



Introduction to Power Systems Engineering Tentative Syllabus

A power systems analysis course focused on providing the fundamental concepts and calculations necessary for non-electrical engineering students to pursue education in related areas (e.g., electric vehicle engineering).

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Prerequisite(s): Engineering degree, undergraduate electric circuits (courses that Mechanical, Industrial, Aerospace engineering students typically take).

Course Text: [Electromechanical Energy Devices and Power Systems | Wiley](#)

Required Software: Throughout the course, power engineering calculations, modeling and simulation of electric plant components and systems will be developed using Matlab and Simulink (Simscape Electrical Systems).

Matlab may be downloaded to your personal computer for free via ODU's Mathworks' License agreement:

<https://www.mathworks.com/academia/tah-portal/old-dominion-university-30347959.html>

Course Content:

Week 1: Introduction, History, Structure of US electric utility, Present & future trends. Description of primary sources of energy conversion systems used today (Coal, Wind, Solar, Nuclear, Natural Gas).

Weeks 2 - 5: Review of DC circuit analysis techniques. Introduction to Phasor Analysis of electric circuits, Complex power, Analysis of Balanced 3-phase circuits: use of single-line diagrams to facilitate the analysis of electrical systems

Weeks 6 and 7: Electro-mechanical energy conversion – transforming mechanical motion to electrical power.

Weeks 8 -10: Power system components – generators, transformers, transmission lines, loads

Weeks 11 and 12: Introduction to power system control – Automatic voltage regulator/prime mover governor, voltage compensation, tap-changing transformers.

Weeks 13 and 14: Introduction to solid state energy conversion – using power electronics to convert 3-phase AC power to DC (rectifiers) and DC power to AC (inverters). Applications relevant to power systems provided.

Week 15: Introduction to renewable energy sources – wind and solar

Course Grading:

Homework Assignments: 50%

At-Home Exam 1: 25%

At-Home Exam 2: 25%