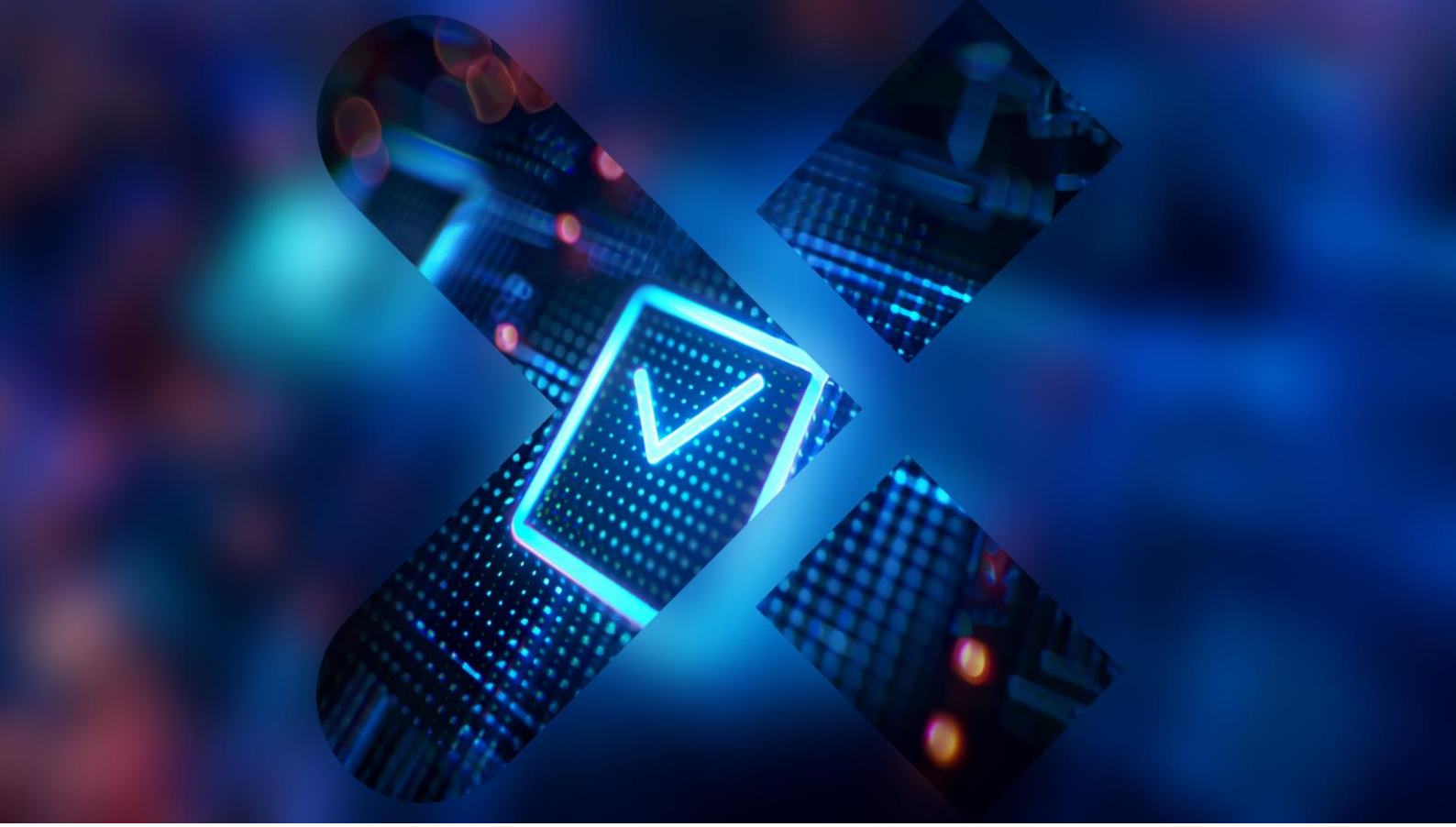

GRID SOFTWARE UNIVERSITY

Gridscale X Advanced Protection Assessment

Course Catalog

Document: GSW-U-APA

SIEMENS

Contents

1. Gridscale X Advanced Protection Assessment Outlines Courses

This Course Catalogue has everything for your customer to get started using Advanced Protection Assessment. This consists of 8 individual training courses.

1.1 Advanced Protection Assessment for New Users

Objectives

This course is especially designed for new users of Advanced Protection Assessment (APA). It provides a short introduction to the main features and modules of the software, including how to start using the program, a general description of the user interface, how to load an APA database, a description of the structure of the APA database as a repository for network and protection data, the One-Line Diagram, the Short Circuit module, the use of the Coordination Graphics module and the module for protection simulation, System Simulation.

General Information

Course Code	GSW-U-APA-NU
Delivery Method	Remote, On-Site
Duration	8 Hours
Language	English, Spanish

Target Audience

This course is designed as an introduction to Gridscale X Advanced Protection Assessment for New User.
Roles: Transmission and Distribution Protection Engineers

Prerequisites

- None.

Content

- Overview and Getting Started
- Interface
- OL & Data Entry
- Short Circuit for New Users
- Protection Data Entry
- Coordination Graphics for New Users
- System Simulation for New Users

1.2 Coordination Graphics

Objectives

This course introduces the Coordination Graphics module interface, how to configure this tool to display distance protection and overcurrent protection characteristics. Studying the operation of these functions under fault conditions and evaluating their coordination with nearby devices is described. The production of special displays are discussed, as well as the use of commands and specialized macros.

General Information

Course Code	GSW-U-APA-CG
Delivery Method	Remote, On-Site
Duration	4 Hours, or 8 hours (Advanced)
Language	English, Spanish

Target Audience

This course is designed to Gridscale X Advanced Protection Assessment's experimented user.

Roles: Transmission and Distribution Protection Engineers

Prerequisites

- Advanced Protection Assessment for New Users

Content

- Fault Studies for Distance Protection
- Plot Resistive Faults
- Plot Maximum Resistive Reach of Sliding Fault s
- Plot Actual Reach
- Plot Dynamic characteristic
- Compute Zero-Sequence Compensation Factor
- Time-Distance Diagram Production
- Apparent Impedances from COMTRADE Files
- Fault Studies for Overcurrent ProtectionDynamic TOC Displays
- Guide to Coordination Graphics Macros

1.3 System Simulator (with Sensitivity and Coordination Macros)

Objectives

This course provides an overview of Stepped-Event Analysis and System Simulator for protection simulation. The curse explains the definition of Local Zone of Protection (LZOP) and its use for protection simulation, suggests contact logic codes, introduces wizards for creating teleprotection schemes, and covers automated relay coordination studies for general use, as well as wide area coordination and sensitivity studies.

General Information

Course Code	GSW-U-APA-SS
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English, Spanish

Target Audience

This course is designed to Gridscale X Advanced Protection Assessment for experimented user.

Roles: Transmission and Distribution Protection Engineers

Prerequisites

- Advanced Protection Assessment for New Users

Content

- Overview of Stepped-Event Analysis and System Simulator
- Local Zone of Protection (LZOP) Explanation
- Suggested Contact Logic Codes
- Wizards for Creating Teleprotection Schemes
- An Automated Relay Coordination Study for General Use
- Wide Area Coordination Study Macros
- Wide Area Sensitivity Study Macros

1.4 NERC PRC-026 Compliance and APA -TS Link

Objectives

This course includes the basics of the Stable Power Swing Relay Loadability (NERC PRC-026 standard) study in the Advanced Protection Assessment, performing this protection reliability study in the Compliance Module.
The course also introduces to the co-simulation platform between PSS(R)E and Advanced Protection Assessment, the APA-TS Link. Fundamentals of power swing and out-of-step protection, and practical exercises using the APA-TS Link are also included in the course.

General Information

Course Code	GSW-U-APA-TS
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English, Spanish

Target Audience

This course is designed to Gridscale X Advanced Protection Assessment for experimented user.
Roles: Transmission and Distribution Protection Engineers, Compliance Engineers, Planning Engineers

Prerequisites

- Advanced Protection Assessment for New Users

Content

- Basics of the Stable Power Swing Relay Loadability (NERC PRC-026 Standard) study in the Advanced Protection Assessment
- Perform Stable Power Swing Relay Loadability in the Compliance Module
- APA-TS Link Introduction
- Fundamentals of Power Swing and Out-of-Step Protection
- Practical Exercises using APA -TS Link

1.5 Compliance Module for NERC PRC-027

Objectives

This course describes how to perform wide-area coordination evaluations (NERC PRC-027 standard, Req 2, Opt 1), using the Compliance Module. Configuring the module, running the studies and the description of results are discussed. Similarly, the course introduces the tracking of short circuit bus currents (NERC PRC-027 standard, Req 2, Opt 2) to identify locations in the network system where a wide-area coordination study may be necessary to perform.

General Information

Course Code	GSW-U-APA-CP
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English, Spanish

Target Audience

This course is designed to Gridscale X Advanced Protection Assessment for experimented user.
Roles: Transmission and Distribution Protection Engineers, Compliance Engineers

Prerequisites

- Advanced Protection Assessment for New Users

Content

- Basics of the PRC-027 standard
- Compliance using the short-circuit level monitoring approach
- Compliance using the protection coordination study approach
- Performing wide-area coordination reviews
- Reporting and analysis of results

1.6 Managing & Merging Data

Objectives

This course covers topics associated to the managing of the Advanced Protection Assessment Database, including the Database Editor (DBE), the application that allows interaction with the data inside the APA database. This course focuses on the current DBE capacities to manage accounts, passwords creation, backing up the database, importing of data from different database files, etc. In addition, the course explains the processes to merge new APA database system information into a production APA database.

General Information

Course Code	GSW-U-APA-MMD
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English, Spanish

Target Audience

This course is designed to responsible personnel of the Gridscale X Advanced Protection Assessment database.
Roles: APA Database Administrators, IT Utility Engineers, Advanced APA Users

Prerequisites

- APA Demo or APA software, in any package.

Content

- The Advanced Protection Assessment Database:
  Sharing; Managing Accounts; Backup/Restore; Updating the Schema
- Data Management Tools in DBE:
  Library Import; Equipment Categories; DBE Tools
- Merging Data:
  Boundary Merge; Internal Merge; System Import; Comparisons

1.7 SQL Introduction

Objectives

The Advanced Protection Assessment database is based on SQL. This course covers topics associated to the capacities of the Database Editor (DBE), to script SQL commands to query data from the APA database. The APA database tables, and their structure are discussed, as well as the SQL command syntax and editing exercises. Similarly, the use of the existing DBE tools to prepare and run SQL scripts are part of this course.

General Information

Course Code	GSW-U-APA-SQL
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English, Spanish

Target Audience

This course is designed to Gridscale X Advanced Protection Assessment for experimented user.
Roles: Transmission and Distribution Protection Engineers, APA Database Administrators, Advanced APA Users

Prerequisites

- Advanced Protection Assessment for New Users
- APA Demo or APA software, in any package.

Content

- SQL Command Syntax
- SQL with Advanced Protection Assessment

1.8 Modeling Inverter-Based Resources for Short-Circuit Analysis

Objectives

This course discusses the different inverter-based resources (IBR) models available in the Advance Protection Assessment for short circuit analysis. These models include various types of wind and solar generators and batteries. The course includes a description of the data necessary to configure the models, as well as issues associated with the convergence of this equipment, as well as the solutions.

General Information

Course Code	GSW-U-APA-MI
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English

Target Audience

This course is designed to Gridscale X Advanced Protection Assessment for experimented user.

Roles: Transmission and Distribution Protection Engineers

Prerequisites

- Advanced Protection Assessment for New Users
- APA Demo or APA software, in any package.

Content

- Purpose of Types I, II, III and IV wind and solar generators
- Nine-bus test network from EPRI
- APA Type III basic model: setting current limits
- Type IV control model: generator data
- Type IV initial power (P, Q)
- Type IV controls: V, Q and fault-ride through
- Type IV limits
- Voltage-Controlled Current Source with table of currents
- Convergent and non-convergent solutions
- Effect of weak network source (high Thevenin equivalent; low short-circuit ratio)
- Multiple generators
- Controls for types III and IV sources

1.9 Relay Setting

Objectives

This course addresses the use of the automatic relay setting module in Advanced Protection Assessment, Reay Setting. The different relay setting rules pre-programmed in the module, as well as the description of the results obtained upon the execution of the selected relay setting rules. Advanced exercises, which include the modification of the existing relay setting rules programming for customization are also discussed.

General Information

Course Code	GSW-U-APA-RL
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English

Target Audience

This course is designed to Gridscale X Advanced Protection Assessment for experimented user.
Roles: Transmission and Distribution Relay Setting Engineers.

Prerequisites

- Advanced Protection Assessment for New Users
- APA Demo or APA Executive software.

Content

- Automatic relay setting in APA
- Running the Relay Setting module
- Testing Settings in Coordination Graphics
- Other relay setting macros of interest
- Relay Setting module organization for custom relay settings development
- Custom relay setting macro

1.10 Modeling Detailed Bus Structures

Objectives

This course explores the capabilities of the Advanced Protection Assessment One-Line module to design network substations in detail (breaker-node). Single to quadruple bus structures, ring bus structures, breaker-and-a-half bus structures, transfer bus structures, and double or more bus with transfer bus configurations are modeled into the system model to reproduce faithfully the physical substation connectivity in the software. Protection modeling considerations are also included in the course for discussion.

General Information

Course Code	GSW-U-APA-BS
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English, Spanish

Target Audience

This course is designed to Gridscale X Advanced Protection Assessment for experimented user.
Roles: Transmission and Distribution Protection Engineers

Prerequisites

- Advanced Protection Assessment for New Users
- APA Demo or APA Executive software.

Content

- Single, Double, Triple and Quadruple Bus Structures
- Ring Bus Structures
- Breaker-and-a-Half Bus Structures
- Transfer Bus Structures
- Double (or more) Bus with Transfer Bus

1.11 Macros – Beginner

Objectives

This course provides an initial overview of the Advanced Protection Assessment User Programming Language (CUPL), includes online quick reference documents, exercises for writing simple macros, using the Multi-Question Form in macros, and a guide to shortcuts and ready-to-use Advanced Protection Assessment macros.

General Information

Course Code	GSW-U-APA-MB
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English, Spanish

Target Audience

This course is designed to Gridscale X Advanced Protection Assessment for experimented user.
Roles: Transmission and Distribution Protection Engineers

Prerequisites

- Advanced Protection Assessment for New Users
- APA Demo or APA Executive software.

Content

- Overview of APA User Programming Language (CUPL)
- CUPL Help – the online quick reference document
- Exercises writing simple macros
- Exercise writing a more complex macro
- Using the Multi-Question Form in Macros
- Guide to Shortcuts and Ready-to-use APA Macros

1.12 Macros – Advanced

Objectives

A continuation of the Macros for Beginners course, this advanced course uses the basic concepts taught in the beginners' course to program more complex, production-wise macros. More sophisticate uses of the multi-question forms, designing and coding forms with various input types, topology searches using CUPL, working with sets of objects (buses, branches, devices), fault application, network topology modifications and report edition commands are covered in this course.

General Information

Course Code	GSW-U-APA-MA
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English

Target Audience

This course is designed as an introduction to Gridscale X Advanced Protection Assessment for experimented user.
Roles: Transmission and Distribution Protection Engineers

Prerequisites

- Macros - Beginner
- Advanced Protection Assessment for New Users
- APA Demo or APA Executive software.

Content

- Multi-question form basics
- Designing and coding a Multi-question form with different types of input
- Topology searches using CUPL
- Working with sets of objects (buses, branches, devices)
- Putting it all together in a macro

1.13 Breaker Duty Analysis

Objectives

This course covers the use of the Breaker Duty module in the Advanced Protection Assessment software. The course discusses the IEEE/ANSI and IEC standards considerations for computing the interrupting margins of power breakers and how these are programmed in the module. The breaker interrupting margin reports produced by the module are discussed. Similarly, the use of special breaker duty macros included in the module is also included.

General Information

Course Code	GSW-U-APA-BDA
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English, Spanish

Target Audience

This course is designed as an introduction to Gridscale X Advanced Protection Assessment for experimented user.
Roles: Transmission and Distribution Protection Engineers

Prerequisites

- Advanced Protection Assessment for New Users
- APA Demo or APA Executive software.

Content

- Basic Concepts
- Computing Breaker Margin
- Performing Breaker Rating Studies in Advanced Protection Assessment
- Special Breaker Duty Macros

1.14 Line Constants Module

Objectives

This course discusses the Line Constant module of the Advanced Protection Assessment software. In this course, the line impedance parameters of a transmission line are computed based on the right-of-way soil resistivity, tower design and cable data and line circuit architecture, including line section design. The course describes the data required, as well as the structure of the associated tables in the APA database where this data should be stored. The course also discusses the integration of the computed line impedances into the APA database for its use in the short circuit analysis in the software.

General Information

Course Code	GSW-U-APA-LC
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English

Target Audience

This course is designed as an introduction to Gridscale X Advanced Protection Assessment for experimented user.
Roles: Transmission and Distribution Protection Engineers, Power System Modeling Engineers

Prerequisites

- Advanced Protection Assessment for New Users
- APA Demo or APA Executive software.

Content

- Basic LC Data Concepts
- Practical Exercise:
  Library Data: soil resistivity, conductor constants, tower designs
  System data: rights of way, tower strings, line sections

1.15 Transformer Modeling and Neutral Nodes

Objectives

This course covers the modeling of power transformer modeling and neutral nodes and neutral networks for short circuit analysis in the software. The course discusses transformer test reports, IEEE transformer standards, library data, phase angles, short-circuit reports, zigzag windings, autotransformers, neutral shunts, and converting Tee-model transformers to N-Circuit models.

General Information

Course Code	GSW-U-APA-TM
Delivery Method	Remote, On-Site
Duration	4 Hours
Language	English

Target Audience

This course is designed as an introduction to Gridscale X Advanced Protection Assessment for experimented user.
Roles: Transmission and Distribution Protection Engineers, Power System Modeling Engineers

Prerequisites

- Advanced Protection Assessment for New Users
- APA Demo or APA Executive software.

Content

- Manufacturer's transformer test reports
- IEEE Standards for transformer measurements
- Library data
- Exciting current and percent impedance; no-load loss
- Phase angles for Y-D connection and angle taps
- One delta in 3-wdg YYD transformer
- Two-winding core-form transformer
- Short-circuit reports
- Zigzag windings as zero-sequence shunts
- Base voltages and off-nominal tap voltages
- Autotransformer with shared neutral group
- Neutral shunts on transformers and generators
- Initializing prefault voltages
- Transformer Details report
- Converting Tee-model transformers to N-Circuit models in Advanced Protection Assessment database

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