

Power and Energy Certificate

Almost all industrial complexes and larger commercial and public buildings have a system of support utilities, which includes equipment that requires engineers trained in power and energy to operate and maintain. This could range from a single electrical motor or transformer to a complex system of generation, transmission and distribution, including turbines, energy automation systems, and smart grid technologies. P&E engineers research and implement ways to integrate renewable power technology and are often involved in public works projects, and employed on federal projects that involve the integration of large power grids.

The Philip M. Drayer Department of Electrical Engineering (LUEE) offers the certificate in P&E as a set of elective courses to BSEE holders, specifically engineers in industry, to prepare these engineers for work at a diverse range of power and energy relevant companies. The certificate was designed to cover industry necessities including design and implementation of electric machines and power electronics drives, control of the dynamics of power generation units, power system monitoring and protection, power system modeling and the concept of the smart grid.

Facilities that typically require power and energy engineers trained in the areas covered by the certificate include, but are not limited to, power and chemical plants, transmission and distribution facilities, utilities, chemical and petrochemical plants, pulp mills, sawmills, food production plants and any industrial organization that consumes power. The certificate will be awarded to students who successfully pass the P&E courses described below. P&E students need not be enrolled in the LUEE MSE/EE program.

P&E Certificate Details

The P&E certificate at Lamar University offers professional training in advanced topical areas relevant to the industry. In Graduate level, candidates take three core courses and then select one of two electives to receive the certificate, while in undergraduate level, they need two core courses and one elective. The program has been specifically designed for electrical engineers in industry who wish to assume new or increased responsibilities in the power and energy industry. Whoever passes these 3 courses with minimum GPA: 3.5 will receive the certificate in power and energy.

Graduate Program Outcomes

After completing the P&E certificate, the learners will be able to achieve the following objectives:

- Implement power electronics drives on various types of electric machines.
- Understand power systems controls, multi-area and automatic generation control.
- Dynamic modeling and analysis of power generation, transmission and distribution components.
- Apply engineering sciences to the design, analyses and steady-state operation of power apparatus in stable power systems.

- Apply modern simulation (PowerWorld/Windmill) and mathematical (Mathcad and/or Matlab) tools for design, analyses, and performance of power system networks.
- Formulate the requisite problem solving skills associated with power system analysis and design.
- Design power system networks to meet desired operation conditions and specifications.
- Design current and voltage transformers in power system protection.
- Design DSP-based relays and understand associated functions such as aliasing, sampling, Discrete Fourier Transform and its application to current and voltage phasor estimation.
- Design and compare numerical relaying algorithms for over current, distance and differential protection with application to transmission systems to include transformer and bus bar protection.
- Discuss and implement wide area monitoring, protection and control (WAMPAC).

Graduate Certificate Requirements

Core Courses

ELEN 5355: Electric machines and power electronics drives (fall semester)

ELEN 5356: Power system stability and control (spring semester)

ELEN 5357: Power system monitoring and protection (summer I semester)

Elective Courses

ELEN 5301: Advanced Power Electronics (fall semester)

ELEN 5301: Electric System Modeling (introduction to smartgrid) (Summer II semester)

Requirements to Apply

- Bachelor of Science in Electrical Engineering (BSEE)
- Experience in industry related to power and energy
- Registration as a student at LU (may be non-degree seeking)

Undergraduate Program Outcomes

The general outcomes for the certificate are as follows:

- Outline power system design techniques and analytical skills of various combinations of power apparatus that include transformers, transmission lines and requisite transmission line parameters, per-unit values, synchronous motors and generators, and induction motors in all various configurations.
- Describe the characteristics and circuit models of AC machines in both short circuit and steady-state modes of operation and expanding same for advanced study of monitoring, control and protection.

Apply basic engineering sciences to the design, analyses and steady-state operation of power apparatus in stable power systems.

- Apply modern simulation (PowerWorld/Windmill) and mathematical (Mathcad and/or Matlab) tools for the design, analyses, and performance of power system networks.
- Formulate the requisite problem solving skills associated with power system analysis and design.
Design power systems and networks to meet desired operation conditions and specifications.

Undergraduate Certificate Requirements

Core Courses

ELEN 3441: Fundamental of power system (spring semester)

ELEN 4309: Power system monitoring and protection (summer 1 semester)

Elective Courses

ELEN 4310: Electric machines and power electronics drives (fall semester)

ELEN 4311: Power system stability and control (spring semester)

Requirement to Apply

- Current student of Bachelor of Science in Electrical Engineering
- ELEN 3371 Electromagnetics I