ELECTRIC POWER TECHNOLOGY (ELPW)

ELPW 105. Electrical System Fundamentals
Credits: 3
Typically Offered: FASPSU
This course will discuss the basic electrical power grid system from the electrical generation facility to your home usage. Students will study the different types of electrical power production including: fossil fired, hydroelectric, gas turbine, combine cycle, nuclear power and renewable energy sources such as wind, solar, and geothermal. The course will also cover what the future of the electrical system might look like using fuel cell and smart grid technology.

ELPW 111. Introduction to Electrical Industry and Power Grid
Credits: 3
Typically Offered: FASPSU
This course will begin with a basic introduction to the systems and components that make up a basic electrical system, including generation, transmission and distribution. Students then study the history behind electrical utility industry, how the electrical system in the United States was established and how Thomas Edison and George Westinghouse influenced the development of electrical systems. They learn how the electrical industry was first regulated and how regulation of the industry has changed. Students learn how the electrical industry is currently being re-regulated to encourage competition. Students will also gain knowledge of the system operations and marketing of electricity. Finally, they study how the electrical industry is segmented into utility sectors, such as investor-owned, federally owned, publicly owned and cooperatively owned utilities.

ELPW 112. Electrical System Components
Credits: 3
Typically Offered: FASPSU
This course provides in-depth look into the components used in the transmission of electricity. Students begin with an introduction to the generation of electric power. Students will then learn how switchyards, substations, overhead transmission systems, and underground transmission systems transmit that power at the proper voltage levels and provide system protection. Components such as transformers, circuit breakers, regulators, capacitor banks, tap changers, disconnects, current and potential transformers, relays, and lightning arrestors will be examined in detail. Students will also study the various types of electrical conductors, structures, and insulators used to transmit electricity.

ELPW 114. Industrial Safety & Health
Credits: 3
Typically Offered: FASPSU
This course provides standard safety, health and environmental practices performed in the electrical industry. Students study safe work practices, including personal protective equipment, chemical safety, fire protection, and tool and machine safety. Students will then learn about the electrical safety and protection. Throughout the course, personal responsibility required for safe and environmentally sound work habits will be reinforced.

ELPW 120. Industrial Prints & Diagrams
Credits: 4
Typically Offered: FASPSU
This course introduces students to the different schematics used in power plant operations and electrical transmission and distribution systems. Students will gain an understanding of the standard symbols and how to read them. Students learn how to read basic piping and instrumentation diagrams, how to interpret single line electrical diagrams and how to navigate complex electrical systems and feeder maps. Students also study schematics that are used when working with electronic systems and system instrumentation that is used to control and monitor the flow of electricity through the electrical system. Throughout the course, students will learn to use the diagrams to troubleshoot system problems and safely isolate sections of the electrical system.

ELPW 204. Advanced Electrical Systems
Credits: 4
Typically Offered: FASPSU
This course provides students with a complete understanding of the design and operation of electrical transmission and distribution systems. Students begin by studying the basic principles of transmission and distribution circuits, including the advantages and disadvantages of AC and DC transmission. Students will also learn some of the procedures used by system operators and line crews to maintain the safe and effective delivery of power during adverse conditions and the steps necessary to restore power after outages. An introduction to distribution system automation is also provided.

ELPW 206. Electrical System Protection
Credits: 4
Typically Offered: FASPSU
This course covers philosophies and principles used to protect the electrical system from abnormal and fault conditions, beginning with the generator. Instrument transformers, protective relays, and system grounding principles are covered.

ELPW 208. Advanced Math
Credits: 4
Typically Offered: FALLSPR
This course covers algebra, geometry and trigonometry needed for energy technicians working in the electrical system design and metering specialization areas. The course covers the fundamental concepts of algebra, equations, functions and graphs. The course also covers trigonometric functions, laws of sines and cosines, vectors and analytic geometry.

ELPW 210. Overhead Transmission and Distribution Line Construction
Credits: 4
Typically Offered: FALL
This course covers the design and construction of transmission and distribution overhead lines. This includes structures, conductors, insulators and the factors that influence particular use for both transmission and distribution systems. The course covers guidelines for working safely with poles, conductors, switchgear, transformers, rigging, grounds and more. Students will be introduced to high and low voltage troubleshooting procedures, stringing procedures and guidelines for live line work. Maintaining good voltage to the customer and street lighting issues also will be discussed.

ELPW 211. Substation Relays
Credits: 4
Typically Offered: SPRING
This course focuses on testing and calibrating substation equipment, including voltage testing on equipment feeder relays, and circuit breaker relays. Students also learn the various tests that need to be conducted on protective relays, such as overcurrent and voltage relays, directional and line relays, as well as ground and test device testing.

ELPW 213. Fundamentals of Metering
Credits: 3
Typically Offered: FALL
This course introduces students to the fundamentals of metering, such as terminology and basic principles of meters. Students learn basic math needed in metering, and review basic electricity and magnetism principles. They are introduced to meter testing equipment, meter diagrams and standards, and learn technical data and how to read watt hour and demand meters.

ELPW 230. Underground Line Construction
Credits: 4
Typically Offered: FALL
This course covers the two basic categories of underground line construction, such as direct burial and those found in vaults and ducts. Students learn the design, conductors, and transformers used in residential direct burial and the factors that affect it. The course includes underground line construction design and the factors that affect this type of installation.

ELPW 231. Substation Operations
Credits: 4
Typically Offered: SPRING
This course will detail the specifics of power electronics as applied in substations for power transmission. It will describe typical functions provided in utility substation automation systems and some important considerations in the interface between substation equipment and the automation system components. Students will look at the availability of information, the analysis of this information, and the subsequent decision making to optimize system operation in a competitive environment. Oil containment, animal issues and security will also be discussed and the requirements necessary to qualify a substation to withstand seismic events. The operation of substation fire protection and substation communications systems such as the scada system and scada security will be examined system design specialization.

ELPW 233. Single-Phase Metering and Polyphase Metering
Credits: 3
Typically Offered: FALL
In this course students learn about single-phase metering and polyphase metering, including meter design, adjustments and compensations, and applications. They also learn about power factor analyzers, high amperage CT cabinets, meter demand theory, demand registers, and testing and maintenance of thermal demands.

ELPW 240. Electric Distribution Systems
Credits: 4
Typically Offered: SPRING
In this course, students will be introduced to the basic components and operations of electric utility distribution substations and circuit feeders. Their functions, typical design parameters and the coordination of their protective devices are presented to form a complete picture of the working systems they comprise. Topics include transformers, bus configurations, regulators, capacitors, circuit breakers, reclosers, relays, fusing, arresters, reliability, power quality and the economics.

ELPW 250. Transformers
Credits: 4
Typically Offered: FALL
This course begins by reviewing basic transformer design and operation. The course also covers 3-phase transformers, single-phase loads for 3-phase transformers, and the connections used in such transformers. The course introduces students to installation procedures and maintenance procedures.

ELPW 251. Substation Construction and Maintenance
Credits: 4
Typically Offered: SPRING
This course begins with a review of hand and power tools used during the construction and maintenance of substations and continues with safety procedures and equipment put in place to protect workers within a substation. Students learn the basic construction of a substation, including electrical equipment rigging and installation, cable tray and conduit installation, cable controls and panel wiring, as well as a wide variety of installation procedures for electrical components and protection equipment.

ELPW 252. Civil Design
Credits: 4
Typically Offered: SPRING
In this course students study the basic principles of civil design in electrical distribution system facilities. It includes site selection and surveying, soils testing and compaction, grounding, grading, drainage and oil catchment requirements, step potential protection, design layouts, line plan and profile development, foundations, trenching and raceway design, and underground design considerations. Customer requirements, design layout considerations, and new construction permitting requirements are studied.

ELPW 253. Advanced Metering Technology
Credits: 2
Typically Offered: FALL
This course introduces students to various metering system designs and application options. The students study the metering system components, associated wiring configurations, and instrument transformer variations. Topics include ratio, burden, and correction factor calculations, functional testing, and calibration procedures as well as safe installation procedures. Also included are cogeneration metering, and principles of load management and associated equipment.