

# ELECTRICAL TRANSMISSION SYSTEMS TECHNOLOGY (ETST)

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## **ETST 240. Power Industry Concepts**

Credits: 3

Typically Offered: FALLSPR

This course begins with a study of the history, development, and evolution of the electrical industry over the last 140 years. This course explores the effects of industry deregulation on modern day electrical markets. Finally, this course covers the high demands placed on system operators. The reliability of our nations critical infrastructure demands professionals of the highest level. Requirements include passing a NERC certification, shift work, extensive knowledge of the system, and superb troubleshooting skills; balance that with being responsible for the safety of the public and other employees, keeping the lights on, and still making the utility a profit.

## **ETST 250. Electrical Generation Theories**

Credits: 4

Typically Offered: FALLSPR

This course covers the design and construction of large electrical generators. Students study the sources of voltage and the design and types of A.C. and D.C. generators and related auxiliary equipment. Students also study the design and operation of A.C. and D.C. motors.

## **ETST 254. Substations**

Credits: 3

Typically Offered: FALLSPR

This course covers the basic equipment found in switchyards and substations. Also included are the function and types of substations, related transmission and distribution systems and how each system is tied to one another.

## **ETST 256. Transformers**

Credits: 3

Typically Offered: FALLSPR

This course furthers a students understanding by introducing basic diagrams, transformers, and basic substation safety and performing inspection. Topics covered in this course will include interpreting one-line diagrams, exploring power and specialty transformers, and lock-out/tag-out (LOTO) procedures for transformers. This course will also introduce power transformers and the role they play in the overall electrical system, including switchyards, substations, and distribution networks. In addition, the study of basic switching procedures and the role and responsibilities of lineworkers, switchmen, system operators and dispatchers in these procedures will be a focus.

## **ETST 258. Protective Relaying**

Credits: 4

Typically Offered: FALLSPR

This course focuses on protective relaying of substation equipment and transmission lines. Details found in this course include practical understanding and identification of protective and control equipment, zones of protection, protection schemes, and relay communication systems.

## **ETST 260. Electrical Diagram Interpretation**

Credits: 2

Typically Offered: FALLSPR

This course covers electrical diagrams including single line diagrams, schematic diagrams and logic diagrams. This course focuses on the system operators perspective and the role diagram comprehension plays in an operators job performance. The student is introduced to the challenging art of interpreting electrical prints, diagrams and schematics. Learners will have a working knowledge of the symbols, logic and layout of electrical diagrams, schematics and power system operating diagrams upon successful completion of this course.

## **ETST 262. Power System Operations**

Credits: 3

Typically Offered: FALLSPR

This course covers the basic roles and responsibilities of system operators including transmission operations, market operations, reliability, balance and interchange and scheduling. The goal of this course is to introduce the multitude of positions found in a typical transmission control center.

## **ETST 266. Interconnected System Operations**

Credits: 3

Typically Offered: FALLSPR

This course covers the operation of power pools, regional reliability organizations and independent system operators and the role of each. In addition, this course covers interconnected switching procedures between utilities.

## **ETST 268. Power Flow**

Credits: 3

Typically Offered: FALLSPR

In this course, students study the control of power flow through interconnected systems and the operation of parallel power systems. The topics include generator synchronization, phase angle, VAR control and line voltage regulation. Procedures for controlling electrical power flows to maintain steady state conditions across the power grid are also a focus of this course.

**ETST 270. System Operator Work Practices**

Credits: 3

Typically Offered: FALLSPR

In this course students gain the operational knowledge how the North American Transmission Grid is managed. Emphasis is placed on the understanding and use of various applications available to system operators for predicting and managing real time operations. Other areas of focus include the effect of voltage on power system stability, the effect of megawatt flow on voltage and reactive power requirements, and the effect of system voltage on static reactive resources and the NERC requirements for reactive power.

**ETST 272. Power System Safety**

Credits: 3

Typically Offered: FALLSPR

This course covers the safe operating practices, system isolation procedures, and accident prevention procedures used in the transmission and distribution of power. Emphasis will be placed on electrical system lock out and safety procedures.

**ETST 274. SCADA Systems & Communication**

Credits: 3

Typically Offered: FALLSPR

This course covers supervisory control and data acquisition systems and the application of various communications technologies used in the electric industry.

**ETST 276. Power System Economics**

Credits: 3

Typically Offered: FALLSPR

This course covers economic factors governing electrical system operations. Costs of generation, transmission and distribution are explained. The organization of markets for electrical energy and how this structure affects participating companies' operational and investment decisions are discussed. The effects of congestion, transmission losses and penalty factors are studied. Load management, scheduling and pricing are a focus as well.

**ETST 278. Power System Emergency Concepts**

Credits: 3

Typically Offered: FALLSPR

This course concentrates on the concepts involved in the emergency operations of the interconnected power system. Learners will study all of the NERC Emergency Preparedness and Operations Standards (EOP) that govern those operations. Topics include emergency planning, recognition of, and reaction to, power system emergencies and abnormal conditions, as well as system restoration and the implementation and coordination of the proper procedure to restore the electrical system to a safe operating condition.

**ETST 280. Reliability Policies and Procedures**

Credits: 3

Typically Offered: FALLSPR

This course familiarizes and helps students understand the policies and procedures that ensure the reliability of the power system. North American Electric Reliability Corporation (NERC) standards, as well as other regulatory agency policies, are explained and discussed. Government agencies, reliability regions, and state reliability concerns also are defined and discussed.