

ESE350 Syllabus

Electric Power Systems

Professor: Timothy J. Driscoll (timothy.driscoll@stonybrook.edu)

Text Book: Power System Analysis and Design, J. Duncan Glover, Cengage 6th Ed.
(ISBN-13: 978-1-305-63213-4)

(Reference: “Power System Analysis”, Charles Gross, Wiley, 2nd Edition)

Goals: Teach analysis and design techniques associated with the generation, transmission, and distribution of electric power.

Objectives: Upon completion of this course, students will have an appreciation for the generation, transmission, and distribution of electric power. Students will demonstrate techniques for single phase and three phase electric power systems including: 1) characterization of voltage, current, and complex power, 2) AC circuit analysis, 3) function of time, phasor, symmetrical component, and per unit system analysis, 4) three phase transformers and transmission lines, 5) three-phase synchronous generators and economic dispatch, 6) balanced and unbalanced short-circuit analysis.

Topics Covered:

| | | |
|---------|--|--|
| Week 1. | Overview: Generation, Transmission, Distribution, and Utilization. Historical perspective of electric power systems development. Single phase AC circuit analysis (function of time and phasor analysis), impedance, real and reactive power, power factor correction. | |
| Week 2. | Balanced three phase systems analysis: phase and line voltage, current, complex power, delta-wye conversion. | |
| Week 3. | Power system representation: system modeling, per-phase analysis, per-unit system, one line diagram. | |
| Week 4. | Three Phase Power Transformers: equivalent circuit, impedance, lab measurement circuitry, delta –wye phase shift. | |
| Week 5. | Overhead and Underground Transmission Line Modeling: series resistance, series inductance, shunt capacitance, shunt conductance, line compensation, insulation, lightning, surge arresters, corona, shielding, radio/ TV interference. | |
| Week 6. | Review: Week 1 – Week 5 | |
| Week 7. | First Exam | |

| | | |
|----------|--|--|
| Week 8. | Review First Exam Balanced Three Phase Faults. Symmetrical Components. | |
| Week 9. | Unbalanced Faults: Analysis of line to ground, line to line, and double line to ground faults. | |
| Week 10. | Operating and Controlling Power Systems: economic dispatch. Form teams for class field trip to operating power plant. Discuss individual team assignments | |
| Week 11. | Field Trip to Operating Power Plant | |
| Week 12. | Team presentations: production of electricity; environmental impacts, reliability and maintenance; economics and fuel use; federal, state and local regulations; community impact. Electric Power System Environmental Impacts and Mitigation, UN Rights of Nature Discussion. Renewable Resource Systems Team Assignment. | |
| Week 13 | Renewable Resource System Presentations | |
| Week 14. | Review for Second Exam. | |
| Week 15 | Second Exam | |

Notes:

- Homework assignments are due at next session.
- The weekly quiz will cover material discussed during the previous session.
- Final grade will be determined as follows:

| | |
|--|------------|
| Homework, Weekly Quiz, Class Participation | 17% |
| Team Projects | 17% |
| First Exam | 33% |
| Second Exam | <u>33%</u> |
| | 100 |