



# SIEMENS

*Ingenuity for life*



## PSEC 640

### Protective Relaying – Fundamentals

Siemens Power Academy TD - NA • [usa.siemens.com/pti-education](http://usa.siemens.com/pti-education)

#### At a glance

Protective devices serve to increase system performance and play a crucial role in minimizing equipment damage and customer outages that can result from short circuits and other abnormal power system operating conditions. Protective relays and other protective devices are vital in maintaining reliability in today's electric power systems.

**Protective Relaying – Fundamentals** is designed for engineers interested in deepening their practical understanding of the protective devices and systems commonly used in generation, transmission, sub-transmission and distribution systems. Topics covered in **PSEC 640** include:

- Characteristics of a protection system and general principals of protection schemes
- Objectives of selecting and applying a protective relaying scheme

- Equipment damage as a result of system disturbances
- Relay input sources (CTs and PTs)
- Principles of protection (time-overcurrent, differential and distance)
- Elements of distribution system protection, including relays, reclosers, fuses and sectionalizers
- Elements of transmission line protection, including overcurrent and distance relays
- Advantages and disadvantages of bus protection methods
- Components of optimal transformer protection
- Multiple aspects of generator protection
- Out-of-step relaying for a generator and transmission system
- Inputs for a coordination study

Upon completion of this course, engineers working in all areas of power system planning, operations, testing and construction will be able to better relate the operation of the protective system to their particular area of responsibility.

#### Prerequisites

Participants should understand the fundamentals of power system engineering and basic mathematical skills, such as trigonometry, complex numbers, matrix algebra and applied calculus.

#### Course structure

This is a three-day course. Material is presented in both morning and afternoon sessions for a total of six hours of daily instruction. Standard course hours are 9:00 a.m. to 4:00 p.m. each day.

#### To view the PSEC 640 Course Schedule on the web:

[https://siemens.coursewebs.com/cart/pageCourseInfo.aspx?Course\\_ID=PSEC\\_640](https://siemens.coursewebs.com/cart/pageCourseInfo.aspx?Course_ID=PSEC_640)

## Instructors

All courses offered through Siemens Power Academy are developed and taught by leading industry engineers. In addition to their proven instructional ability, our engineers have advanced degrees complemented by first-hand knowledge and experience solving power system problems throughout the world.

## Continuing Education Units (CEUs), Professional Development Hours (PDHs):

Licensed engineers, on a voluntary or mandated basis, attend continuing professional education for licensure renewal to ensure competency. All courses offered through Siemens

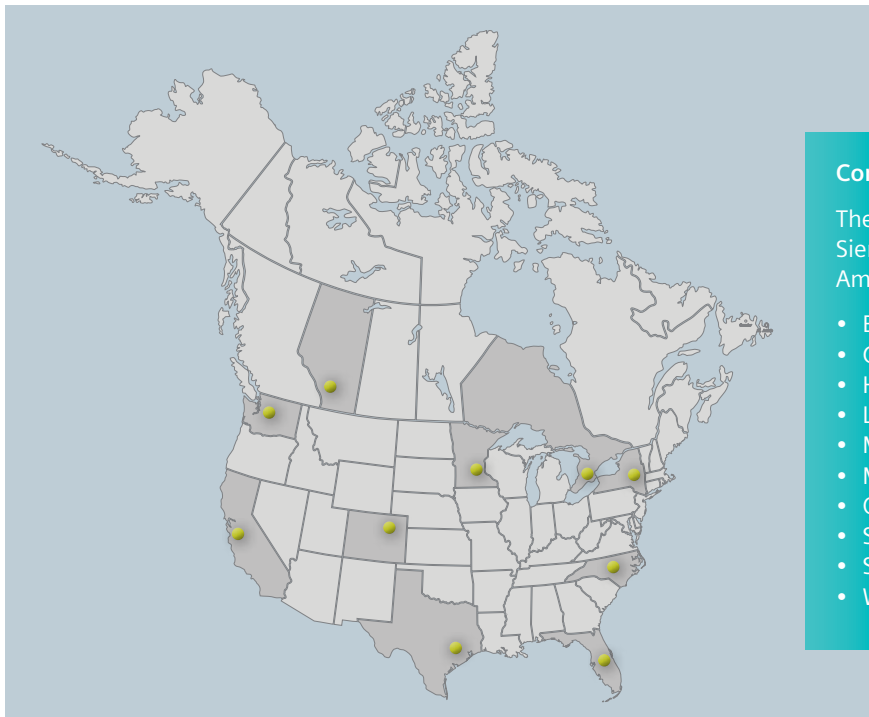
Power Academy meet the requirements for CEUs and PDHs.

- Continuing Education Units (CEUs) are the nationally recognized units for recording participation in professional development and noncredit educational programs. Participants completing this course will be awarded CEUs based on the instructional hours of the course: one CEU is awarded for 10 classroom hours of instruction.
- Professional Development Hours (PDHs) – Continuing education training for the Professional Engineer (PE) – that needs to earn annual Professional Development Hours

(PDHs). Through our instructor-led training, participants earn one PDH for each one hour of instruction. The participant is responsible for maintaining records of courses taken in support of licensure.

## Client site and custom training

All courses are available for presentation at any client's location by special arrangement. At client sites, it is recommended that sufficient computer terminals be available to enable a fully interactive and productive class, if applicable. Client site courses can also be tailored to address specific topics of local importance.



## Convenient training locations

The course is scheduled on a regular basis at Siemens offices located throughout North America, including:

- Burlington, Ontario, Canada
- Calgary, Alberta, Canada
- Houston, Texas, USA
- Littleton, Colorado, USA
- Minnetonka, Minnesota, USA
- Mountain View, California, USA
- Orlando, Florida, USA
- Schenectady, New York, USA
- Seattle, Washington, USA
- Wendell, North Carolina, USA

## Contact us

### Siemens Power Academy TD - NA

Phone: (518) 395-5005

Fax: (518) 346-2777

Email: [power-academy.us@siemens.com](mailto:power-academy.us@siemens.com)

Web: [usa.siemens.com/pti-education](http://usa.siemens.com/pti-education)

Export Control

AL-Number:

ECCN: EAR99

### Siemens Industry, Inc.

Siemens Power Technologies International

400 State Street

P.O. Box 1058

Schenectady, NY 12301-1058 USA

© 2017 Siemens Industry, Inc.

[usa.siemens.com/digitalgrid](http://usa.siemens.com/digitalgrid)