capable of preventive product-related maintenance without executing operations. He will be familiar with the product and tools and will be capable of interpreting data (circuit breaker response time, gas analysis, etc.).

Price on request

139,320 MXN

AIS Current 3AP – 3AQ Product Range – Operation & Maintenance – Intermediate

Booking code: HV-OM3AP/Q

Training objectives
Acquisition of the “intermediate level” technical knowledge required for operation and maintenance of the above mentioned AIS circuit breakers, in compliance with safety regulations. At the end of the training course, the participant will be capable of preventive product maintenance without executing operations. He will be familiar with the product and tools and will be capable of interpreting data (circuit breaker response time, gas analysis, etc.).

1,080,000 COP

1,140 GBP

10,000 INR

1,825 USD

HVDC and FACTS – Workshop

Booking code: HVDC-WS

Training objectives
The participant will understand power electronics in high voltage and medium voltage systems with a focus on HVDC and FACTS and their applications. Information on the technical features of different solutions, HVDC and FACTS system behavior, design of components, operation and maintenance requirements.

9CA4110-0NE00-0DF8

650 EUR

2,825 USD

HV Overhead Transmission Line Design – Fundamentals

Booking code: HV-OVHDLIN

Training objectives
The participant will understand the design aspects of 69-765 kV transmission lines with special emphasis on component parts of lines and their functions, insulation, electrical environmental effects of fields and noise, selection of conductors and structures, and integration into an overall design.

CO

1,560,000 COP

FR

Price on request

TR

Price on request

MX

58,860 MXN

HV Switchgear Design – Basics

Booking code: HV-SWITCH

Training objectives
The participants will get a basic understanding of all aspects of switchgear design by covering fundamental aspects as a basis for further detailed study in any specific topic associated with switchgear design.

1,140 GBP

10,000 INR

1,825 USD

HV Substation Design – Basics

Booking code: HV-SUBST

Training objectives
The participants will get a basic understanding of all aspects of substation design by covering fundamental aspects as a basis for further detailed study in any specific topic associated with substation design.

485 GBP

1,800 TRY

1,800 TRY

HV Primary Test Performing and Test Equipment

Booking code: HV-TEST

Training objectives
In this theoretical - practical course, the participants will acquire the necessary knowledge for performing power primary equipment diagnosis, commissioning and maintenance test as well as understanding basic concepts necessary for interpretation and analysis of the results obtained in the tests, tending to the development of a suitable diagnosis of equipment condition.

1,560,000 COP
Hydraulic Knowledge & Maintenance – Fundamentals

Booking code: HV-HYDRAUF

Training objectives
To study the various types of hydraulic operating mechanisms with which AIS and vintage GIS circuit breakers are equipped and become familiar with the function of each hydraulic component and the adapted maintenance. At the end of the course, the candidate will be capable of identifying apparatus technology and structures. He will be familiar with safety-related risks and will be capable of answering technical questions. No component replacement.

Price on request

Metal-Clad GIS – Current B8D Product Range – Operation and Maintenance – Advanced

Booking code: HV-OMMGOS

Training objectives
Acquisition of the “advanced level” technical knowledge required for operation and maintenance of the above-mentioned metal-clad switchgear, in compliance with safety regulations. At the end of the course, the candidate will be capable of participating in a disassembly operation, of the corrective maintenance type, with a certain level of autonomy.

Note
The duration is to be defined after consultation.

Price on request

Metal-Clad GIS – Vintage Product Range – Operation & Maintenance – Advanced

Booking code: HV-OMGISVI

Training objectives
Acquisition of the “advanced level” technical knowledge required for the operation and maintenance of the above-mentioned metal-clad switchgear, in compliance with safety regulations. At the end of the course, the candidate will be capable of participating in a disassembly operation, of the corrective maintenance type, with a certain level of autonomy.

Note
For courses in France, the duration is to be defined after consultation.

Price on request

Metal-Clad GIS – Vintage Product Range – Presentation

Booking code: HV-PRESENT

Training objectives
To present new equipment to operation and maintenance personnel. Acquire the knowledge relating to its specificities, main characteristics and metal-clad switchgear maintenance program. The trainee will be capable of product-related preventive maintenance operations without intervening. He will be familiar with the product and tools and will be capable of interpreting data (circuit breaker response time, gas analysis, etc.).

Price on request

Metal-Clad GIS – Vintage Product Range – Operation & Maintenance – Intermediate

Booking code: HV-OMMGISV

Training objectives
Acquisition of the “intermediate level” technical knowledge required for operation and maintenance of the vintage GIS switchgear product range, in compliance with safety regulations. The trainee will be capable of preventive product maintenance without executing operations. He will be familiar with the product and tools and will be capable of interpreting data (circuit breaker response time, gas analysis, etc.).

Note
The duration is to be defined after consultation.

Price on request

HV GIS Switchgear Reyrolle Type YG 420 / 550 kV

Booking code: HV-YG

Training objectives
The participant will get a thorough understanding of YG 420/550 kV gas-insulated switchgear.

Price on request

HV GIS Circuit Breaker Reyrolle Type SPD2 420 / 550 kV

Booking code: HV-SPD2

Training objectives
The participants will get a thorough understanding of SPD2 420/550 kV SF_6 circuit breaker.

Price on request

(Net prices)
HV Circuit Breaker – Testing

Booking code: HV-BREAK

Training objectives
This course enables the participants to deal with all aspects needed for HV circuit breaker testing.

2,140 GBP

HV AIS Circuit Breaker Reyrolle Type SPL2 420 / 550 kV

Booking code: HV-SPL2

Training objectives
The participants will get a thorough understanding of SPL2 420/550 kV SF₆ circuit breaker.

Notes
The course is a combination of lectures and hands on practical training.

850 GBP

AIS Vintage SB6 Product Range – Operation & Maintenance – Intermediate

Booking code: HV-OMAIS

Training objectives
Acquisition of the "intermediate level" technical knowledge required for operation and maintenance of the SB6 AIS circuit breakers, in compliance with safety regulations. The trainee will be capable of preventive product maintenance without executing operations. He will be familiar with the product and tools and will be capable of interpreting data (circuit breaker response time, gas analysis, etc.).

Note
The duration is to be defined after consultation.

Price on request


Booking code: HV-OMAISVI

Training objectives
Acquisition of the "intermediate level" technical knowledge required for operation and maintenance of FA AIS circuit breakers range, in compliance with safety regulations. The trainee will be capable of preventive product maintenance without executing operations. He will be familiar with the product and tools and will be capable of interpreting data (circuit breaker response time, gas analysis, etc.).

Price on request

Price on request

Price on request

Upgrading Oil Circuit Breakers – OP & MO Product Range – Advanced

Booking code: HV-UPGR

Training objectives
Acquisition of the "advanced level" technical knowledge required to execute corrective sealtightness operations on minimum oil circuit breakers (MOCB). At the end of the training course, the candidate will be capable of participating in a disassembly operation, of the corrective maintenance type, with some autonomy.

Hydraulic Knowledge & Maintenance – Intermediate

Booking code: HV-HYDRAULI

Training objectives
To study a method enabling hydraulic failure detection on maintenance circuit breakers. Learn to replace standard hydraulic components. Study and execute functional circuit breaker tests. Acquire basic stainless steel tube bending techniques. The candidate will be capable of executing product-related preventive maintenance without intervening. He will be familiar with the product and tools and will be capable of interpreting data (circuit breaker response time, gas analysis, etc.).

Price on request

Price on request

Price on request

High Voltage
## MV Switchgear – Technical Information Course (AIS & GIS)

**Booking code:** MV-INFO

**Training objectives**
The training provides information on switchgear and devices in the primary and secondary distribution level. It gives the main technical knowledge of operational and personal safety and maintenance. On the basis of exhibits handling and locking concepts of different designs are demonstrated for air and gas insulated switchgear.

**Target audience**
Planning, operation and service personnel from utilities and industries. Interested parties from sales and project processing.

**Prerequisites**
Basic technical knowledge (medium voltage).

**Main features**
- Primary and secondary distribution
- Circuit breakers and other devices in medium voltage switchgear
- Air and gas insulated switchgear
- Design and Classification (IEC 62271)
- Personal and operational safety
- Testing, maintenance and service
- Practical exercises on switchgear panels
- Factory tour Schaltwerk Frankfurt (for courses in Germany)

**Notes**
The training program can also be tailored to special customer needs if requested.

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(Net prices)
MV – Rural Electrification Techniques for Engineers & Technicians
Booking code: MV-RURAL

Training objectives
The participants will gain knowledge of the commissioning and maintenance of distribution transformers, their cooling methods and block distribution stations. They will be able to, identify, use and maintain different types of cables, carry out cable jointing and cable termination, conduct tests on cables, carry out installation earthing. They will be able to install, commission and maintain basic supply and lighting units using Photovoltaic.

Target audience
Engineers, junior engineers, field personal and technicians involved in operation, planning, design, maintenance and servicing of rural electrification systems.

Prerequisites
Basic knowledge of electrical engineering.

Main features
- Transformer installation and maintenance,
- Block distribution stations / Ring Main Units (including different types of switchgear)
- Cable splicing and termination
- System and installation earthing
- Photo voltaic power supply and lighting units

525,000 NGN

Notes
This certificate is valid for 3 years. The certification of gas insulated switchgear is only available in Germany, and air insulated switchgear only in Turkey.

Price on request

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MV – Assembly and Installation Training

Training objectives
The training imparts profound knowledge about the layout, operation, installation and attendance (current state – control) in the primary parts of the according switchgear. After successful completion of the course, the participants receive a certificate that authorizes them to work self-responsibly on switchgears (primary parts).

Target audience
Assembly and installation staff.

Prerequisites
Basic knowledge of assembly technique. Since the assembly and installation training includes active learning components, the participants must wear suitable working clothes and safety shoes.

Main features
- Theory (ratings, typicals, layout, circuit-breaker modules, switches)
- Operation (Operator controls, drive mechanism, operating procedures, interlocks)
- Installation (installation of panel / block interconnecting equipment, busbar installation; installation of the voltage transformer

We offer trainings for the following switchgears:
- NXAIR World (MV-NXAIRW)
- NXAIR M World (MV-NXAIRM)
- NXPLUS C (MV-NXPLUSC)
- NXPLUS (MV-NXPLUS)
- 8DA / B10 (MV-8DA8DB)
- 8DJ10 (MV-8DJ10)
- 8DH10 (MV-8DH10)
- 8DJH (MV-8DJH)
- SIMOSEC (MV-SIMOSEC)
- 8BT1 (MV-8BT1)
- 8BT2 (MV-8BT2)
- 8BT3 (MV-8BT3)
- SIMOPRIME World (MV-SIMOPRI)

Price on request

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MV Equipments – Certification Program for Operation & Maintenance
Booking code: MV-CERTIF

Training objectives
The participants will be familiarized with selection, engineering, operation and maintenance of medium voltage switchgear and power transformers.

Target audience
Supervisors, engineers, field personal, technicians and specialists involved in operation, planning, design, maintenance and servicing of switchgear, transformers and protecting equipments from electric utilities and the industrial sector.

Prerequisites
Basic knowledge of electrical engineering and first relevant exposure to MV equipments.

Main features
- Technical information course for medium voltage switchgear and switching equipments: selection, planning and design functions, locating and rectifying faults, safety regulations, handling of SF6 gas
- Technical information course for operating personnel-power transformers: selection, planning and design functions, assembly and inspection
- Medium voltage switchgear – NXPLUSC, 8DA, operation and maintenance: fundamental functions and characteristics, installation, operation and maintenance of breaking devises, etc.
- Power and distribution transformer – technical workshop: operation and maintenance
- Technical workshop-life cycle management
- Protection of transformers

525,000 NGN

Notes
This certificate is valid for 3 years. The certification of gas insulated switchgear is only available in Germany, and air insulated switchgear only in Turkey.
Training objectives
This course conciliates a basic knowledge of power systems and systems engineering enabling participants to work out reliable and cost-effective solutions to problems that are encountered in industrial processes.

MV – Partial Discharges

Training objectives
In this theoretical - practical course, the participants will acquire the necessary knowledge for performing partial discharge test, as well as understanding basic concepts necessary for interpretation and analysis of the results obtained in the tests, tending to the development of a suitable diagnosis of equipment condition.

Notes
This course is arranged according to your switchgear devices and previous knowledge. Please contact us!

Design and Projection of Industrial Electrical Networks using the Software SIMARIS

Training objectives
On completion of the compact training, the participant will acquire a sounding overview of power engineering in theory & practise and the expertise required to plan, engineer and dimension power systems and networks. He will gather information on the structure of an industrial power network. He will understand the different equipments and systems present in typical industry network, their dimensioning and calibration / setting. Using the Simaris software, he will exercise examples of true life situation in regard of planning of networks and dimensioning of power equipment. Aside the technical aspects of the planning, he will understand the financial implications of its planning on the operation and the management of the power systems. The practical Session (using Simaris) will enable to familiarize with Siemens portfolio (product range and specification) as in regard of products and systems used for power distribution.

MV Assembly and Installation Training – Refresher

Training objectives
This training offers knowledge about the most up-to-date development of different switchgears:
- NXPLUS C (MV-RPLUSC)
- NXPLUS (MV-RPLUS)
- BDA / B10 (MV-R8DAB10)

MV – Switchgear – Maintenance

Training objectives
The participants receive a fundamental training course in our training centers or directly on-site, especially created for your circuit breaker installation.

Target audience
The training course is designed for maintenance technicians, technical department foremen and engineers.

Prerequisites
Technical fundamental knowledge in operation of switchgears.

Main features
- Switchgear:
  - Ratings, typicals, layout
  - Operator controls, drive mechanism, operating procedures
  - General visibility control of circuit breakers
  - Mechanical and electronical function control
  - Verification of circuit breakers and its driver
  - Control of all bolted connections and ist contact system
  - Lubrication according to operating instructions
  - Recognizing damaged drive components
- Substation:
  - Rotational maintenance work according to manufacturer information

Notes
This course is arranged according to your switchgear devices and previous knowledge. Please contact us!

Design and Projection of Industrial Electrical Networks using the Software SIMARIS

Training objectives
On completion of the compact training, the participant will acquire a sounding overview of power engineering in theory & practise and the expertise required to plan, engineer and dimension power systems and networks. He will gather information on the structure of an industrial power network. He will understand the different equipments and systems present in typical industry network, their dimensioning and calibration / setting. Using the Simaris software, he will exercise examples of true life situation in regard of planning of networks and dimensioning of power equipment. Aside the technical aspects of the planning, he will understand the financial implications of its planning on the operation and the management of the power systems. The practical Session (using Simaris) will enable to familiarize with Siemens portfolio (product range and specification) as in regard of products and systems used for power distribution.

MV – Cable Testing & Diagnostics

Booking code: MV-CABLE

Training objectives
In this theoretical - practical course, the participants will acquire the necessary knowledge for performing diagnostic cable tests, as well as understanding basic concepts necessary for interpretation and analysis of the results obtained in the tests and locating incipient faults.

Notes
This course is arranged according to your switchgear devices and previous knowledge. Please contact us!

Design and Projection of Industrial Electrical Networks using the Software SIMARIS

Training objectives
On completion of the compact training, the participant will acquire a sounding overview of power engineering in theory & practise and the expertise required to plan, engineer and dimension power systems and networks. He will gather information on the structure of an industrial power network. He will understand the different equipments and systems present in typical industry network, their dimensioning and calibration / setting. Using the Simaris software, he will exercise examples of true life situation in regard of planning of networks and dimensioning of power equipment. Aside the technical aspects of the planning, he will understand the financial implications of its planning on the operation and the management of the power systems. The practical Session (using Simaris) will enable to familiarize with Siemens portfolio (product range and specification) as in regard of products and systems used for power distribution.
Transformers

Distribution Transformers – Basics and Operation

Booking code: TR-DT

Training objectives
This course supplies a basic understanding of a transformer. Presentations, training exercises and experiments carefully illustrate the characteristic properties of transformers, examples on distribution transformers (DT).

Target audience
Employees who would like to be informed about general knowledge of functionality and operation of a transformer.

Prerequisites
Basic knowledge of electrical engineering. Fundamentals of AC and DC circuits. Basic knowledge of measurement for electrical variables.

Main features
1. General transformer overview
   - Transformers and reactors in transmission and distribution networks
   - Transformer standards
   - Transformer technology:
     - Electrical basic design, explained on a single phase transformer, measuring and calculation voltage ratio
     - Introduction to 3 phase transformers
     - Mechanical design of power transformers
2. Transformer components
   - Voltage regulation with tap changers
   - External connections
   - Introduction to cooling equipment
   - Overview control and protection devices
3. Transformer in service
   - Introduction to safety policies
   - Transport and checking after delivery
   - Overview of electrical measurements during commissioning
   - Maintenance:
     - Condition assessment and on-site diagnostics
     - Oil regeneration and drying

Power Transformers – Basics and Operation

Booking code: TR-PT

Training objectives
This course supplies a further understanding of a transformer. Presentations, training exercises and experiments carefully illustrate the characteristic properties of transformers, examples on power transformers (LPT, MPT).

Target audience
Employees who would like to be informed about further knowledge of functionality and operation of a transformer.

Prerequisites
Basic knowledge of electrical engineering. Fundamentals of AC and DC circuits. Extended knowledge to measuring electrical variables.

Main features
1. General transformer overview
   - Transformers and reactors in transmission and distribution networks – final exercises
   - Transformer technology
     - Advanced electrical design, measuring winding resistance and no load response
     - Autotransformers
     - Vector groups
     - Advanced electrical design, response under load condition
     - Short circuit characteristics
     - Efficiency and transformer loss
     - Measuring on different vector groups
2. Transformer components
   - Voltage regulation with tap changers – final questions
   - Cooling equipment, troubleshooting using circuit diagrams
3. Transformer in service
   - Working with control and protection devices
   - Inspection tasks
   - Advanced condition assessment and fault scenarios
   - Overload and emergency operation

Transformers Lifecycle Management

Booking code: TR-TLM

Training objectives
Participants are provided with an overview of diverse diagnostics possibilities, monitoring systems and measures for prolonging the life of power transformers. Aging phenomena are described on the basis of chemical and physical principles and possibilities of intervening in the processes are discussed. The areas of use of existing maintenance processes are assessed in connection with the results of diagnosis.

1,560,000 COP

Transformers Integral Maintenance

Booking code: TR-MAIN

Training objectives
The training conveys general and special knowledge required for the safe operation of power transformers, maintenance works and early fault detection.

1,560,000 COP

Distribution Transformers – Grounding and Protection

Booking code: TR-DGRDPRO

Training objectives
The primary objective of this class is to improve the participants understanding of the distribution system including primary and secondary systems, allowable connections, connections to be avoided, distribution system grounding types and overcurrent protection devices and applications.

2,399 USD

(Net prices)
General

SF₆ Gas Awareness
Booking code: SF6-AW

Training objectives
Participants will receive a basic level of SF₆ awareness as required for those personnel who have some involvement with SF₆ filled equipment, or operate in areas where SF₆ in containers or SF₆ filled equipment is present. The personnel are not directly involved in 'gas handling' or operation of the equipment.

GB 225 GBP
MX 24,840 MXN
NL 215 EUR

SF₆ Gas Competence
Booking code: SF6-COMP

Training objectives
Participants will receive the operational training which complies with EC 305/2008 and is accredited by "Energy & Utility Skills" the UK sector skills council. The training includes the full requirements of those involved in the installation, operation and maintenance of SF₆ gas filled high voltage switchgear.

GB 920 GBP
NL 1,250 EUR

Substation Condition Monitoring System Operation
Booking code: COND-NONIT

Training objectives
Participants will be trained in operation and application of Siemens substation monitoring systems.

GB 520 GBP

(Net prices)
Protection Technology – Principles

Booking code: PR-PRIN

Training objectives
The participants will learn about basics of possible applications, principles of operation and the overall concept of the most important protection devices.

Target audience
Employees of power supply utilities and the industrial sector who are familiar with the planning, commissioning and maintenance of power system protection equipment.

Prerequisites
Basic knowledge of electrical engineering.

Main features
- Protection principles
- Earth fault
- Current transformer dimensioning
- Overcurrent-time protection
- Distance protection
- Line and transformer differential protection
- Busbar protection
- Frequency protection
- Motor protection

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Protective Relaying – Fundamentals

Booking code: PR-FUNDA

Training objectives
This training provides participants with an understanding of the protective devices and systems commonly used in generation, transmission, subtransmission, and distribution systems.

Target audience
Recommended for engineers seeking an understanding of protection fundamentals, the course would also be a valuable resource for engineers just entering the system protection field.

Prerequisites
Fundamentals of power system engineering and the basic mathematical skills, such as trigonometry, complex numbers, matrix algebra, and applied calculus.

Main features
- Protection fundamentals and applications
- Protective relay operational characteristics
- Relay input sources (CTs and PTs)
- Generator protection
- Protection applications
- Transformer protection
- Bus protection
- Transmission line protection
- Over-current and distance relay
- Blinders on distance relay
- Out-of-step relay
- Loss of excitation relay
- Relay coordination and over-current relays
- Fault current and breaker duty
- Instantaneous setting procedure
- Distribution overcurrent protection
- Relays, fuses, reclosers, and sectionalizers
- Coordination of devices

System Protection – Workshop on a Real Time Digital Simulator RTDS

Booking code: RTDS-PS

Training objectives
The participants will learn about complex fault situations with a transient network analyzer, considering different network and protection systems.

Target audience
Experts for relay applications from utilities and industry.

Prerequisites
Expert knowledge of protection technology.

Main features
- Parameterization of 7SA
- Analysis of fault records and protocols
- Theoretical explanation of network and algorithms
- Automatic reclosure and synchronization
- Parameterization of 7SD
- Differential protection and communication
- Simulation of protection communication lines and GPS
- Stabilisation of differential protection
- Transformer differential protection
- Exchange of expert experience

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SIPROTEC 4 – Application and Exercises
Booking code: SIP4-SYS

Training objectives
The participants will become familiar with the concept and principle of operation of the digital network protection systems SIPROTEC 4.

Target audience
Power system protection experts who have been assigned to plan, commission and maintain digital protection systems.

Prerequisites
Basic knowledge of power system protection.
Course “Protection Technology – Principles (PR-PRIN)” or comparable knowledge.
Course “DIGSI 4 – Basics (DIGSI4-B)” or comparable knowledge.

Main features
- General properties of SIPROTEC 4
- Operation of protection relays with DIGSI 4
- Devices in practical operation:
  - Overcurrent protection 7SJ
  - Distance protection 7SA
  - Transformer differential protection 7UT
  - Differential protection 7SD
  - Busbar protection 7SS
  - SIPROTEC hardware
  - Hardware, jumpers, interfaces, electrostatic sensitive devices, firmware

SIPROTEC 4 – Protection Devices for Service Engineers
Booking code: SIP4-SERV

Training objectives
The participants will have a deeper understanding of the nature of numerical protection devices. They will understand the meaning of bountiful settings and how to analyze malfunctions and know remedies thereof.

Target audience
Engineers of power supply utilities and industry who deal with the planning, configuration, commissioning, maintenance and operation of numeric protection systems.

Prerequisites
Basic knowledge of protection technology.

Main features
- Principles and virtues of numerical protection devices
- Hardware of numerical protection and settings thereof
- Operating and analysis software DIGSI 4.87 by the scenario:
  - Planning department act 1 and 2
  - Commissioning department
  - Maintenance department
  - Multiple CFC exercises
- Numerical protection: The duty tests
- Exercises accordingly and more with:
  - O / C protection 7SJ6
  - Distance protection 7SA52 or 7SA61
  - Transformer differential protection 7UT612 or 7UT613
  - Cable and line differential protection 7SD52 or 7SD610
  - Busbar differential protection 7SS52 or 7SS60
- Quality assurance / repair forms

SIPROTEC 4 – Protection Devices for Expert Engineers
Booking code: SIP4-EXPER

Training objectives
The participants will have a deeper knowledge of the state-of-the-art protection of power transmission systems. They will know how to conceive complex protection schemes and be familiar with the special requirements for the protection of high and extra-high-voltage systems.

Target audience
Engineers of power supply utilities and industry who deal with the planning, configuration and settings of numeric protection systems.

Prerequisites
Basic knowledge of protection technology.

Main features
- The task of protection systems
- What methods of protection are in use?
- The nature of numerical protection
- CT requirements
- CT evaluating & dimensioning
- Data acquisition of transmission lines and cables
- Distance protection 7SA
- Transformer differential protection 7UT
- Line differential protection 7SD
- Motor protection
- Busbar differential protection 7SS

Price on request

(Net prices)
**SIPROTEC 4 – Protection Engineering Complete: 10 Days Certification Program**

**Booking code:** SIP4-CERTI

**Training objectives**
The participants will be familiarized with selection, commissioning, operation and maintenance of protection schemes and system protection equipment. They will get to know the softwares used to operate, to analyze faults and to the test the numerical relays.

**Target audience**
Supervisors, engineers, field personal, technicians and specialists involved in operation, planning, design, maintenance and servicing of switchgears, transformers and protecting equipments from electric utilities and the industrial sector.

**Prerequisites**
Basic knowledge of electrical engineering and first relevant exposure to power system protection.

**Main features**
- Principles of Numerical Protection Technology
- DIGSI 4 – Basics of Protection And Control Functions
- SIGRA 4 – Efficient interpretation of fault records of SIPROTEC-devices
- SIPROTEC 4 – Protection Devices for Service Engineers
- SIPROTEC 4 – Secondary Relay Testing with the OMICRON Test System

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**Generator / Dynamics and Protection – Workshop on a Real Time Digital Simulator RTDS**

**Booking code:** RTDS-GEN

**Training objectives**
The participants will learn about complex fault situations with a transient network analyzer, considering different network and protection systems.

**Target audience**
Experts for relay applications from utilities and industry.

**Prerequisite**
Expert knowledge of protection and generator technology.

**Main features**
- Theory of generators in steady state and transient conditions
- Simulation of generators
- Generator stability and power swing
- Generator protection device 7UM
- Setting calculation
- Analysis of fault records and protocols
- Exchange of expert experience

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**SIPROTEC 4 – Busbar Protection 7SS52**

**Booking code:** SIP4-7SS

**Training objectives**
The participants become familiar with the principles, the application, and functions of the distributed busbar protection 7SS52.

**Target audience**
Employees from utilities or industry involved in the planning, commissioning and maintenance of busbar protection systems.

**Prerequisites**
Good knowledge of busbar protection technology.

**Main features**
- Introduction to busbar protection 7SS52
- Function overview
- Hardware and function splitting
- Communication and configuration
- Security measures
- Protection algorithms
- Breaker failure protection
- Recommendations for settings
- Practical exercises with decentralized busbar protection 7SS52 and CMC256 + CMA156 of OMICRON
- High impedance – Low impedance – A comparison
SIPROTEC 4 – Distance Protection 7SA

Booking code: SIP4-7SA

Training objectives
The participants will deepen their knowledge of the use and functional test of the impedance protection devices 7SA5 / 7SA6.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of distance protection.

Main features
- Basics of numerical impedance protection
- Fault detection and distance measurement
- Zone settings
- Signal comparison protection
- Demands on current- and voltage transformers
- Distance protection on parallel lines
- Distance protection on tapped lines
- Teed feeder protection
- Parallel lines
- Power swing detection
- Application with serial compensation
- Operation and testing of a 7SA52 with secondary test-kit CMC of OMICRON
- Fault analysis with SIGRA

9CA4140-05E00-0DD2
2,400 EUR

9CA4140-05E00-0DA3
2,400 EUR

1,100 EUR

Price on request

15,000 INR

68,580 MXN

SIPROTEC 5 – Busbar Protection 7SS85

Booking code: SIP5-7SS85

Training objectives
The participants become familiar with the principles, the application, the operation and functions of the centralized busbar protection 7SS85.

Target audience
Employees from utilities or industry involved in the planning, commissioning and maintenance of busbar protection systems.

Prerequisites
Basic knowledge of busbar protection technology.

Main features
- Introduction to busbar production 7SS85
- Function overview
- Hardware and function splitting
- Communication and configuration
- Security measures
- Protection algorithms
- Recommendations for settings
- Practical exercises with centralized Busbar protection 7SS85 and CMC256 + CMA156 of OMICRON

9CA4140-05E00-0DC2
2,400 EUR

SIPROTEC 4 – Machine / Motor Protection 7UM & 7VE

Booking code: SIP4-7UMVE

Training objectives
The participants will learn about the principles of operation and functions of generator block protection and synchronization.

Target audience
Users from power supply utilities and industrial enterprises who deal with the testing, commissioning and maintenance of generator protection systems.

Prerequisites
Basic knowledge of generator protection technology.

Course "DIGSI 4 – Basics" or comparable knowledge.

Main features
- Generator block protection application example
- Explanation of protection functions and parameters
- Generator capability curve
- Synchronization
- WEB Monitor
- RTD box
- Presentation of the generator model
- Selection of protection functions
- Configuration and operation of SIPROTEC 4 7UM
- Configuration and operation of SIPROTEC 4 7UT
- Test of protection functions and synchronization with secondary test equipment
- Connection of protection devices to the generator model
- Operation of the synchronous generator
- Measurements and operational indications
- Tripping on faults by generating faults
- Analysis of fault records and fault indications

9CA4140-05E00-0DJ1
3,100 EUR

15,000 INR

35
SIPROTEC 4 – Application and Exercises of Generator / Motor Protection

Booking code: SIP4-GEN

Training objectives
The participants will gain knowledge of the mode of operation, applications and configuration of numerical unit and auxiliary protection systems.

Target audience
Employees from utilities and that sector of industry concerned with planning, maintenance and testing of machine protection equipment.

Prerequisites
Basic knowledge of protection and generator technology.
Course “DIGSI 4 – Basics (DIGSI4-B)” or comparable knowledge.

Main features
- Introduction to the principles of machine protection
- SIPROTEC 4 – machine protection
- Short-circuit protection
- Differential protection
- Recommendations on CT coordination
- Rotor earth fault protection
- Underexcitation protection
- Principles of stator earth fault protection
- Engineering of stator earth fault protection
- Configuration examples
- Practical exercises
- 7UM as motor protection
- Paralleling device 7VE

SIPROTEC 4 – Line Differential Protection 7SD

Booking code: SIP4-7SD

Training objectives
The participants will deepen their knowledge of the use and functional test of the line differential protection devices 7SD.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of line differential protection.

Main features
- Basics of numerical line differential protection
- Information on protection functions
- Demand on current transformer
- Multiple topologies
- Protection of transformer and line as a unit
- Numerical differential protection communication:
  - Basics, interfaces, network technology,
  - GPS synchronization
- Application of the WEB Monitor
- Operation and testing of a 7SD610 resp. 7SD523 topology with secondary test-kit CMC of OMICRON at hand of multiple tasks

1,560,000 COP
9CA4140-05E00-0DA4
2,400 EUR

1,100 EUR
Price on request

GB
en
2

15,000 INR
68,580 MXN

SIPROTEC 5 – Distance & Line Differential Protection 7SL

Booking code: SIP5-7SL

Training objectives
The participants will deepen their knowledge of the use and functional test of the line differential protection devices SIPROTEC 5 7SL.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of distance and line differential protection.

Main features
- Properties of SIPROTEC 5 7SL devices
- Requirements on current and voltage transformers
- Basics of numerical impedance protection
- Fault detection and distance measurement
- Zone settings
- Signal comparison protection
- Distance protection on parallel lines
- Distance protection on tapped lines
- Power swing detection
- Automatic reclosing
- Basics of numerical line differential protection
- Multiple topologies
- Protection of transformer and line as a unit
- Differential protection communication:
  - Basics, interfaces, network technology,
  - GPS synchronization
- Setting of device with DIGSI 5
- Operation and testing of a SIPROTEC 5 7SL relays with secondary test-kit CMC of OMICRON
- Double sided fault locator
- Commissioning and maintenance
- Fault analysis with SIGRA

9CA4140-05E00-0DK7
2,400 EUR

36
SIPROTEC 4 –
Overcurrent and Motor Protection 7SJ

Booking code: SIP4-7SJ

Training objectives
The participants will deepen their knowledge of the use and functional test of the definite-time / inverse-time overcurrent protection devices 7SJ.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of overcurrent protection.

Main features
■ Fault types and measuring value achievement
■ Definite-time / inverse-time characteristics
■ Pick up security and - dependability
■ Fault clearance- and grading times
■ The three stages of application of DMT / IDMT protection with their according application
■ Motor protection within the overcurrent protection
  – Thermal overload protection
  – Motor startup monitoring
  – Motor restart inhibit
■ Multiple functional checks with 7SJ6

Price on request

(Net prices)

SIPROTEC 5 –
Overcurrent and Motor Protection 7SJ & 7SK

Booking code: SIP5-7SJ

Training objectives
The participants will deepen their knowledge of the use and functional test of the SIPROTEC 5 7SJ85 and 7SK85 devices.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Basic knowledge of protection technology.
Course “DIGSI 5 – Basics” or comparable knowledge.

Main features
■ Fault types and measuring value achievement
■ Properties of SIPROTEC 5 7SJ and 7SK devices
■ Definite-time / inverse-time characteristics
■ Pick up security and dependability
■ Fault clearance and grading times
■ The three stages of application of DMT / IDMT protection with their according application
■ Motor protection
  – Thermal overload protection
  – Motor startup monitoring
  – Motor restart inhibit
■ Setting of device with DIGSI
■ Multiple functional checks with 7SJ85 and secondary test set CMC of OMICRON

Price on request

SIPROTEC 4 –
Transformer Differential Protection 7UT

Booking code: SIP4-7UT

Training objectives
The participants will deepen their knowledge of the use and functional test of the transformer differential protection devices 7UT6.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of transformer differential protection.

Main features
■ Basics of numerical transformer differential protection
■ Adaption of ratio, vector group and impact of tap-changer
■ Transformer tap adjustment
■ Stability during inrush and overexcitation
■ Demand on current transformers
■ Application examples (busbar protection, auto transformer, multi-winding transformer)
■ Earth-differential protection (REF) for faults near starpoint
■ Setting of device with DIGSI
■ Operation and testing of a 7UT61 with secondary test-kit CMC of OMICRON
■ Application of the WEB Monitor function
■ Fault analysis with SIGRA

Price on request

(Net prices)
Protection

SIPROTEC 5 – Transformer Differential Protection 7UT

Booking code: SIP5-7UT

Training objectives
The participants will deepen their knowledge of the use and functional test of the transformer differential protection devices SIPROTEC 5 7UT.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of transformer differential protection.

Main features
- Properties of SIPROTEC 5 7UT devices
- Basics of numerical transformer differential protection
- Adaptation of ratio, vector group and impact of tap-changer
- Stability during inrush and overexcitation
- Demand on current transformers
- Application examples (busbar protection, auto transformer, multi-winding transformer)
- Earth-differential protection (REF)
- Setting of device with DIGSI 5

Earth-differential protection (REF)

SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC

Booking code: SIP4-CMC

Training objectives
The participants will gain practical knowledge of essential device parameters and their secondary testing. The course focuses on hands-on creation of test documents for distance, cable and transformer differential protection in medium and high voltage grids.

Target audience
Engineers and technicians of power utilities and industries who deal with commissioning and periodic testing of protective devices.

Prerequisites
Basic knowledge of protection technology.

Main features
- Introduction to the OMICRON test system
- Creating test documents (OCC-files) for overcurrent, distance and differential protection:
  - Testing the starting functions
  - Testing tripping characteristic
  - Testing harmonic stabilisation (inrush and overexcitation)
  - Testing switch-onto-fault (SOTF)
  - Testing the automatic reclosure function
  - Earth fault detection in non-earthed systems
  - Practical application of the created test documents on SIPROTEC devices

Fault Record Analysis

Booking code: SIP4-FANA

Training objectives
The participants will be able to analyze fault records presented in the Comtrade format and to understand the protection’s behavior. The course includes the views and diagrams of SIGRA and the ways of fault record analysis. The participants will also analyze fault records and extensively discuss the results. The analysis emphasizes timings, variations of current and voltages, determination of impedances, fault location and the analysis for harmonics.

Price on request

System Protection Communication of Power Transmission and Distribution Networks

Booking code: PR-COM

Training objectives
The participants will become familiar with the basics of communication technology. There will be an overview of the various ways in which communication components and protocols can be used and are able to specify requirements for modern communications systems.

1,250 EUR
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Booking Code</th>
<th>Training Objectives</th>
<th>Price</th>
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<tbody>
<tr>
<td><strong>SIPROTEC 4 – Power System Protection – Basics</strong></td>
<td>SIP4-BASIC</td>
<td>The participants will become familiar with the fundamentals of power system protection and protection schemes.</td>
<td>1,100 EUR</td>
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<tr>
<td><strong>SIPROTEC 4 – MV Protection &amp; Control</strong></td>
<td>SIP4-MV</td>
<td>The participants will understand the principles of medium voltage protection and control and knows how to apply it in practice.</td>
<td>1,100 EUR</td>
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<tr>
<td><strong>SIPROTEC 4 – Power System Protection – Advanced</strong></td>
<td>SIP4-ADVAN</td>
<td>The participants will learn about the process of protection and control system engineering.</td>
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<tr>
<td><strong>SIPROTEC 4 – HV Protection &amp; Control</strong></td>
<td>SIP4-HV</td>
<td>The participants will understand the principles of high voltage protection and control and knows how to apply it in practice.</td>
<td>1,100 EUR</td>
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<tr>
<td><strong>SIPROTEC 4 – Protection &amp; Control System Engineering</strong></td>
<td>SIP4-ENGIN</td>
<td>The participants will learn about the process of protection and control system engineering.</td>
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<td><strong>SIPROTEC – Guided Exercises</strong></td>
<td>WS-GUIDE</td>
<td>The participants will gain knowledge of the mode of operation and basic functions of SIPROTEC protection devices. They will be able to operate the protective equipment.</td>
<td></td>
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<tr>
<td><strong>Current and Voltage Transformers – Intensive Course</strong></td>
<td>SIP-VTI</td>
<td>The participants will gain in-depth insight into the physical behavior of instrument transformers (current and voltage transformers). The course will focus on the dimensioning of instrument transformers and their practical application in power system protection. Aside from the instrument transformer dimensioning conforming to standards, the proper interaction of instrument transformer and protection or measuring device and future trends in instrument transformer technology will also be discussed.</td>
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<tr>
<td><strong>SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC – Basics</strong></td>
<td>SIP4-TESTB</td>
<td>The participants will gain practical knowledge of essential relay parameters and their secondary testing. The course focuses on hands-on creation of test documents for distance, cable and transformer differential protection in medium and high voltage grids.</td>
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<tr>
<td><strong>SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC – Advanced</strong></td>
<td>SIP4-TESTA</td>
<td>The participants will gain practical knowledge of essential relay parameters and their secondary testing. The course focuses on hands-on creation of test documents for distance, cable and transformer differential protection in medium and high voltage grids.</td>
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<tr>
<td><strong>Protection Systems – Accessory Equipment</strong></td>
<td>SIP4-ACCES</td>
<td>The participants will learn about the main additional devices of power system protection and their function and use.</td>
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<tr>
<td><strong>SIPROTEC 4 – Transformer Protection &amp; Control</strong></td>
<td>SIP4-TR</td>
<td>The participants will understand the principles of medium voltage protection and control and knows how to apply it in practice.</td>
<td>1,100 EUR</td>
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</table>

(Net prices)
Protection

SIGRA 4 – Efficient Interpretation of Fault Records
Booking code: SIP4-SIGRA

Training objectives
The participants will be able to apply SIGRA 4 efficiently, to analyze fault records presented in the comtrade format and to understand the protection’s behavior. The course includes the views and diagrams of SIGRA and the ways of fault record analysis. The participants will also analyze fault records and extensively discuss the results. The analysis emphasizes timings, variations of current and voltages, determination of impedances, fault location and the analysis for harmonics.

Transmission System Protection – Schemes and Settings
Booking code: PR-DSPS

Training objectives
The participants will learn about the most commonly used additional functions of power system protection and their use.

Transmission System Protection – Calculation Practice – Intensive
Booking code: PR-DPSP

Training objectives
The participants become insight in the protection practice in power grids, not only from the object protection but also from the system protection point of view (frequency and voltage protection). The requirements on complex power system protection will be discussed, and systems like Protection Security Assessment (SIGUARD® PSA) and Wide Area Protection will be shown. Furthermore, the course will focus on discussion on the practical examples and on knowledge exchange. Any further subjects brought by the participants are highly welcome and can be flexibly discussed, as well.

Transmission System Protection – Schemes and Settings
Booking code: PR-DSPS

Training objectives
The participants will get to know the DIGSI operating program. They will learn how to adjust, manage, operate and analyze faults of SIPROTEC devices using the DIGSI operating program. They will use DIGSI program to configure and perform their own functions and control tasks.

Transmission System Protection – Schemes and Settings
Booking code: PR-DSPS

Training objectives
The participants will get to know the DIGSI operating program. They will learn how to adjust, manage, operate and analyze faults of SIPROTEC devices using the DIGSI operating program. They will use DIGSI program to configure and perform their own functions and control tasks.

Generator / Motor Protection – Design and Settings
Booking code: PR-DSMP

Training objectives
The participants will be trained on detailed preparation of SIPROTEC setting values for electrical machines.

Protection Schemes for Power Generation and Industry – Design and Settings
Booking code: PR-DSIN

Training objectives
The participants will have an in-depth knowledge of protection of public distribution networks. They will know the special requirements for the protection of medium voltage distribution networks.
**DIGSI 4 – Advanced**

Booking code: DIGSI4-A

**Training objectives**
The participants will not only learn to implement the knowledge in course “DIGSI 4 – Basics” in a typical project application, but also learn about extended functionality of the CFC and the display editor. The participants will be able to create and test user-specific functions, and design a protection coordination concept. They will be familiar with several protection-principles and setting of SIPROTEC 4.

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<td>RU</td>
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**DIGSI 4 – IEC 61850 and GOOSE Configuration**

Booking code: DIGSI4-I

**Training objectives**
The participants will gain essential knowledge in substation communication based on ethernet and IEC 61850. Participants will be familiar with the concept and configuration of device communication via the IEC 61850 protocol on the basis of data exchange between the devices belonging to the bay or station level and connected on ethernet bus. The following topics will also be presented in the course: the basics of the ethernet communication profile, the application of diverse communication topologies and the basics of testing Ethernet compliant with IEC 61850. The participants will realize a GOOSE communication between Eberle-tapchanger and SIPROTEC 4.

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**DIGSI 4 – CFC**

Booking code: DIGSI4-C

**Training objectives**
The participants will discuss and work on the realization of their protection and control instrument automation requirements. They will get useful tips all around the subject of graphic configuring of automation tasks. Furthermore, they will become familiar with the CFC blocks in detail.

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**DIGSI 5 – Basics**

Booking code: DIGSI5-B

**Training objectives**
The participants will be familiar with the DIGSI 5 operating program and learn how to adjust, manage and operate the SIPROTEC 5 devices using the DIGSI 5 operating program. The participants will use DIGSI 5 program to configure and perform their own functions and control tasks.

**Target audience**
Users from electric utilities and the industrial sector who are working for design, for parameterization and for commissioning, as well as for maintenance and operation of SIPROTEC 5 devices.

**Prerequisites**
Basic knowledge of electrical engineering.

**Main features**
- Design of protection / control- and monitor-concept on the basis of high voltage switchgear 8DN8.
- Introduction of hardware- and function group-concept of SIPROTEC 5
- The modularity of HW, SW, protection function and control function
- Operating and working with SIPROTEC 5
- Create the scope of supply and order number with SIPROTEC 5 online-configurator
- Introduction: DIGSI 5 one tool for all working processes
  - Start with the design of Single Line Diagram for the switchgear project. Design the protection and control functions for a HV single busbar configuration for SIPROTEC 5 devices
  - Implementation of protection settings and allocation of binary inputs and outputs and analogue measurements inputs for SIP 5
  - Creating of display pages and user log lists. Creating of logic functions with CFC and test of the logics
  - Online-test for commissioning of the SIPROTEC 5 devices. Checking inputs / outputs and simulating of fault records
  - Operating phase of SIPROTEC 5: Get information and retrieve logs and fault records from the SIPROTEC 5 device
  - Control of switching devices, interlocked / not interlocked control, local / remote control
- Flexibility of protection functions of SIPROTEC 5:
  - Expansion of protection function points
  - Simple GOOSE communication between SIPROTEC 5 devices with IEC 61850 protocol
  - Practical exercises with helpful DIGSI 5 guide

**Notes**
Theory / Praxis: 30 / 70.
**Protection**

### DIGSI 5 – Systems

**Booking code:** DIGSIS-5

**Training objectives**
The participants will enhance their knowledge of SIPROTEC 5 / DIGSI 5 in the context of a typical HV application. The basic knowledge will be deepened by learning extended functionality of the CFC and the display editor and simulation of measurement test sequences for SIPROTEC 5 tests with DIGSI 5.

**Target audience**
Users from electric utilities and the industrial sector who are working for design, for parameterization and for commissioning, as well as for maintenance and operation of SIPROTEC 5 and SIPROTEC 4 devices.

**Prerequisites**
Basic knowledge of electrical engineering. Course “DIGSI 5 – Basics (DIGSI5-B)” or comparable knowledge.

**Main features**
- Design of protection / control- and monitor-concept on hand of expanded high voltage switchgear with SIPROTEC 5 and SIPROTEC 4 devices
- Learning extended functionality of the display editor and further CFC blocks
- Tracing of CFC logic with DIGSI 5
- Simple GOOSE communication between SIPROTEC 5 and SIPROTEC 4
- Expansion of SIPROTEC 5 project with SIPROTEC 4 devices
- Simple GOOSE communication between SIPROTEC 4 and SIPROTEC 5
- Automatic setting group changing with using of SIPROTEC 4 and SIPROTEC 5 GOOSE communication
- Communication of SIPROTEC 4 and SIPROTEC 5 to SICAM PAS System via IEC 61850 protocol
- Simulation of analogue and binary process parameter with DIGSI 5 test suite
- Using the DIGSI 5 online expert mode
- Practical exercises with helpful DIGSI 5 guide

**Notes**
Theory / Praxis: 30 / 70.

### DIGSI 5 – IEC 61850 and GOOSE Configuration

**Booking code:** DIGSIS-I

**Training objectives**
The participants will gain essential knowledge in substation communication based on ethernet and IEC 61850. The participants will be familiar with the concept and configuration of device communication via IEC 61850 protocol on the basis of data exchange between the devices belonging to the bay or station level and connected on ethernet bus. The basics of the ethernet communication profile and the application of diverse communication topologies will be presented. The basics of testing ethernet compliant with IEC 61850 will be presented. The participants will realize a GOOSE communication between SIPROTEC 5 devices as well as between SIPROTEC 5 and SIPROTEC 4 devices.

**Target audience**
Professional users of power supply utilities and industry who deal with the planning, configuration, commissioning, maintenance and operation of SIPROTEC 5 and SIPROTEC 4 as well as to Station Automation Systems with IEC 61850-Communication Systems.

**Prerequisites**
Basic knowledge of electrical engineering. Course “DIGSI 5 – Basics (DIGSI5-B)” or comparable knowledge.

**Main features**
- Basics of communication networks and systems in substations with ethernet and IEC 61850 (TCP / IP; OSI / IEC 61850 model)
- Overview of IEC 61850 edition 2
- Structure of the substation communication bus IEC 61850 profile
- Structure of ethernet communication networks (topology, architecture, components, addressing)
- Implementation of IEC 61850 with DIGSI 5
- Simple example of GOOSE communication with SIPROTEC 5
- Configuring of reverse interlocking for protection with GOOSE communication
- Station interlocking with ethernet-substations-bus
- Transfer of displays to neighbour-feeder between SIPROTEC 5 devices with GOOSE
- GOOSE communication between SIPROTEC 4 and SIPROTEC 5
- Communication of SIPROTEC 4 and SIPROTEC 5 to SICAM PAS System via IEC 61850 protocol
- Commissioning, testing und diagnostic of IEC 61850 communication networks
- Practical exercises with helpful DIGSI 5 guide

### DIGSI 5 – CFC

**Booking code:** DIGSIS-C

**Training objectives**
The participants will enhance their knowledge of SIPROTEC 5 / DIGSI 5 in the context of their application. The participants will work on and discuss the realization of their protection and control instrumentation automation requirements. They will get useful tips all around the subject of graphic configuring of automation tasks. Furthermore, they will become familiar with the CFC blocks in detail. The CFC logics will be tested with DIGSI 5 and with the corresponding SIPROTEC 5 devices.

**Notes**
Theory / Praxis: 30 / 70.

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(Net prices)
Protection of Oil and Gas Power Networks – Part 1

Booking code: PR-OG1

Training objectives
Characteristics of a typical oil and gas network and topics of load flow, short circuit, motor start, voltage and frequency stability, protection settings coordination, and typical setting report will be discussed. Based on a real-life example, industrial network design topics like network structure, reliability of supply, protection concept, contingency analysis, and load shedding analysis are presented in order to provide a proper response to minimize consequences of faults. Calculation tools are used to simulate short circuits, motor starts, motor reacceleration etc.

Target audience
This course is directed at plant protection engineers, who would like to increase their analytical and practical skills for system protection.

Prerequisites
University degree in protection engineering.

Main features
- Power supply reliability
- Network structures
- Load flow and contingencies analysis
- Short circuit analysis for phase and earth faults
- Current transformer dimensioning
- Over current-time protection
- Distance protection
- Differential protection
- Frequency protection
- Motor protection
- Transformer protection
- Cable and overhead line protection
- IEC 61850 / GOOSE theory basics such as data model and services

9CA4140-0SE00-0DB7
3,850 EUR
225,000 NGN

Protection of Oil and Gas Power Networks – Part 2

Booking code: PR-OG2

Training objectives
In the second part of the course practical exercises with Siemens’ over current and differential protection relays for line, transformer and motor equipment within the real-life industrial network example are executed. The trainees are taught to interpret and analyze an incident by using available fault records.

Target audience
This course is directed at plant protection engineers, who would like to increase their analytical and practical skills for system protection.

Prerequisites
University degree in protection engineering. Course “Protection of Oil and Gas Power Networks – Part 1 (PR-OG1)”.

Main features
- DIGSI 4 operating and evaluation software:
  - How to set up a project structure in Project Manager
  - How to get and set a device parameters in Device Manager
  - How to go online and work online
  - How to change settings – with DIGSI and device front port
  - How to feed back setting changes to the planning department
  - How to do maintenance with DIGSI
- Overcurrent protection device 7SJ device:
  - Ordering information and accessories
  - Scope of functions
  - Overall operation hardware and connections
  - Doing sample settings and settings discussion
  - Information configuration matrix for input / output / internal signals
  - Measurement supervision, fault interpretation by using SIGRA
  - Hands-on training with 7SJ devices, DIGSI, SIGRA and test equipment with using secondary test equipment (e.g. OMICRON) to produce faults such as internal and external faults and analyze them
  - Establish and use the "WEB Monitor" function
- Final discussion:
  - Typical report and settings
  - How to set protection devices in accordance to the typical setting report, as taught in the first week of course

9CA4140-0SE00-0DB8
3,700 EUR
225,000 NGN
**Substation Automation**

### SICAM PAS – Basics

**Booking code:** PAS-B

**Training objectives**
The participants will learn how to use SICAM PAS V8 system and its basic knowledge. They will learn about the operation and will find out how to use this in the system management.

**Target audience**
Customers from power utilities and industry responsible for operating a SICAM PAS system.

**Prerequisites**
Fundamentals of telecontrol and automation.

**Main features**
- Introduction to SICAM PAS total system
- System functions
- Intro to PQS functions
- System components
- Licensing
- SICAM PAS UI – User Interface
- PAS Runtime System Control with UI Operation
- Test and diagnostic tool SICAM Value Viewer
- Basics of telecommunication
- Interface test program
- Siemens serial hub
- Local HMI system SICAM SCC
- IEC 61850 – Communication Standard for Switchgears
- SICAM Station Unit
- PAS Redundancy concept
- Configuration Examples
- Basics of IT-Security

### SICAM PAS – Parameterization

**Booking code:** PAS-P

**Training objectives**
The participants will be able to independently set up a SICAM PAS V8 configuration.

**Target audience**
Customers from power utilities and industry who wish to do user specific parameterization or changing of parameterization.

**Prerequisites**
Course “SICAM PAS – Basics (PAS-B)”.

**Main features**
- Summary of basics of SICAM PAS
- Setting up SICAM PAS software
- Starting parameterization
- Tele-communication with IEC 101/104
- Interface to local operator station SICAM SCC
- Communication with bay units by IEC 103
- CFC logic programming
- Communication with IEC 61850
- SNMP monitoring
- Redundancy
- Practical Exercises

### SICAM SCC – Configuring an Operator Station

**Booking code:** PAS-S

**Training objectives**
The participants will be able to configure a graphical operator station with PAS CC V8.

**Target audience**
Customers from power utilities and industry who wish to be able to design or modify the graphical user interface.

**Prerequisites**
Basic knowledge of SICAM PAS.

**Main features**
- System overview of SICAM SCC
- Installing SICAM SCC software
- PAS Interface to SCC
- Devising a project
- Graphics Designer
- Compatibility Key
- Switching Authority
- User Administrator
- Bay and Telecontrol Blocking
- Message lists
- Practical exercises

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**Costs**

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(Net prices)
### SICAM PAS – Complete

**Booking code:** PAS-COM

**Training objectives**
The participants will gain a basic knowledge of the entire SICAM PAS system. They will be able to independently set up a SICAM PAS configuration and to configure a graphical operator station with SICAM SCC.

**Target audience**
Customers from power utilities and industry responsible for operating a SICAM PAS system, who wish to do user specific parameterization and to be able to modify the graphical user interface.

**Prerequisites**
Fundamentals of telecontrol and automation.

**Main features**
- This course combines following 3 single training courses:
  - SICAM PAS – Basics
  - SICAM PAS – Parameterization
  - SICAM SCC – Configuring an Operator Station

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### SICAM PAS – Automation with CFC, ST and SFC

**Booking code:** PAS-C

**Training objectives**
The participants will be familiar with the most important CFC blocks and how to use them. Furthermore, they learn about the advantages of the programming language ST (Structured Text), which was especially developed for automation systems. Both of these tools will be used to parameterize and program examples for various applications.

**Target audience**
Customers who are in charge of parameterization and programming of logic functions in a SICAM PAS system.

**Prerequisites**
Course “SICAM PAS – Parameterization (PAS-P)”.

**Main features**
- Introduction to PAS automation
- Frequently used CFC blocks
- Application of CFC in various examples
- Basics of programming language ST
- Primary use of ST and CFC
- Writing programs / functions / function blocks with ST
- Combinations of CFC and ST
- SFC – sequential function chart for switching sequences

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### SICAM PAS – System Diagnosis and Trouble Shooting

**Booking code:** PAS-SYS

**Training objectives**
The course provides systematical diagnosis and fault analysis in the entire substation automation. It imparts profound detailed information out of different components.

**Target audience**
Users in parameterization and commissioning of SICAM PAS.

**Prerequisites**
Knowledge in substation automation, remote control, network and communication.

**Main features**
- IEC 101/104 Protocol description, Test-Tools
- Protocol analysis with "ethereal" / wireshark
- Systematical approach to identify communication problems
- RuggedCom settings, IP, SMNP, configuration concepts
- Diagnosis
- Siemens Scalance Components / Redundancy Protocols
- Remote access for diagnosis
- Customer Support Center
- Voltage regulators A-eberle
- IEC 61850
  - Interoperability
  - Diagnosis Tools
  - IEC Browser
  - Netview
  - Networkview
  - GOOSE-Inspector
- Fault analysis for serial protocols
- SICAM PAS
  - General Information
  - DSIITest
  - CfeTestAndDiagnosisUI
  - Redundancy
  - Time Synchronisation
  - Power Quality
  - Soft PLC
  - SICAM PAS Station Unit
- WinCC
  - Diagnostic Tools
  - Scripting
  - Archiving

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Substation Automation

**SICAM RTUs – Basics**

Booking code: RTU-BASIC

**Training objectives**

The participants will develop an understanding for the productivity of the scalable automation unit SICAM RTUs; gain an overview of the construction of SICAM RTUs; understand the most important functions; and know the basic working of SICAM RTUs.

**Target audience**

Employees from sales and engineering departments.

**Prerequisites**

Knowledge of the most important terms in telecontrol technology as trained in the course “Telecontrol and Automation – Fundamentals (SAS-TELE)”.

**Main features**

- Product families at a glance
- The scalable automation concept SICAM RTUs
- The features of the different automation units:
  - SICAM AK automation module
  - SICAM TM automation module
  - SICAM BC automation module
  - SICAM EMIC automation module
  - SICAM CMIC automation module
- The mode of operation of SICAM RTUs – from data acquisition to data output
- Diagnosis and test

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**SICAM RTUs – Service**

Booking code: RTU-SERVIC

**Training objectives**

The participants gain the knowledge required to carry out the maintenance of the scalable automation components SICAM AK, SICAM TM, SICAM EMIC and SICAM CMIC with the supplied systemrelated tools. The procedures for changes / extensions are not given here.

**Target audience**

Service technicians involved in the maintenance of SICAM RTUs systems. Technicians involved in the engineering of SICAM RTUs automation systems.

**Prerequisites**

Course “SICAM RTUs – Basics (RTU-BASICS)”.

**Main features**

- System architecture and hardware overview
- SICAM TOOLBOX II – handling in principle
- Diagnosis options
- How to change system elements
- Connection system, mechanical system
- Remote maintenance
- Practical exercises with SICAM TOOLBOX II and SICAM AK, SICAM TM, SICAM BC, SICAM EMIC

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**SICAM RTUs – Engineering**

Booking code: RTU-ENG

**Training objectives**

The participants will be able to set up a SICAM RTUs automation system based on pre configured templates; create process signals in the engineering tool OPM II; and use process signals in a function block diagram. They will also learn how to apply and test communication connections to other SICAM RTUs devices and / or SCADA systems; and configure the data flow routing from data acquisition to data output within the system SICAM RTUs.

**Target audience**

Technicians, who want to realize complete solutions with the automation system SICAM RTUs.

**Prerequisites**

Course “SICAM RTUs – Basics (RTU-BASICS)”. Course “SICAM RTUs – Service (RTU-SERVIC)”.

**Main features**

- Overview of functions within SICAM RTUs
- Compile an addressing concept in accordance with IEC 60870-5
- Automatic data flow routing
- Parametrization of the communication
  - Test and simulation practicabilities with the SICAM TOOLBOX II
  - Extension and adjustment of the configuration with OPM II and CAEx plus
  - Practical exercises with the SICAM TOOLBOX II and a SICAM AK, SICAM TM, SICAM BC or SICAM EMIC
  - Parameter administration with the SICAM TOOLBOX II: Import / export / Backup

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SICAM RTUs – CAEx plus

Booking code: RTU-CAEX

Training objectives
The participants will master the operation and creation of a steering task in destination system SICAM RTUs with use of CAEx plus. They will learn the IEC 61131 conform programming language emphasising FBD (Functional-Block-Diagram) and its use.

Target audience
Automation technicians for SICAM RTUs automation systems.

Prerequisites
Basic knowledge of digital circuit technology.
Basic knowledge of SICAM RTUs automation system.
OPM II basic knowledge – see course “SICAM TOOLBOX II – Basics (TOOLBOX)”.

Main features
- Overview of norm IEC 61131
- Creation of data module for CAEx plus with OPM II
- Handling of Functional-Block-Diagram
- Creation and structuring of a steering task
- Loading into destination system SICAM RTUs
- Use of tests (OFFLINE, ONLINE oscilloscope)
- Creation of a documentation with CAEx plus

SICAM RTUs – Complete

Booking code: RTU-1703

Training objectives
The participants will be able to configure a complete station by using the automation system SICAM RTUs including a control task (CAEx plus) within 10 days. They will gain consolidated knowledge with theoretical foundations.

Target audience
Technicians who want to create complete solutions with the automation system SICAM RTUs.

Prerequisites
Knowledge of the most important terms of telecontrol technology as trained in the course “Telecontrol and Automation – Fundamentals (SAS-TELE)”.

Main features
- 4 modules grant the optimal combination of theory and practice:
  - SICAM RTUs – Basics (1 day)
  - SICAM RTUs – Service (1 day)
  - SICAM RTUs – Engineering (5 days)
  - SICAM RTUs – CAExplus (2,5 days)
- The specification of the individual modules you’ll find on the next pages

SICAM RTUs – Power Week

Booking code: RTU-WEEK

Training objectives
The participants gain basic knowledge of the scalable automation system SICAM RTUs and the configuration tool OPM II. They will be able to independently carry out simple configuration changes as well as plant diagnosis.

Target audience
This course focuses on practical exercises and has specifically been designed for technicians who quickly need to become familiar with the SICAM RTUs world.

Prerequisites
Knowledge of the most important terms of telecontrol technology as trained in the course “Telecontrol and Automation – Fundamentals (SAS-TELE)”.
Experiences in telecontrol and automation systems.

Main features
- Overview of SICAM RTUs product line
- Basic concepts
- SICAM Toolbox II and OPM basic facts
- Testing, simulation and error analysis
- Data routing
- Process communication to other units of the SICAM RTUs product line

(Net prices)
SICAM RTUs Workshop – Configuration IEC 60870-5-103 Interface

Booking code: RTU-IEC103

Training objectives
The participants will acquire the skills necessary to configure an IEC 60870-5-103 interface in the SICAM RTUs system. In the course, both master and slave are first configured and then tested with the training unit.

Target audience
Engineers who work with SICAM RTUs as a substation automation system.

Prerequisites
Knowledge of SICAM RTUs.

Main features
- IEC 60870-5-103: overview of standards and reference to practical application
- Configuration with OPM II
- Commissioning and testing with SICAM TOOLBOX II
- Analysis with the protocol test system

SICAM CMIC – Smart Grid Solutions

Booking code: RTU-CMIC

Training objectives
A possible smart grid application in a medium voltage substation will be the example for becoming familiar with the handling and parameterization of SICAM CMIC.

Target audience
Engineers who work with SICAM RTUs and use it as a substation automation system.

Prerequisites
Knowledge of SICAM RTUs and practical experience.

Main features
- The new hardware
- Parameterization
- Application fields

SICAM EMIC – WebParameterization

Booking code: RTU-EMIC

Training objectives
The participants will learn about the concepts, performance characteristics and possible applications (e.g.: Speed monitor) of the systems SICAM MIC and SICAM EMIC. They will be able to parametrize and make diagnosis on both systems over a Webbrowser.

Target audience
Technicians, who use SICAM EMIC systems in their plants, and would like to parametrize the system with a browser.

Prerequisites
Course “SICAM RTUs – Basics (RTU-BASIC)".

Main features
- Overview of the required hardware
- Initial operation
- Interface configuration
- Hardware data point configuration
- Documentation

SICAM RTUs Workshop – Configuration IEC 61850 Interface

Booking code: RTU-IEC61

Training objectives
The participants gain the skills necessary to configure an IEC 61850 interface in the system SICAM RTUs. In the course, both client and server, are first configured and then tested with a training unit. The course illustrates how a SIPROTEC protection device can be coupled with an SICAM RTUs unit and how the data model is embedded in OPM II via SCL-File.

Target audience
Engineers who work with SICAM RTUs and use it as a substation automation system.

Prerequisites
Knowledge of SICAM RTUs and practical experience.

Main features
- Configuration of an IEC 61850 interface in SICAM RTUs
- Connection to a SIPROTEC device (import of Datamodel via SCL-File)
- Commissioning and testing with SICAM TOOLBOX II

SICAM CMIC – Smart Grid Solutions

Booking code: RTU-CMIC

Training objectives
A possible smart grid application in a medium voltage substation will be the example for becoming familiar with the handling and parameterization of SICAM CMIC.

Target audience
Engineers who work with SICAM RTUs and use it as a substation automation system.

Prerequisites
Knowledge of SICAM RTUs and practical experience.

Main features
- The new hardware
- Parameterization
- Application fields

SICAM EMIC – WebParameterization

Booking code: RTU-EMIC

Training objectives
The participants will learn about the concepts, performance characteristics and possible applications (e.g.: Speed monitor) of the systems SICAM MIC and SICAM EMIC. They will be able to parametrize and make diagnosis on both systems over a Webbrowser.

Target audience
Technicians, who use SICAM EMIC systems in their plants, and would like to parametrize the system with a browser.

Prerequisites
Course “SICAM RTUs – Basics (RTU-BASIC)".

Main features
- Overview of the required hardware
- Initial operation
- Interface configuration
- Hardware data point configuration
- Documentation

SICAM RTUs Workshop – Configuration IEC 61850 Interface

Booking code: RTU-IEC61

Training objectives
The participants gain the skills necessary to configure an IEC 61850 interface in the system SICAM RTUs. In the course, both client and server, are first configured and then tested with a training unit. The course illustrates how a SIPROTEC protection device can be coupled with an SICAM RTUs unit and how the data model is embedded in OPM II via SCL-File.

Target audience
Engineers who work with SICAM RTUs and use it as a substation automation system.

Prerequisites
Knowledge of SICAM RTUs and practical experience.

Main features
- Configuration of an IEC 61850 interface in SICAM RTUs
- Connection to a SIPROTEC device (import of Datamodel via SCL-File)
- Commissioning and testing with SICAM TOOLBOX II

SICAM CMIC – Smart Grid Solutions

Booking code: RTU-CMIC

Training objectives
A possible smart grid application in a medium voltage substation will be the example for becoming familiar with the handling and parameterization of SICAM CMIC.

Target audience
Engineers who work with SICAM RTUs and use it as a substation automation system.

Prerequisites
Knowledge of SICAM RTUs and practical experience.

Main features
- The new hardware
- Parameterization
- Application fields

SICAM EMIC – WebParameterization

Booking code: RTU-EMIC

Training objectives
The participants will learn about the concepts, performance characteristics and possible applications (e.g.: Speed monitor) of the systems SICAM MIC and SICAM EMIC. They will be able to parametrize and make diagnosis on both systems over a Webbrowser.

Target audience
Technicians, who use SICAM EMIC systems in their plants, and would like to parametrize the system with a browser.

Prerequisites
Course “SICAM RTUs – Basics (RTU-BASIC)".

Main features
- Overview of the required hardware
- Initial operation
- Interface configuration
- Hardware data point configuration
- Documentation

Substation Automation Equipment: 10 days Certification Program for Installation & Commissioning

Booking code: RTU-CERTIF

Training objectives
The participants will be familiarized with Installation and commissioning of substation automation system and equipments. Especially the eRTU system and power link equipments.

Target audience
Supervisors, Engineers, field personal, technicians and Specialists involved in planning, design, installation, commissioning and servicing of substation automation systems (especially eRTU and power link) from electric utilities and the industrial sector.

Prerequisites
Fundamental of telecontrol and automation.

Main features
- SICAM eRTU and SICAM diamond, systems
- Introduction, parameterization, configuration, Project creation, Display construction, Graphical topology, communication, Installation and commissioning
- Network communication solution
- Power link equipments
**SICAM 230 – Configuration (latest version)**

**Booking code:** 230-CONF

**Training objectives**
The participants will be able to work with the Designer (Editor) of the latest SICAM 230 version. They will carry out SICAM 230 project changes and expansions themselves. A new SICAM 230 project will be started during the course, and therefore the major features of SICAM 230 will be explained. The new functional project will be realised, and the interface to SICAM RTUs will be explained. This project may serve as the basis for the participants' respective projects.

**Target audience**
Engineers who want to parametrize the SCADA system SICAM 230.

**Prerequisites**
Course “SICAM TOOLBOX II – Basics (TOOLBOX)".

**Main features**
- Overview of SICAM 230
- The new Designer (Editor)
- Project creation
- Data point parameterisation
- Display construction
- Alarm function
- Practical exercises
- Use of user documentation
- Graphical Topology
- Communication Interface via IEC 60870-5-101/104 and IEC 61850

**SICAM 230 Workshop – Topology**

**Booking code:** 230-TOP  **NEW**

**Training objectives**
With a lot of practical exercises you will learn about the Topology function in SICAM 230.

**Target audience**
Engineers, who want to use Topology in SICAM 230.

**Prerequisites**
Course “SICAM 230 – Configuration (latest version)".

**Main features**
- Topology parameterization – best practice
- Debugging
- Topology function: Power flow calculation
- Topology function: Earth fault detection
- Topology function: Fault detection
- Topology function: Check Connection
- Practical Exercises

**SICAM 230 Workshop – Network Monitoring with SICAM 230 NWM**

**Booking code:** 230-MONIT

**Training objectives**
In the course the participant learns the practical application of the network manager. First part of the course gives an overview of the necessity, requirements and performance characteristics of integrated network management in automation. Second part of the course is about practical knowledge of configuring a network management system.

**SICAM RTUs Workshop – Configuration & Commissioning SICAM 1703 Systems**

**Booking code:** RTU-W51703  **NEW**

**Training objectives**
The participants will be familiarized with configuration, installation and commissioning of SICAM 1703 substation automation systems and equipments.

**SICAM RTUs Workshop – Configuration of SICAM BC**

**Booking code:** RTU-BC1703

**Training objectives**
At SICAM BC protection and control are autonomous. The system uses a display. The course emphasises the parameterisation of this display. The configuration of the control CPU is shown in the course “SICAM RTUs – Engineering”. The participants will master the parameterisation of pictures for the local display on the SICAM BC.

(Net prices)
SIPROTEC 4 – Engineering of Bay Controllers 6MD66 with IEC 61850 – GOOSE Communication

Booking code: SIP4-6MD66

Training objectives
The participants will learn how to adjust, manage and operate 6MD66 devices using the DIGSI 4 operating program. The user will parameterize and test the exchange of information between bay controllers among each other and to foreign-devices with IEC 61850 GOOSE communication.

SIPROTEC 4 – Engineering of Bay Controllers 6MD66 with IEC 61850 – GOOSE Communication

Booking code: SIP4-6MD66

Training objectives
The participants will learn how to adjust, manage and operate 6MD66 devices using the DIGSI 4 operating program. The user will parameterize and test the exchange of information between bay controllers among each other and to foreign-devices with IEC 61850 GOOSE communication.

IEC 61850 – The Standard for Substation Automation

Booking code: SIT-IEC

Training objectives
The participants will learn the concept of the multivendor object model of the norm IEC 61850. They will understand how the communication between substation automation units (bay control units, protective devices, switches, transformers etc.) works.

Target audience
Engineers which are working with substaion automation systems.

Prerequisites
Basic knowledge of digital communication technology.

Main features
- General parts:
  - Part 1: Introduction and Overview
  - Part 2: Glossary
  - Part 3: General requirements
  - Part 4: System and project management
  - Part 5: Communication requirements for functions and device models
- Engineering part:
  - Part 6: Substation automation configuration description language
- Modelling parts
  - Part 7-1: Principles and models
  - Part 7-2: Abstract communication service interface ACSI
  - Part 7-3: Common data classes
  - Part 7-4: Compatible logical node classes and data classes
- Specific communication service mapping SCSM for the communication between substation automation units:
  - Part 8-1: Projection onto MMS (ISO / IEC 9506 parts 1 and 2 via ISO 8802-3)
- Specific communication service mapping SCSM for connecting primary technology:
  - Part 9-1: serial unidirectional multidrop point to point link
  - Part 9-2: for process bus
- Test-related part:
  - Part 10: conformity tests

Substation Automation – Introduction

Booking code: SIT-SSAUT

Training objectives
The participants will get to know solutions for automation and supervision of electrical substations, including basic concepts of networks, topologies, devices and communication protocols.

Target audience
Users from electric utilities and the industrial sector.

Prerequisites
Basic knowledge of protection and control.

Main features
- Network procedures
- Substation automation devices: software, switcher, router, modem, relay, RTU and fault recorder
- Network topology: point-to-point, bus, ring and star
- Redundancies – Protocol RSTP
- Dimensioning concepts
- Sequence of events and alarms
- Timing: GPS, IRIG-B, NTP and PTP
- Communication protocols: IEC 61850, DNP 3.0, Modbus, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104
- Local Control and control center systems
- Smart Grids

Telecontrol and Automation – Fundamentals

Booking code: SAS-TELE

Training objectives
The participants will be familiar with the terms and problem definitions of the automatic control engineering. They will also gain the basic knowledge to further attend the product-related training courses. Basic knowledge of IT-Security will be given.
IT Networks – Basics
Booking code: SIT-NETW1
Training objectives
The participants become familiar with state-of-the-art LAN network types and media, they will deal with protocol structures (TCP / IP), learn to understand terms like Ethernet, switching, IP-routing and IP-addressing. Moreover, the participants gain a basic understanding of network design. Such knowledge enables them to design simple networks and offers a sound basis for understanding more complex networks.

Numerical Communication in Substations – Basics & Trends
Booking code: SIT-NUMER
Training objectives
The participants receive a startup into communication inside substations based on serial data transfer, PROFIBUS and Ethernet. The basics of communication technology are being taught, current and future norms, as well as trends will be introduced.

Communication Networks – Application in Power Transmission & Distribution
Booking code: SIT-COMPT
Training objectives
The participants will receive basic knowledge of communication networks (LAN / WAN) and the application in power systems of transmission and distribution grids.
Power Quality –
SICAM PQS and
SICAM PQ Analyzer

Training objectives
The participants will acquire extensive insight of Disturbance evaluation and Power Quality monitoring with SICAM PQS and SICAM PQ Analyzer. They will learn handling and operating of the related tools and devices on the basis of typical application examples. After the course the participants will be able to configure such systems including disturbance recorders and power quality devices and how to get that information you need for your daily operation.

Target audience
Service / maintenance, operation, commissioning, engineering.

Prerequisites
Basics of electrical engineering, Basics of Power Quality, PC know-how.

Main features
■■ Introduction Power Quality (PQ) Monitoring and Disturbance Recording
■■ Current field solution for Disturbance-, Power Quality Monitoring and Substation Automation
■■ Introduction Substation automation system SICAM PAS in order to operate SICAM PQS
■■ Introduction of disturbance recorder SIMEAS R-PQ / PMU
■■ Introduction of Power quality recorder SICAM Q80
■■ Overview SICAM PQS (Power Quality System): device hardware and architecture, software licenses, scope of functions, communication, commissioning and complete parameterization, time synchronization
■■ User Interface Configuration: Configuration, Mapping, Topology, Templates, Reports, Grid Codes
■■ User Interface Operation: Overview of system components and their operating state
■■ Overview PQ Analyzer
■■ Applications of PQ Analyzer
■■ Practical exercises

Notes
Theory / Praxis: 60 / 40.

SICAM Q80 –
Application and Practice

Training objectives
The participants will acquire knowledge of the power quality recorder SICAM Q80 and Q80 Manager for parameterization and evaluation. They will learn about the system parameterization, evaluation, and reporting systems.

Target audience
Service / maintenance, operation, commissioning, engineering.

Prerequisites
Basics of electrical engineering.

Main features
■■ Introduction
■■ Power Quality Definitions
■■ Functional Overview of Hardware and Software
■■ SICAM Q80 Parameterization
■■ SICAM Q80 Manager Parameterization, Evaluation and Reporting Concepts
■■ Communication & Time Synchronization Concept
■■ Practice in typical workflows in parameterization, evaluation and reporting

Notes
Theory / Praxis: 60 / 40.

SIPROTEC 7KE85 –
Fault Recorder

Training objectives
The participants will acquire extensive basic knowledge of the digital fault recorder SIPROTEC 7KE85 in combination with DIGSI 5, SIGRA and SICAM PQS / SICAM PQ Analyzer for parameterization and evaluation. They will learn the issues of system indications and power system quality and will know the corresponding recording systems. Furthermore, they will learn to evaluate and interpret the indicated data on the basis of typical application examples.

Target audience
Service / maintenance, operation, commissioning, engineering.

Prerequisites
Basics of electrical engineering.

Main features
■■ Introduction
■■ Communication and Time Synchronization Concept
■■ Functional Overview
■■ Parameterization and evaluation with DIGSI 5
■■ 7KE85 in combination with the Power Quality System SICAM PQS / SICAM PQ Analyzer
■■ Practice in typical workflows in parameterization and evaluation of the 7KE85

Notes
Theory / Praxis: 60 / 40.
Power Transmission & Distribution – Technology at a Glance

Booking code: GEN-TD

Training objectives
The participants will learn about principals of electrical engineering and will get an overview about use and applications engineering of products and solutions in the field of power transmission and distribution.

Target audience
Employees in the divisions Transmission and Distribution, or who are interested in deepening the knowledge in the operation and application of products and solutions in the energy transmission and distribution.

Prerequisites
Technical basic knowledge.

Main features
- Transmission and Distribution Division strategy, business goals, organization
- Scope of products and services
- Important technical characteristics to ensure safe operation (i.e. protection relaying, selectivity)
- Presentation of business units
  - Medium voltage
  - High voltage
  - Transformers
  - Energy automation
  - Energy Management & Information Systems
  - Services
- Scope of Transmission and Distribution Division Training

Notes
This training course is intended exclusively for Energy Sector employees.

1,600 EUR

DEMS 3.0
Training for Technical Sales and Operations

Booking code: GEN-DEMS

Training objectives
The Trainee will be enabled to sell and implement projects with the Decentralized Energy Management System (DEMS).

Expertise in
1) Software solution functionalities
2) Software handling
3) Software engineering
4) Data modeling
5) Software solution integration with respect to Virtual Power Plants, Demand Response, Decentralized Energy Systems with distributed generators, loads and storages.

Target audience
Siemens Technical Sales and Siemens Operations.

Prerequisites
Basic understanding of
1) Energy automation software
2) Energy market and regulations
3) Power systems.

Main features
- DEMS 3.0:
  1) Overview functionalities
  2) Data Engineering with DEMS Designer
  3) Process Interface
  4) Interface to other IT-systems
  5) Data model development based on real-life examples

650 EUR

Division Smart Grid – Technology at a Glance

Booking code: GEN-SG

Training objectives
The participants will learn about principals of electrical engineering and will get an overview about use and applications engineering of products and solutions in the field of power transmission and distribution.

Siemens Energy Program for Graduates and Young Engineers (3 Months)

Booking code: ENERGY-NIG

Training objectives
On completion of the training, the participant could apply for a licence as electrical expert, work as electrical technician for a power utility or in an industrial set up, or work as a self-employed Electrical Technician capable of performing installation, operation and maintenance jobs on electrical installations (utility, domestic and industrial networks).

825,000 NGN
Transmission and Distribution Networks – Basics Part I

Booking code: PE-TDNET1

Training objectives
The participants obtain basic knowledge about electrical power transmission and distribution systems. The participants become practical infor-

tmation that is important when configuring and using switchgears and learn the basic principles of the power system protection system. Strong accent will be put on explanations of the correla-

tions between the individual components of the power system and their interaction in the whole system.

Target audience
Engineers and persons interested in technical fields who want to obtain a basic understanding of electrical power systems or refresh and deepen their technical knowledge about power systems and power system elements.

Prerequisites
Basic knowledge of physics and electrical engineering.

Main features
- Generation of electrical energy, fossil and renewable energy sources – energy demand and efficiency
- Fundamentals of electrical engineering: – steady-state and transients, time constants – AC & DC systems, electrical power in single- and three phase-AC systems
- Transmission and distribution of electrical energy – characteristics of power system elements
- Short circuit calculations and symmetrical components
- Network topologies, chosen network planning aspects
- Methods of neutral point earthing
- Introduction and overview of power system protection
- Practical calculation examples and multi-media (e.g. short films) will be shown and discussed in details to consolidate the gained knowledge and to help to understand the correlations

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Transmission and Distribution Networks – Basics Part II

Booking code: PE-TDNET2

Training objectives
The participants deepen the information obtained in Part 1 with respect to electrical power systems and the correlations between the individual power transmission and distribution components. They refresh and enlarge their knowledge about the tasks of power system components such as gener-

ators, transformers, motors, lines, cables and switchgears. The training provides practical hints that are necessary during configuration and application of components of an electrical power supply system like switchgears elements (e.g. circuit breakers, instrument transformers). Moreover, secondary system like power system protection will be discussed, as well.

Target audience
Engineers and persons interested in technical fields who want to obtain a basic understanding of electrical power systems or refresh and deepen their technical knowledge about power systems and power system elements.

Prerequisites
Basic knowledge of physics and electrical engineer-

ing, course "Transmission and Distribution Networks – Basics Part I (PE-TDNET1)".

Main features
- Lines, cables for power transmission and distribution
- Transformers and their characteristic data, connection symbols, grounding principles, voltage control and tap changers
- Generator and motor – basic principles
- Circuit breaker types, vacuum-switching technique and SF₆ switching systems, switching operations, arc extinction principles
- Air- and gas-insulted switchgears – construction principles, mode of operation
- Reactive power management, shunt and series compensation
- FACTS and high voltage direct current transmission systems (HVDC)
- Voltage and current measurement (instrument transformers) for protection, control and metering
- Principles and types of power system protection, design of protection systems, protection principles for transmission and distribution systems
- Practical calculation examples and multi-media (e.g. short films) will be shown and discussed in details to consolidate the gained knowledge and to help to understand the correlations

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Power Distribution Engineering – Introduction

Booking code: PE-DISTENG

Training objectives
The main objective of this course is to improve the participant’s understanding of power circuit analysis and distribution systems. The participant will take away the ability to analyze common power circuit problems. The participant will also have a stronger understanding of distribution system problems and equipment applications.

Target audience
A great course for new engineers, technicians from industrial applications, operations or Smart Grid application engineers who need to better understand the distribution system components, limits and risks.

Prerequisites
It is assumed that participants have college level geometry, trigonometry, matrix algebra, and physics. A background in electric power systems is not required.

Main features
- The course reviews the fundamental methods used in the steady-state analysis of AC circuits as applied to power distribution systems including:
  - Complex numbers, phasors and vectors
  - Ohm’s law for resistive, capacitive and inductive linear circuit elements
  - Real and reactive power in AC circuits (kVA, kW and kvar)
  - Kirchoff’s laws and the fundamentals of circuit analysis
  - Matrices and network solution methods
  - Three-phase power systems
  - The per unit system
  - Symmetrical components
  - Fault currents and Thevenin and Norton equivalents
  - Overview of the power delivery systems
  - Introduction to reliability and power quality
  - Distribution system configuration
  - Distribution equipment
  - Voltage drop
  - Voltage regulation
  - Load types: lighting, motors and load cycles
  - Power factor correction and capacitor applications
  - NERC Approved
  - (18 CE Hours, 6 Standards Hours, 1.5 Simulation Hours) and offers PE 1.8 CEU’s or 18 PDH / CE Hours

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(Net prices)
**Substation – Engineering and Operations**

**Booking code:** PE-SUBENG

**Training objectives**
This course will introduce participants to aspects of substation engineering and operations.

**Target audience**
Engineers interested in topics that include design parameters, bus arrangements, drawings, specifications, electrical clearances, structures, foundations, grounding design, conduit design, protection, monitoring, and maintenance.

**Prerequisites**
The structure of the course is intended for engineers who want to get an overview of the substation engineering and operation process.

**Main features**
- Introduction
- General design parameters
- Electrical engineering and design
- Construction, commissioning and startup
- Maintenance

**Arc Flash Hazards – Analysis and Risk Assessment**

**Booking code:** PE-FLASH

**Training objectives**
The participants will learn to evaluate arc current which is mostly less than bolted fault current between phase buses in plant switchgears. Using:
- NFPA 70E-2000, and
- IEEE Standard 1584-2002
the necessary flash protection boundary distance and the incident energy, dissipated through arc plasma up to the fault interruption moment, will be analyzed. Accordingly the minimum Personal Protective Equipment (PPE) requirement will be determined. Arc flash hazards risk impact onto process and personnel will be discussed. Based on such risk assessment results, different methods to manage arc flash hazards risk will be trained. Analysis methods to reduce arc incident energy in plant power system will be discussed. With this approach, arc flash analysis results will help to operate plants with lower risk, lower PPE requirements, and easier maintenance with lower costs.

**Target audience**
Engineers and project leaders who are involved into the design and operation of industrial plants protection systems; particularly industries with explosive hazard areas e.g. Oil and Gas.

**Prerequisites**
Basic knowledge of protection systems and short-circuit calculation.

**Main features**
- Short-circuit current calculation for arc faults
- Current interruption device design types and protection coordination concept
- Evaluation of arc faults interrupt time
- Incident energy calculation
- Hazard of transition from arc fault to arc flash
- Required flash boundary distance
- Required personnel protective equipment (PPE)
- Arc flash risk assessment on process and personnel
- Methods to manage assessed arc flash risks

**Rail – Fundamentals**

**Booking code:** PE-RAIL

**Training objectives**
As a participant you know: “Railways are more than trains and tracks”. You have an insight into this specific world and understand the special terms and needs of railroad operating companies. You are able to lead meaningful and technically correct discussions with railroad customers. This allows you to identify and develop new potential business.

**Target audience**
Technical sales people who want to develop their (railway) business.

**Prerequisites**
Basic technical knowledge.

**Main features**
- 1st Day “A Look Behind the Scenes”
  - Railways are more than trains and tracks!
  - Comparison of railroads with power utilities
  - Railroad networks in Europe
  - Typical organizational structure (operations, infrastructures, public transport, cargo, …)
  - Electrical operations
  - Operations management systems
  - Technical operation etc.
- 2nd Day “Siemens – Our Solutions” Siemens as competent partner for railway comp.
  - Morning – IC SG RE
    - Product Portfolio IC SG RE
    - Overview, Typical Applications, Special Features
    - Marketing Strategy
    - Sales channels, partners, …
    - Project Highlights (Best Practices)
    - Prospects, Visions, Trends
  - Afternoon – IC SG EA
    - Product Portfolio IC SG RE
    - Overview, Typical Applications, Special Features
    - Marketing Strategy
    - Sales channels, partners, …
    - Project Highlights (Best Practices)
    - Prospects, Visions, Trends
## Oil and Gas Industry – Fundamentals

**Booking code:** PE-OILGAS

**Training objectives**
The participants will have a compact, basic knowledge of the oil and gas industry. They will know “how it works” and will be able to understand their colleagues and customers.

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## Electrical Energy Installations – Basics

**Booking code:** PE-INSTAL

**Training objectives**
To give the participants a better understanding of the basic principles of Electrical Energy Installations and help them to understand the main components of the power grid by using different software simulation programs to explain these principles. These simulation programs are a part of the course material.

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## Medium and Low Voltage Installations – Design Criteria

**Booking code:** PE-LMV

**Training objectives**
To give the participants an understanding of the principals of Electrical Installations, dimension of the Power Installation and explanation of the design of a low-medium voltage installation.

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## Industrial Power System Applications

**Booking code:** PSEC 580

**Training objectives**
Participants will be able to build, modify and verify power system models and perform required system analysis utilizing commercial software tools such as SINCAL.

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## Smart Grid – Introduction

**Booking code:** SG-INTRO

**Training objectives**
The participants will be provided with a comprehensive overview of the design, developments, applications and potentials of smart grids.

**Target audience**
Employees of power generation companies and power supply utilities and Siemens employees who want to get an overview of innovative developments in the energy industry.

**Prerequisites**
Basic knowledge of electrical engineering.

**Main features**
- Framework conditions
  - Political, economic, technical
  - European energy policy
  - Potentials and increase of distributed and renewable generation
  - Impact of distributed generation on the power system
- What are smart grids?
  - Intelligence in transmission and distribution systems
  - Smart generation
  - Smart consumption
- Selected smart grid solutions in transmission and distribution systems
  - Monitoring and remote control of equipment
  - Condition monitoring
  - Automation solutions to increase supply reliability
  - Asset management
  - Blackout prevention
  - Use of power electronics
  - Control of power flows using SIPLINK, FACTS
  - Transmission capacity increase
  - New supply structures, e.g., microgrids
- Smart generation
  - Virtual power plants (VPP), decentralized energy management
  - Electric vehicles
  - Battery storage systems
- Smart consumption
  - Smart metering
  - Load management
  - Building automation / building management systems
- Information and communication technology (ICT)
- Experiences from pilot applications and projects

## Smart Metering – Basis for Smart Grids

**Booking code:** SG-METER

**Training objectives**
The participants will understand the concepts and ideas of smart metering which is the fundamental basis of Smart Grid solutions. They will have an overview of the integrated solution (smart metering and distribution network automation in one system) provided by Siemens.

**Target audience**
Engineers and managers who are engaged in smart metering and who are interested in a complete (smart metering and automation) solution.

**Prerequisites**
Basic knowledge of electrical engineering.

**Main features**
- Smart Grids – the requirements on a modern distribution network
- Smart Metering – terms, concepts, solutions
- AMIS – automatic meter and information infrastructure
  - Meter, load switching devices
  - Data concentrators
  - Telecontrol- and automation system – SICAM RTUs
  - Communication
  - Central components (Transactionserver, Networkmanagement, Toolbox II)
- Energy IP – Meter Data Management System
  - Introduction into MDM structure
  - Integration into the IT world on the basis of standardprocesses
  - Meter-to-Bill / Integration to SAP
  - Support during meter deployment and rollout
  - Customer information (EnergyEngage)
- Future utility business models
- Live presentation of the overall Smart Metering solution

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The Energy & Smart Grid Series for Non-technical Professionals

Booking code: SG-EPROF

Training objectives
Understanding the Physical Grid and then developing a Smart Grid strategy is a complex endeavor. This course provides participants with an assessment of the critical infrastructure and the associated decisions required to maintain the current system and plan for smart grid solutions.

Target audience
Whether you are in development, customer service, finance, project management or a transitioning civil or mechanical engineer, understanding the concepts of the electrical grid and smart grid concepts will enable you to provide valuable contributions to your organization.

Main Features
- The Physical Grid
- The Financial Grid
- Grid Markets and Players
- Defining Smart Grid Objectives, a Needs Assessment
- Grid Challenges – social, environment and political drivers and impacts, reliability issues, changes in generation and technology improvements
- Understanding Distribution Systems and Grid Performance
- Understanding performance measures and challenges – reliability indices, cost of reliability, electric vehicles, distributed generation, outages and losses
- Current and Future Distribution System Equipment
- Smart Grid ROI – Weighing the Costs and Benefits to Stakeholders
- Communications, IT and Data Management
- Distributed Generation – PV, Wind, fossil generation and CHP
- As time and interest allows, examples of PSS®SINCAL – planning software tool will be used for demonstration of smart grid solutions

Network Planning

Electromobility – Introduction and Status

Booking code: SG-ELECT

Training objectives
The participants will be provided with an overview of the design, developments and potentials of electromobility. Effects on the power system depending on different charging strategies will be discussed.

AMIS – How it Works

Booking code: SG-AMIS

Training objectives
At the end of this training the participants will have basic knowledge of the smart metering solution AMIS. They will know the necessary products (Counters, Dataconcentrator, Transaction Server, ...) and their technical details. They will be able to install a complete AMIS solution by their own.

EnergyIP – How it Works

Booking code: SG-IP

Training objectives
Participants will be able to correctly interpret the current system status. They will be able to implement measures in order to assure the continuous and correct operation of the overall system. They will be able to supervise and control processes and manually establish substitute values respectively check their automatic generation.

Network Planning

Power System Planning – Principles

Booking code: NET-PRINC

Training objectives
The participants will receive general information about technical-economical solutions of power-transmission and distribution in industry and other supply utilities.

Target audience
Siemens employees as well as other employees from utilities and industry with their main field of work in planning and operation of power systems.

Prerequisites
Basic knowledge of physics, preferably electrical engineering.

Main features
- Power system configuration and extension planning of high voltage, medium voltage and low voltage power systems, substation and component design
- Neutral grounding, project planning of earthing systems, interference of power supply installations
- Power system analysis and calculations (load flow and short circuit)
- Instrument transformer dimensioning, design and coordination of protection systems
- Operating and dynamic behavior of industrial systems with numerous use of machinery
- Switching operations, overvoltage protection and isolation coordination
- Harmonics and filter circuits, system perturbations
- Behavior of HVDC converter stations, static var compensators and controlled series compensation
- Accompanying practical instructions in questions of power system calculation, current transformer dimensioning and protection coordination

(Net prices)
Network Planning

Power Transmission & Distribution Systems – Load Flow and Short Circuit Calculation
Booking code: NET-CALCU

Training objectives
The participants will receive information about the actual status of standard power system calculation methods, recognizing weak spots in the power system and searching for remedies.

Target audience
Engineers and service technicians from power supply utilities and industry in operation, planning, design and servicing of switchgear.

Prerequisites
Basic knowledge of electrical engineering

Main features
- Symmetrical components
- Model of the network components
- Mathematical methods of the network calculation
- Short-circuit
- Application: Overcurrent protection coordination
- What is the purpose of load-flow and short-circuit current calculation?
- Power system structures and star point handling
- Characteristic equipment values
- Theory of calculating electrical power supply systems
- Modeling the most important electrical equipment (generator, transformer, line and load)
- Load-flow calculation, current iteration and Newton Raphson methods
- Short-circuit calculation, regeneration methods, standards
- Selectivity of time-graded protection facilities (overcurrent-time and distance protection)
- Small examples calculation relating to the above-mentioned methods
- Calculating really existing power systems with the aid of interactive calculation programs on a PC or workstation to verify manually determined values
- Interpreting the results
- Possibilities of remedying weak spots in the network

Power Flow Analysis with Applications – Introduction
Booking code: NET-PFLOW

Training objectives
Utility, IPP, ISO and other organizations in the electric power industry need engineers who have a solid comprehension of power flow behavior. This course aims to provide participants with an education in steady-state power flow analysis of electric power systems.

Power System Dynamics – Introduction
Booking code: NET-PSDUS

Training objectives
Engineers in planning and operations will gain an understanding of dynamic effects encountered in daily operation of the system and necessary in planning contingencies.

Power System Dynamics – Basics
Booking code: NET-PSDUK

Training objectives
This training will familiarize engineers with basic dynamic phenomena in power systems. Emphasis will be placed on modeling power system components for dynamic simulations.

Power Transmission Networks – System Planning and Quality
Booking code: NET-TRANS

Training objectives
The participants will receive detailed information about problems and technically economical power transmission solutions for public power supply networks.

Power Distribution and Industry Networks – System Planning and Quality
Booking code: NET-DISTRI

Training objectives
The participants are given detailed information about problems and technically economical power distribution solutions for public power supply networks, industry and other power supply facilities.

Power Flow Analysis with Applications – Fundamentals
Booking code: NET-POWER

Training objectives
The participants will learn about the fundamental theory of steady-state power flow, network modeling and solution methods, along with various applications such as contingency and transfer limit analysis, reactive power and voltage control.
### High and Low Voltage Installations – Earthing and Interference

**Booking code:** NET-EARTH

**Training objectives**
The participants will be able to use basic knowledge about protective earthing in high voltage installation, electromagnetic interference, lightning protection and selection of low voltage systems in their work environment.

**9CA4110-0NE00-0DC1**
1,400 EUR

### Low Voltage Networks – Theory and Practical Applications

**Booking code:** NET-LV

**Training objectives**
In this course, participants will learn about network system design, protection and operations. Topics include network relay characteristics and settings, fuse and cable limiter characteristics and coordination, primary system grounding and relaying, application of primary side fuses, overvoltages during capacitive backfeed, arcing fault characteristics and protection schemes for 480-volt spot networks, cogeneration and closed transition load transfers on spot networks, and network protector test sets for relay and protector testing.

**PDEC 630**
2,399 USD

### Power Distribution Systems – Management and Automation – Basics

**Booking code:** NET-AUTOM

**Training objectives**
The participants will understand the customer process regarding Distribution Network Structures and Management, with a focal point on Distribution Automation. They will be able to express the most important benefits of a Distribution Management System, and they will understand the general use of the IT Systems in relation to Electricity Distribution.

**9CA4110-0NE00-0DE8**
1,300 EUR
100,000 NGN
950 USD

### Dynamic Network – Phenomena, Simulation and Analysis

**Booking code:** NET-DYNAM

**Training objectives**
The participants will acquire basic knowledge on how to simulate dynamic networks and how to analyze the results. Main field of application will be “Protection Technology”. The participants will learn about the essential usage of a dynamic network simulation program and carry out basic simulations on topics load flow, stability and transients.

**9CA4120-0NE00-0DD3**
1,750 EUR

### Power System – Reliability

**Booking code:** NET-PSREL

**Training objectives**
This course will provide participants with an organized review of the power system fundamentals, defining the reliability relationship, and discussing traditional and modern methods to improve reliability.

**PSEC 63B**
1,825 USD

### Circuit Diagrams and Reference Systems – Basics

**Booking code:** NET-CIRCUI

**Training objectives**
The participants will learn how to use documentation for electrical high- and medium voltage installations. They will learn about the different types of documents used to document an electrical installation, old and new reference systems, cross-references between different circuit diagrams, etc.

**12,800 NOK**

### Power System – Stability and Stabilizer Tuning

**Booking code:** NET-STABIL

**Training objectives**
This course provides participants a thorough analysis of dynamic stability problems and control analysis tools used for PSS tuning. Theoretical and practical aspects of PSS commissioning and tuning are examined. Analysis of PSS input signals, including: electrical power, speed, frequency and accelerating power are covered.

**9CA4110-0NE00-0DA3**
1,300 EUR

### Overvoltages and Insulation Coordination

**Booking code:** NET-INSUL

**Training objectives**
This course will improve the participants’ understanding of power system transient and overvoltage events such as faults, switching and lightning surges.

**1,560,000 COP**
Renewables Integration

Wind Power – Power System Studies for Integration

Booking code: REN-WPPSS

Training objectives
The primary objective of this course is to provide the participant with an overview of the technical challenges and benefits for integrating large amounts of wind turbine generation into the power system, and the Power System Studies that need to be conducted.

Target audience
This course is for power system engineers, planners and developers who need to understand the growing role of wind energy in the power supply and the operational impacts of integrating wind resources.

Prerequisites
The course requires no specialized background in power system engineering, but does presume a general understanding of the power and transmission systems.

Main features
- Technical considerations for integrating large amounts of wind turbine generation into the power system
- Wind turbine generation interconnection requirements, as well as current practices and industry trends
- Wind turbine generator types and technical capabilities for participating in the active power and ancillary services markets
- Industry trends; generator sizes, technology and location (off shore versus on shore)
- Modeling of wind turbine generators for steady-state and stability analyses
- Steady-state and voltage stability impacts of integrating large amounts of wind turbine generation
- Dynamic studies required for the integration of wind turbine generation
- Wind integration operational impacts; frequency regulation (AGC and spinning reserve), load following (economic dispatch), and unit commitment
- Market impacts of wind integration; forecasting, day-ahead, hour-ahead markets

Price on request

Wind Power – Grid Connection Feasibility for Onshore Wind Farms

Booking code: REN-WPGC

Training objectives
The training will provide participants with an understanding of the issues relating to connecting onshore windfarms to the electricity network.

Target audience
Engineers with an interest in planning, design, engineering and operation of onshore windfarms.

Prerequisites
Basics of electricity transmission and distribution and renewable energy generation.

Main features
- Overview of grid connection process
- Network connection issues
  - Geographical
  - Environmental
  - Electrical
  - Social / political
- Grid connection studies
  - Fault level
  - Reactive power
  - Load flow
- Feasibility study process
- Case studies

Price on request

Wind Power – Network Integration

Booking code: REN-WIND

Training objectives
The participants will receive basic knowledge of power systems and systems engineering and will work out reliable and cost-effective solutions as required for the planning and design of wind power plants.

Target audience
Engineers and technicians who work for power supply companies and industry and who have to solve integrated network and systems engineering problems within the context of new business development activities, planning, preparation of quotations, and processing in connection with the use of wind farms.

Main features
- Wind power plants in Germany and Europe
- General political conditions
- Characteristics of diverse types of wind generators
- Setting up a wind farm distribution (onshore and offshore)
- Linking wind farms to the power system (onshore and offshore) by means of AC or DC concepts
- Behavior of wind farms in the event of problems caused by the power system or by wind
- The German power infeed law (EEG) and the consequences for power system and power plant operation
- Requirements arising from the power grid code
- Consequences of concentrated wind farm locations at the North Sea and Baltic Sea for the regulated zone, the power utility and the end customer
- DENA Study
- Dynamic behavior of wind parks

Price on request

PSEC 535
2,825 USD

9CA4110-0NE00-0DF6
1,450 EUR
Wind Power – Introduction to Grid Compliance for Onshore Wind Farms

Booking code: REN-WPGCOM

Training objectives
The training will provide participants with an understanding of Grid Compliance issues relating to connecting Onshore Windfarms to the electricity network.

Price on request
1,800 TRY

Distributed and Renewable Power Generation – Integration

Booking code: REN-DIS

Training objectives
The participants will be provided with an objective overview of the design and use of distributed generation technologies and technologies that are based on renewable energy sources, their effects on the power system and aspects that must be considered when integrating these plants into existing network structures.

9CA4110-0NE00-0DG1
1,450 EUR

Distributed Generation – Energy Storage Applications on Power Systems

Booking code: REN-STORAG

Training objectives
This course provides a thorough overview of Distributed Generation (DG) technologies, applications, and system analysis methods. Students will gain an understanding of DG technologies, DG interconnection practices / requirements and DG impacts on the power system.

PDEC 620
1,875 USD

Building Automation and Energy Efficiency

Booking code: BT-EFFIC

Training objectives
This on-the-job training provides an introduction to the equipment specialists will encounter on job sites and to the tasks they will be performing. This training includes eleven checklists to be completed by the student and mentor.

Target audience
BAU specialists.

Main features
- The training provides an introduction to:
  1. Basic on-boarding tasks and time tracking.
  2. Key Specialist Tools: Commissioning Tool, WCIS, Multi-Meter, Mobile Solution (service only).
  3. Key equipment and products: HVAC system components, APOGEE system components.
  4. Key work processes and roles: Solutions workflow, Service workflow.
- Some checklists may be completed by the students individually, but they will need a mentor available to answer questions. Some checklists can be completed at the branch while others will require a trip to a customer site. You may download the checklists by launching the Specialist and Mentor User Manual contained in the BAU 101 online training course. Students are required to complete an online quiz to verify that they have completed the on-the-job training modules.

1,080,000 COP

Fire Detection – New Technologies

Booking code: BT-FIRE

Training objectives
After the training the participant is qualified to commission “stand-alone” and simple networked installations, to document these installations, and to complete existing installations.

Target audience
Fire Technicians and / or local trainers.

Prerequisites
Basic knowledge of fire detection system.

Main features
- General
  - Welcome
  - Resources
- System Review
  - Panel Types
  - System Setup
  - Overview of System Trees
- Hardware
  - Panel Hardware
  - Optional Modules
  - C-NET Devices
- Operating Unit
  - Operating
  - Common Events
  - Tree Messages
- Engineering Tool
  - LRC
  - Cerberus-Engineering-Tool
  - Installing the Tool
  - Cerberus-Remote
- System Function / Configuration
  - Hardware Tree
  - Detection Tree
  - Control Tree
  - Alarm Verification and the IC
  - Operation Tree
  - Network Tree
- Commissioning & Maintenance
  - Workflow overview
  - Prerequisites
  - Manual configuration
  - Auto-configuration
  - Testing
  - Maintenance

1,560,000 COP
PSS®E – Power System Simulation Software

PSS®E – Power Flow and Steady State Analysis Using PSS®E

Booking code: PSSE-PFSS

Training objectives
Interpret power flow results (convergence, divergence, non-convergence), understand the causes and event sequence of voltage collapse and apply data checking functions in PSS®E to identify power flow modeling issues. This course provides the fundamental PSS®E software training to help novice users navigate the interface and gain hands-on experience. Topics include power flow modeling data, one-line diagrams, power flow solutions and reports, program automation, response files and Python™, contingency and transfer limit analysis and more.

Target audience
New users who wish to become familiar with the power flow and fault analysis sections of the PSS®E program.

Prerequisites
This course assumes participants are familiar with computers, electric network modeling fundamentals (course "Power Flow Analysis with Applications – Introduction (NET-PFLOW)"), symmetrical component theory of poly-phase systems (course “Power Distribution Engineering – Introduction (PE-DISTENG)”), and power system analysis methods.

Main features
■ Introduction to PSS®E
■ Basic power flow modeling data
■ Creating one-line diagrams
■ Power flow solution and reports
■ Data addition and modification
■ Features of the new interface
■ Data checking
■ Program automation
■ Contingency and transfer limit analyses
■ Balanced switching
■ Fault analysis
■ Line properties calculator
■ Data management
■ Network reduction
■ Special applications

PSS®E – Advanced Power Flow Using PSS®E

Booking code: PSSE-ADVPF

Training objectives
This training provides experienced PSS®E users with instruction in the use of PSS®E at an advanced level. The training is structured to include lecture sessions and hands-on exercises for selected topics.

Target audience
Experienced PSS®E users.

Prerequisites
Participants should be experienced with power flow of power systems and should have completed the course “PSS®E – Power Flow and Steady State Analysis Using PSS®E (PSSE-PFSS)”. 

Main features
■ What’s new in the latest PSS®E version
■ Load Flow and Short Circuit Interface
■ Transformer Modeling
■ Fault Analysis Applications
■ Modeling of FACTS Devices
■ Voltage Analysis
■ Introduction to Optimal Power Flow
■ Contingency Analysis
■ PV and PQ Analysis
■ Program Automation

PSS®E – Reactive Power Planning Using PSS®E

Booking code: PSSE-REACP

Training objectives
Utility engineers who conduct studies with PSS®E must understand the fundamental concepts of power system behavior, as well as know how to execute the many complicated routines within the program. This course provides experienced PSS®E users with instruction in the use of PSS®E at an advanced level for the analysis of voltage control issues (voltage collapse, reactive power compensation, dynamic voltage recovery, etc.).

Target audience
This course is great for the experienced PSS®E user who needs to increase his / her analytical skills related to voltage control issues in steady state and dynamic simulation.

Prerequisite
Course "PSS®E - Dynamic Simulation Using PSS®E (PSSE-DYNSI)".

Main features
■ Voltage Criteria
■ Voltage Collapse
■ Steady State Assessment
– Contingency analysis
– PV analyses
– QV analyses
■ Optimal power flow – Capacitor placement – Load curtailment
■ Reactive compensation
– Shunt capacitors
– TSC & TCR
– SVC
– STATCOM
– Synchronous condensers
– Series capacitors
– Modeling in PSS®E
■ Load characteristics
– Induction motors
– Load damping
– Under voltage load shedding
■ Dynamic voltage recovery study
– Long-term simulation
– Excitation limiters
– Load tap changers

AR en 4.5
2,825 USD

AR es 4.5
2,825 USD

GB en 3
1,335 GBP

PSSC 710
2,825 USD

AR en 4.5
2,825 USD

GB en 3
1,335 GBP

PSSC 790
2,399 USD
### PSS®E – Voltage Control and Reactive Power Planning Methods

**Booking code:** PSSE-VCONT

**Training objectives**
Training objectives of this course are to provide a thorough coverage of today’s voltage and reactive power planning issues, and of the tools and procedures that are most effective in studying them.

**Target audience**
Power system planner or operator concerned with voltage stability.

**Prerequisites**
This training is most beneficial to those who have had at least a year of experience in power system design, planning, or operation. Power flow analysis experience is recommended but not essential.

**Main features**
- Overview
- Equipment voltage characteristics
- Analytical tools
- Analytical methods
- Voltage characteristics
- Bulk system voltage characteristics
- Reactive power planning
- Review and closing discussion

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<td>PSSC 510</td>
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### PSS®E – Integrating Renewables Using PSS®E

**Booking code:** PSSE-RPSIN

**Training objectives**
This training will cover a wide range of topics related to modeling and application of renewables including wind and solar power.

**Target audience**
Planning engineers who are interested in modeling renewables into the system design and operation.

**Prerequisites**
Participants should have either setup or operating experience with power flow and dynamic simulation of power systems or should have completed the course “PSS®E – Power Flow and Steady State Analysis Using PSS®E (PSSE-PFSS)” and “PSS®E – Dynamic Simulation Using PSS®E (PSSE-DYNSI)”.

**Main features**
- General concepts
- Modeling wind farms and turbines for load flow
- Modeling wind farms and turbines for stability studies
- PSS®E wind and solar power software packages
- Utility / application issues
- Hands-on: Setting up load flow and dynamics with wind farms employing different wind turbines and PV arrays
- A general summary of specific wind turbine model packages developed by Siemens PTI for PSS®E will be given to highlight the latest developments and increase awareness of model contents and availability

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### Power Electronics in Transmission Systems (PETS)

**Booking code:** PSSE-PETS

**Training objectives**
To provide engineers with a comprehensive understanding of HVDC systems, FACTS devices, and alternative energy sources as well as technical problems that may be encountered when installing these elements in an existing power system. The training presents operating and control fundamentals along with discussing modeling principles and advanced analytical tools available. Emphasis on use of the PSS®E software is made and detailed hands-on examples are used to better understand power electronics performance.

**Target audience**
The structure of the course presumes that participants have a degree in electrical engineering and are familiar with load flow and / or dynamic calculations. Experience in using PSS®E is strongly encouraged.

**Prerequisites**
Fundamentals of power system engineering and the basic mathematical skills, such as trigonometry, complex numbers, matrix algebra and applied calculus.

**Main features**
- Introduction
- Conventional HVDC systems
- Latest HVDC technologies
- FACTS technologies
- Alternative energy sources
- Wind turbines and plants

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PSS®E – Dynamic Simulation
Using PSS®E

Booking code: PSSE-DYNSI

Training objectives
This intensive hands-on PSS®E course will help understand different types of disturbances can cause systems to behave in certain ways through analysis of system response outputs from PSS®E dynamic simulations.

Target audience
Power System Engineers interested in learning PSS®E Dynamics.

Prerequisites
Instructors assume participants have attended the course "PSS®E – Power Flow and Steady State Analysis Using PSS®E (PSSE-PFSS)” and are familiar with generator, turbine control and network protection models (course "Power System Dynamics – Introduction (NET-PSDUS)"). Participants should also be conversant with differential equations and Laplace transformers. For locations other than Schenectady, NY, students should bring their company issued laptop with software pre-installed. Loaner computers are available for a fee. Instructions for software downloads will be emailed 2-3 weeks in advance of the course.

Main features
- PSS®E Power flow and dynamic simulation data
- Running PSS®E and dynamic simulation approach
- Steady state analysis setup
- Initialization
- Setup documentation
- Running PSS®E
- Running dynamics simulations
- Examining results
- Model library overview
- Sanity checking
- Response tests
- Setup modifications
- Model writing introduction

PSS®E – Optimal Power Flow

Booking code: PSSE-OPF

Training objectives
This training will provides participants with an understanding of the capabilities of the PSS®E OPF program and introduces them to the many applications and uses for which it has proven to be most beneficial.

Target audience
Engineers and service technicians who work in operation, planning and design of power systems.

Prerequisites
Participants should be familiar with the basic operation of the PSS®E load flow program. Knowledge of optimal power flow theory is not required.

Main features
- Overview and Introduction
- Theory and applications
- Special OPF applications

PSS®E – Using Python to Integrate
PSS®E Workflow

Booking code: PSSE-PSCRI

Training objectives
To teach participants to develop and apply Python programs and to enhance their capabilities and efficiency when conducting PSS®E load flow, short circuit, and dynamics studies.

Target audience
PSS®E users who would like to increase his / her productivity and efficiency through the use of this modern scripting language will benefit from this course.

Prerequisites
PSS®E program knowledge and a basic background in programming and scripting languages.

Main features
- Python language overview
- Input / output processing
- Variables and data structures
- Flow control
- Functions and objects
- Interface with PSS®E
- Accessing PSS®E data
- Looping through buses and branches
- Load flow applications and control
- IPLAN programming in Python
- Plotting and graphics
- Interacting with the host operating system
- Text parsing and customized I / O
- Putting it all together: a complete PSS®E-Python load flow analysis example
PSS®E – Transmission Reliability Studies Using PSS®E

Booking code: PSSE-TRANS

Training objectives
The training emphasizes the practical assessment of transmission reliability and the calculation of reliability measures.

Target audience
This training is intended for anyone dealing with reliability concepts and their application and is valuable to all who are involved with transmission systems in the emerging deregulated environment and those who plan, operate, design or use transmission systems.

Prerequisites
Participants should have completed course “PSS®E – Power Flow and Steady State Analysis Using PSS®E (PSSE-PFSS)”

Main features
- Overview of transmission reliability
- Basic concepts and methods
- Deterministic assessment of bulk transmission reliability
- Addressing reactive power problems
- Transfer capability assessment
- Reliability must-run generation
- Probabilistic assessment of bulk transmission reliability

PSSC 635
2,399 USD

PSS®E – Advanced Dynamic Simulation for PSS®E

Booking code: PSSE-ADVDY

Training objectives
This training provides experienced PSS®E users with instruction in the use of PSS®E at an advanced level. The training is structured to include lecture sessions and hands-on exercises for selected topics.

Target audience
This is a challenging course designed for more experienced engineers and is designed to focus on aspects of dynamic modeling such as synchronous generators, excitation systems, prime movers, wind turbines, HVDC and FACTS devices, and loads.

Prerequisites
Participants should either have setup and operating experience with power flow and dynamic simulation of power systems or should have completed the course “PSS®E - Power Flow and Steady State Analysis Using PSS®E (PSSE-PFSS)” and “PSS®E – Dynamic Simulation Using PSS®E (PSSE-DYNSI)”.

Main features
- Review of newest features for PSS®E Dynamics
- Dynamic analysis tools
  - Transfer functions, block diagrams, feedback control system concepts, and controller turning and bode plots
- Dynamic Overview
  - Disturbance chronology, review of PSS®E stability activities
- Modeling
  - Synchronous machines, excitation systems, turbine / speed governor, wind generation, HVDC systems, and SVC – FACTS
- Modeling (cont.)
  - Loads – induction motors, characteristics, modeling, USE of IMD, load damping and NETFRQ, and breakers (line and load relays)
- Data checking and controller tuning
  - Excitation systems, governor models, PSS (Power System Stabilizers), SVC (Static Var Compensators)
- Topics on User-Written Models
  - Basics of model writing and Graphical Model Builder (GMB)
  - Incorporating user-written models into a simulation
- Program Automation – PSAS
- Simulating complex disturbances
  - Stuck breakers, single-pole switching, and motor starting
- Extended term dynamics
- Small-signal stability introduction (NEVA)
- Hands-on examples

2,825 USD

PSS®E – Model Writing for User Defined Models (UDMs) in PSS®E

Booking code: PSSE-UDM

Training objectives
This training provides participants with an understanding of the practical and theoretical aspects of dynamic modeling using the latest power system simulation tools. Students will have an opportunity to write computer subroutines by using PSS®E Power System Simulator Program to perform customized functions.

Target audience
An advanced training course for PSS®E users who want to write their own PSS®E dynamic models or customize an existing model.

Prerequisites
Participants should have either setup and operating experience with power flow and dynamic simulation of power systems or should have completed all introductory courses in PSS®E.

Main features
- PSS®E – Program Structure
- Block Diagrams
- FLECS and FORTRAN
- Equipment Models
  (Excitation Systems, Governors and PSS)
- Structuring the Model
- Advanced Uses of Conc and Conet
- Inputting Data for User Models
- Current Injection Models
- Modeling Special Protection Schemes (SPS or RAS)
- Model Testing
- Extended Term Simulation
- Introduction in Graphical Model Builder

PSSC 720
2,399 USD
PSS®E – Fault Analysis
Booking code: PSSE-ANALY

Training objectives
PSS®E users will be acquainted with program functions in sufficient detail for them to begin study work relevant to fault analysis and transmission line sequence impedance evaluation.

Price on request

PSS®E – Advanced Transmission Planning
Booking code: PSSE-ADVTR

Training objectives
This training provides transmission planners, designers and operators with concepts, tools and methodologies essential to address modern-day issues of competition, open access, wheeling and new technology in transmission planning.

2,825 USD

PSS®E – Protection Suite
Booking code: SINCAL-PRO

Training objectives
The participants will acquire basic knowledge on how to use the protective-devicing-modules in network planning tool PSS®SINCAL. They will learn to use the software for basic calculations on topics related to load flow and shortcircuit.

Price on request

PSS®SINCAL – Basics
Booking code: SINCAL-BAS

Training objectives
The participants will acquire basic knowledge on how to use the network planning program PSS®SINCAL. They will learn to use the software for basic calculations on topics related to load flow and shortcircuit.

Target audience
Engineers and service technicians from power supply utilities and industry in operation, planning and design of power systems.

Prerequisites
Basics knowledge of electrical engineering, electrical networks and protection technology.

Main features
- User interface (window technologies, indications, characteristics)
- Basic functions (create and edit network elements)
- Masks (functionality, manipulation of standardized types)
- Exposition of results (tables, protocols, graphics)
- Filters for demonstration
- Table editor (design, operation, prints)
- Establishing of networks (import, export of data)
- Graphic editor (formatting, evaluation, objects)
- Electrical elements and methods
- Macros, variants, catalogues
- Network planning toolbox
- Calculation methods:
  - Power flow balanced and unbalanced, load profiles
  - Short circuit incl. multiple fault and line constants
- Exercises how to apply PSS®SINCAL with some case studies

1,825 USD

PSS®SINCAL – Protection Suite
Booking code: SINCAL-PRO

Training objectives
The participants will acquire basic knowledge on how to use the protective-devicing-modules in network planning tool PSS®SINCAL. They will learn to use the software for basic calculations on topics related to load flow and shortcircuit.

Target audience
Engineers and service technicians from power supply utilities and industry in operation, planning and design of power systems.

Prerequisites
Basic knowledge of protective devicing is recommended.

Main features
- Introduction to time-overcurrent protection
- Protective relaying functionality in PSS®SINCAL
- Module time-overcurrent protection
  - Collecting elements
  - Calculation of single faults or groups
  - Evaluation of reports
  - Generation of diagrams
- Introduction to distance protection
- Module DI – Calculation of gradings
  - Calculation of grading factors
  - Evaluation of the results in masks
  - Generation of selectivity diagrams
- Module SZ – Simulation of protection trips
  - Input of user-defined protection devices
  - Calculation of protection coordination
  - Evaluation of the results in diagrams
- Calculation modules
  - Overcurrent time protection, distance protection setting, protection simulation
  - LV Fuse coordination, Arc Flash and Introduction to PDMS
- Practical exercises on all modules
<table>
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<tr>
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<th>Description</th>
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<th>Language</th>
<th>Price</th>
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<tbody>
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<td>The participants will acquire detailed knowledge of the operation and control of microgrids and off-grid solutions. The course focuses on the calculation and simulation of the Microgrid behaviour for steady-state and dynamic calculations in PSS®SINCAL.</td>
<td>SINCAL-SG</td>
<td>1,500 EUR</td>
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<td><strong>PSS®SINCAL – Dynamic Smart Grid Studies for Off-Grid Solutions</strong></td>
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<td>SINCAL-SGD</td>
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<td><strong>PSS®SINCAL – Basics for Distribution Companies</strong></td>
<td>The participants will acquire basic knowledge on how to use the network planning program PSS®SINCAL for distribution networks. They will learn to use the software for basic calculations on topics related to load flow, short-circuit with real system examples.</td>
<td>SINCAL-BAD</td>
<td>3,200 TRY</td>
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<td><strong>PSS®SINCAL – Advanced for Distribution Companies</strong></td>
<td>The participants will acquire advanced knowledge on how to use the network planning program PSS®SINCAL for distribution networks. They will learn to use the software for advanced calculations on topics related to load flow, short-circuit and load development.</td>
<td>SINCAL-ADD</td>
<td>3,200 TRY</td>
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<td><strong>PSS®SINCAL – Smart Grid</strong></td>
<td>The participants will acquire knowledge of challenges and solutions for integrating a high share of renewable energy sources into distribution grids. This knowledge is transferred via practical course by analyzing a distribution network in PSS®SINCAL.</td>
<td>SINCAL-SG</td>
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<td>SINCAL-ADD</td>
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Training objectives
This course provides participants with an understanding of current methods and techniques used to schedule and operate electric power supply systems in an economic and secure manner.

Target audience
Engineers, operators and those involved in electric regulation, policy and planning.

Prerequisites
An engineering degree with basic knowledge of electric utility systems is desirable.

Main features
- Training overview
- Characteristics of generating units
- Economic dispatch
- Unit commitment
- Generation control
- Interchange evaluations and power pools
- Operating security
- State estimation

Price on request
SIGUARD PDP – Observation and Analysis of Power Systems with PMUs

Training objectives
SIGUARD PDP, the phasor data processor, uses PMUs – a cutting-edge phasor-measurement technology – to observe the actual state of the power system. It monitors system variables and informs about critical system states. Scope and content of the SIGUARD DSA course will be designed based on your individual demand.

Price on request

SIGUARD DSA – Assessment of Power System Stability

Training objectives
SIGUARD DSA, the dynamic security assessment, analyzes possible contingencies and assesses the system stability. It provides the operator with an overview of the current and near-future state of system stability. Scope and content of the SIGUARD DSA course will be designed based on your individual demand.

Price on request

SIGUARD PSA – Assessment of Protection Performance

Training objectives
SIGUARD PSA, the protection security assessment, analyzes the selectivity, sensitivity, and speed of the entire protection system. It enables a rigorous protection system performance audit. Scope and content of the SIGUARD PSA course will be designed based on your individual demand.

Price on request

Power System Dynamics – Stability and Oscillations

Training objectives
The participant will receive essential knowledge on system dynamics, system oscillations and damping and countermeasures in transmission systems and at the generators.

Price on request

Electrical Power Issues in Nigeria for Bankers, Investors and Professionals

Training objectives
Participants will leave the course with a thorough practical understanding of: How lenders analyse power projects - from both a qualitative and a quantitative perspective, how project financings are sized and tailored to the cash flow of a specific project, the loan documents which govern a financing and how they interface with the other project documents such as power sales agreements, EPC contracts, supply agreements and insurance arrangements.

250,000 NGN

SCADA System – Spectrum Power CC – Basic Level

Training objectives
Participants will understand the basic architecture of a control center (SCADA), how to design it, and how to engineer the SCADA Siemens Spectrum Power CC.

1,080,000 COP

SCADA System – Spectrum Power CC – Intermediate Level

Training objectives
This training will deepen the knowledge of advanced tools SCADA Siemens Spectrum Power CC.

1,560,000 COP


Training objectives
The participants adopt black out causes and experience counteractive measures. One measure is the improvement of system monitoring by use of "phase measurement units" (PMUs) and the erection of "wide area" meter systems. Worldwide development trends of these measurement systems are presented and their implementation is part of discussion.

1,450 EUR

(Net prices)
### Argentina / AR

**Power System Engineering**

#### Network Planning

- **Power System – Stability and Stabilizer Tuning**
  - Dates: On request / BA
  - Booking code: NET-STABIL
  - Page: 59

**Power System Simulation Software**

- **PSS®E**
  - **PSS®E – Advanced Dynamic Simulation for PSS®E**
    - Dates: On request / BA
    - Booking code: PSSE-ADV DY
    - Page: 65
  - **PSS®E – Advanced Power Flow Using PSS®E**
    - Dates: On request / BA
    - Booking code: PSSE-ADVPF
    - Page: 62
  - **PSS®E – Dynamic Simulation Using PSS®E**
    - Dates: On request / BA
    - Booking code: PSSE-DYN S I
    - Page: 64
  - **PSS®E – Integrating Renewables Using PSS®E**
    - Dates: On request / BA
    - Booking code: PSSE-RPSIN
    - Page: 63
  - **PSS®E – Model Writing for User Defined Models (UDMs) in PSS®E**
    - Dates: On request / BA
    - Booking code: PSSE-UDM
    - Page: 65
  - **PSS®E – Optimal Power Flow**
    - Dates: On request / BA
    - Booking code: PSSE-OPF
    - Page: 64
  - **PSS®E – Power Flow and Steady State Analysis Using PSS®E**
    - Dates: On request / BA
    - Booking code: PSSE-PFSS
    - Page: 62

### Austria / AT

**Secondary Technology**

#### Protection

- **DIGSI 4 – Basics**
  - Dates: 25.–27. Feb. / VIE
  - Dates: 16.–18. Sep. / VIE
  - Booking code: DIGSI4-B
  - Page: 40

- **DIGSI 4 – IEC 61850 and GOOSE Configuration**
  - Dates: On request / VIE
  - Booking code: DIGSI4-I
  - Page: 41

#### Substation Automation

- **Ax 1703 – Workshop**
  - Dates: On request / VIE
  - Booking code: AX-BASIC
  - Page: 49

- **SICAM 230 – Configuration (latest version)**
  - Dates: 03.–06. Mar. / VIE
  - Dates: 12.–15. May / VIE
  - Dates: 03.–06. Nov. / VIE
  - Booking code: 230-CONF I
  - Page: 49

- **SICAM 230 Workshop – Network Monitoring with SICAM 230 NWM**
  - Dates: On request / VIE
  - Booking code: 230-MONIT
  - Page: 49

- **SICAM 230 Workshop – Topology**
  - Dates: 07. Nov. / VIE
  - Booking code: 230- TOP
  - Page: 49

- **SICAM CMIC – Smart Grid Solutions**
  - Dates: 14. Apr. / VIE
  - Dates: 18. Aug. / VIE
  - Dates: 01. Dec. / VIE
  - Booking code: RTU-CMIC
  - Page: 48

- **SICAM EMIC – WebParameterization**
  - Dates: On request / VIE
  - Booking code: RTU-EMIC
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- **SICAM RTUs – Basics**
  - Dates: 17. Feb. / VIE
  - Dates: 07. Apr. / VIE
  - Dates: 30. Jun. / VIE
  - Dates: 29. Sep. / VIE
  - Dates: 24. Nov. / VIE
  - Booking code: RTU-BASIC
  - Page: 46

- **SICAM RTUs – CAEx Plus**
  - Dates: 26.–28. Feb. / VIE
  - Dates: 16.–18. Apr. / VIE
  - Dates: 09.–11. Jul. / VIE
  - Dates: 08.–10. Oct. / VIE
  - Dates: 03.–05. Dec. / VIE
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## Brazil / BR

### Secondary Technology

#### Protection
- Fault Record Analysis
  - On request / SP
  - SIP4-FANA
  - Page 38

#### Substation Information
- IEC 61850 – The Standard for Substation Automation
  - On request / SP
  - SIT-IEC
  - Page 50
- Substation Automation – Introduction
  - On request / SP
  - SIT-SSAUT
  - Page 50

## Colombia / CO

### Primary Technology

#### High Voltage
- AIS Current 3AP – 3AQ Product Range – Operation & Maintenance – Intermediate
  - 27.–28. Feb. / BOG
  - HV-OM3AP/Q
  - Page 24
- HV Primary Test Performing and Test Equipment
  - 21.–23. May / BOG
  - HV-TEST
  - Page 24

#### Medium Voltage
- MV – Assembly and Installation Training
  - See Webshop
  - Page 28
- MV – Cable Testing & Diagnostics
  - 16.–17. Jan. / BOG
  - MV-CABLE
  - Page 29
- MV – Partial Discharges
  - 08.–09. May / BOG
  - MV-PARTIAL
  - Page 29

#### Transformers
- Transformers Integral Maintenance
  - 23.–25. Jul. / BOG
  - TR-MAIN
  - Page 30
- Transformers Lifecycle Management
  - 23.–25. Apr. / BOG
  - TR-TLM
  - Page 30

#### General
- EHV, HV and MV Substations Overview: Arrangement, Protection, Control and Communication System
  - 19.–21. Feb. / BOG
  - SUB-SCHEME
  - Page 31
- UHF Partial Discharge Monitoring for GIS Substations
  - 29.–30. May / BOG
  - GIS-UHF
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### Secondary Technology

#### Protection
- DIGSI 4 – Advanced
  - DIGSI4-A
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- DIGSI 4 – Basics
  - 05.–07. Mar. / BOG
  - DIGSI4-B
  - Page 40
- DIGSI 4 – CFC
  - 11.–12. Sep. / BOG
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- DIGSI 5 – Basics
  - 08.–11. Jul. / BOG
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*BOG = Bogotá; SP = São Paulo; VIE = Vienna*
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| SIPROTEC 4 – Busbar Protection 7SSS2 | 05.–07. Feb. / BOG | SIP4-7SS | 36 |
| SIPROTEC 4 – Distance Protection 7SA | 07.–08. Apr. / BOG | SIP4-7SA | 34 |
| SIPROTEC 4 – Line Differential Protection 7SD | 09.–11. Apr. / BOG | SIP4-7SD | 35 |
| SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC | 28.–30. Apr. / BOG | SIP4-CMC | 36 |
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**Power Engineering**

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### Nigeria / NG

#### Primary Technology

#### Medium Voltage

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- MV – Rural Electrification Techniques for Engineers & Technicians
  - 14.–29. Apr. / LOS
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- MV Switchgear – Technical Information Course (AIS & GIS)
  - 12.–14. Mar. / LOS
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- Design and Projection of Industrial Electrical Networks using the Software SIMARIS
  - 21.–25. Apr. / LOS
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- Protection of Oil and Gas Power Networks – Part 1
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- Protection of Oil and Gas Power Networks – Part 2
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  - PR-OG2 43

- Protection Technology – Principles
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  - PR-PRIN 32

- SIPROTEC 4 – Application and Exercises
  - 03.–07. Feb. / LOS
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  - SIP4-SYS 33

- SIPROTEC 4 – Protection Devices for Service Engineers
  - 19.–23. May / LOS
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  - SIP4-SERV 33

- SIPROTEC 4 – Protection Engineering Complete: 10 Days Certification Program
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Locations worldwide
siemens.com/poweracademy

USA – New York / Schenectady
400 State Street
Schenectady, NY 12305 USA
Phone: +1 518 395 5005
E-mail: power-academy.us@siemens.com

USA – California / Mountain View
685 East Middlefield Road
Mountain View, CA 94043-4045 USA
Phone: +1 518 395 5005
E-mail: power-academy.us@siemens.com

USA – Florida / Orlando
4400 Alafaya Trail
Orlando, FL 32826-2399 USA
Phone: +1 518 395 5005
E-mail: power-academy.us@siemens.com

USA – Minnesota / Minnetonka
10900 Wayzata Boulevard, Suite 400
Minnetonka, MN 55305 USA
Phone: +1 518 395 5005
E-mail: power-academy.us@siemens.com

USA – North Carolina / Wendell
7000 Siemens Road
Wendell, NC 27591 USA
Phone: +1 518 395 5005
E-mail: power-academy.us@siemens.com

USA – Texas / Houston
4920 Westway Park Boulevard #150
Houston, TX 77041 USA
Phone: +1 518 395 5005
E-mail: power-academy.us@siemens.com

USA – Colorado / Littleton
7810 Shaffer Parkway, Suite 100
Littleton, CO 80127 USA
Phone: +1 518 395 5005
E-mail: power-academy.us@siemens.com

Canada – Calgary
24-1930 Maynard Rd. S.E.,
Calgary, AB T2E 6J8, Canada
Phone: +1 (518) 395 5005
E-mail: power-academy.us@siemens.com

Argentina – Buenos Aires
Julían Segundo Agüero 2830 - Munro
Partido de Vicente López (B1605EBQ)
Pcia de Buenos Aires – Argentina
Phone: +54 11 5432 6000
E-mail: power-academy.ar@siemens.com

Brazil – São Paulo
Rua Gerson Benedito de Assis, 281
13213-081 Jundial - SP, Brazil
Phone: +55 0800-775-0080
E-mail: power-academy.br@siemens.com

Colombia – Bogotá
Autopista Medellín Km. 8.3 - Vía La Vega
Tenjo – Cundinamarca, Colombia
Phone: +57 1 294 2637
E-mail: centrodecapacitacion.col@siemens.com

Mexico – Mexico City
Av. Ejército Nacional No. 350, 3er Piso
Col. Chapultepec Morales
Deleg. Miguel Hidalgo
CP 11570 México, D.F.
Phone: +52 55 53 29 68 21
E-mail: georgina.ayala@siemens.com