



Proficiency Certification

Electric Power – Substation Operations and Maintenance

APT's Proficiency Certification Program in Electric Power Systems is based on a set of objectives that are valuable to the industry, the employer and the student. This program incorporates strategically designed curriculum to maximize the knowledge and skills in the electric power industry. This certification program consists of two levels of proficiency. **Level I** provides the important knowledge components needed to confidently work in this specialization. **Level II** builds the student's knowledge and skills to the level to proficient. **This certification credit applies towards APT's Associate Degree in Applied Sciences – Electric Power Systems.** This program is a must for those interested in a lifelong career in electrical power systems and wants to be productive, proficient, and recognized.

Note: APT is recognized by the North American Electric Reliability Corporation as a continuing education provider who adheres to NERC Continuing Education Program Criteria. These classes provide NERC CE Hours.

Program Objectives

- **Productively contribute and interact** with technical professionals in all aspects of substation maintenance
- **Discuss industry practices** on proper installation, maintenance and troubleshooting
- **Describe the safety aspects** of electric power substations
- **Gain valuable knowledge** to actively participate in electric power system maintenance activities.
- **Learn installation and repair** techniques to become productive and valuable.
- **Promote learning** and earn recognition demonstrated by proficiency certification and college credit

Features and Benefits

- Course curriculum, objectives and learning outcomes target employment and industry needs
- Interactive instruction from highly qualified and experienced instructors
- No prerequisites!
- State-of-the-art curriculum that is always updated
- Vast course selection provides mobility and specialization
- Flexibility in scheduling
- **APT** considers prior experience or other accredited courses towards certificate and degree credit.

Courses

Level I Certification (Competent; 112 hrs, 14 Days)

- PC100 Electric Power System Fundamentals (24 hrs)
- PC101 Power System Equipment (16 hrs)
- PC102 Distribution Systems (24 hrs)
- PC103 Switching, Grounding & Safety (16 hrs)
- PC115 Electrical Print Reading (16 hrs)
- PC140 Maintenance Test Instruments & Procedures (16 hrs)

Level II Certification (Proficient; 112hrs, 14 Days)

- PC104 Protection Principles (16 hrs)
- PC105 Monitoring & Control (16 hrs)
- PC110 Power Calculations (16 hrs)
- PC130 Power Quality (16 hrs)
- PC205 Monitoring & Control – II (16 hrs)
- PC260 Utility Telecommunications Systems (16 hrs)
- PC265 High Voltage Protection for Telecommunications (16 hrs)

Program Hours: 224 hours (28 days)

Accreditation



APT is accredited by the U.S. Department of Education's Distance Education and Training Council (DETC).



All courses qualify for CEUs (Continuing Education Units) approved by the International Association of Continuing Education and Training



APT is recognized by the North American Electric Reliability Corporation.



APT courses are approved by Veterans Administration, GI Bill and DANTES!

Contact APT for more information!

www.aptc.edu

(800) 431-8488

LEVEL I (Competent)

PC100 Electric Power System Fundamentals (24 hrs)

Agencies ◦ Terminology ◦ Generation ◦ Transmission ◦ Substations ◦ Distribution ◦ Protection ◦ Interconnections ◦ Control Centers ◦ Telecommunications ◦ Basic Concepts (circuit components, Ohm's Law, AC/DC, single-phase, three-phase, delta and wye)

PC101 Power System Equipment (16 hrs)

Substation Layouts ◦ Transformers ◦ Breakers ◦ Switches ◦ Arresters ◦ Capacitors ◦ Reactors ◦ Control Buildings ◦ Batteries & Chargers ◦ Lines (design, maintenance, vegetation and underground) ◦ Operating Ratings (substation equipment and lines)

PC102 Distribution Systems (24 hrs)

Radial ◦ Overhead ◦ Underground ◦ Metering ◦ Consumption ◦ Protection Overview ◦ Voltage Control (regulators, line drop compensators, capacitors and reactors) ◦ Load Balance ◦ Power Quality ◦ Service Reliability ◦ Automation

PC103 Switching, Grounding & Safety (16 hrs)

Switching & Tagging ◦ Grounding Systems ◦ Ground Potential Rise ◦ Safety (touch-step, personal protective equipment) ◦ Equipment Testing ◦ Arc-Flash ◦ NESC Clearances ◦ PCB ◦ MSDS

PC115 Electrical Print Reading (16 hrs)

Identify, illustrate and diagram drawings associated with electric power systems ◦ standard symbols ◦ one-line diagrams ◦ 3-line drawings ◦ wiring diagrams ◦ as-built drawings ◦ DC control circuits ◦ equipment connections ◦ verification ◦ industry standards ◦ construction ◦ maintenance

PC140 Maintenance, Test Instruments & Procedures (16 hrs)

Working knowledge of common test instruments used in power system maintenance ◦ Megger ◦ Hi-Pot ◦ Dissolved Gas Analysis ◦ dielectric strength ◦ transformer turns ratio ◦ micro-Ohm ◦ test procedures (i.e., batteries, earth resistivity, etc.) ◦ cable fault location ◦ capacitor testing ◦ maintenance ◦ safety precautions ◦ PCB handling ◦ lead awareness

LEVEL II (Proficient)

PC104 Protection (16 hrs)

Faults ◦ Fuses ◦ Relay Types ◦ Sensing Equipment ◦ Control Circuits ◦ Distribution (under-frequency, undervoltage, overcurrent, series reactors and reclosing) ◦ Transmission (zones, differential, breaker failure, out of step, pilot, phase comparison, transfer trip and single pole tripping) ◦ Interconnection ◦ Special and Intelligent Schemes ◦ Disturbance Monitoring Equipment ◦ Transmission Loadability

PC105 Monitoring and Control (16 hrs)

Monitoring System Conditions ◦ Equipment Organization ◦ SCADA (master & remotes) ◦ E-Tagging ◦ EMS ◦ Time Error Correction ◦ Automatic Time Error Correction ◦ Satellite Time Calibration ◦ Intelligent Devices ◦ Substation Automation

PC110 Power Calculations (16 hrs)

Apply basic power system calculations ◦ circuit analysis 3-phase power systems ◦ High-Voltage ◦ High Current ◦ insulation ◦ conductors ◦ clearances ◦ designs ◦ special issues ◦ voltage drop ◦ fault calculations ◦ introduction to symmetrical components ◦ applications ◦ engineering and operations fundamentals

PC130 Power Quality (16 hrs)

Power quality issues ◦ concerns ◦ performance standards ◦ problem types ◦ vulnerable configurations ◦ stray voltages and currents ◦ radio/television interference ◦ ferroresonance ◦ cause analysis ◦ resolution ◦ test, monitor and troubleshoot ◦ case studies

PC205 Monitoring and Control – II (16 hrs)

Gain working knowledge of control center real time data gathering equipment ◦ communications links ◦ control centers and remote terminal equipment connections ◦ transducers ◦ scale factors ◦ interface relays ◦ calibration procedures ◦ monitoring devices ◦ testing and troubleshooting ◦ cyber security in telecommunications

PC260 Utility Telecommunications Systems (16 hrs)

Telecommunications applications for electric operations ◦ transport fundamentals (fiber optics, microwave, power line carrier, wireless, satellite and wireline communication systems) ◦ substation and distribution automation ◦ auto-transfer switches ◦ Programmable Logic Controllers (PLC) ◦ Intelligent Electronic Devices (IED) ◦ communications protocols (Ethernet, ATM, SONET, IP and Utility Communications Architecture)

PC265 High Voltage Protection for Telecommunications (16 hrs)

High voltage isolation equipment ◦ reliable telecommunications circuits ◦ industry standards and practices ◦ proper installation ◦ Ground Potential Rise concerns ◦ wireline and fiber interfaces ◦ proper maintenance ◦ avoiding interruption of critical communications circuits ◦ optical ground wires ◦ safety for telecom personnel