ESE-350 Electric Power Systems
Spring 2021

Syllabus

1. Course Staff and Office Hours

Instructor: Timothy J Driscoll
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Light Eng. 258A

Office Hours: Zoom (by appointment)

TAs: To be announced

Office hours and locations may change. Please check Blackboard for most up-to-date information.

2. Course Description

Fundamental engineering theory for the design and operation of a modern electric power system. Modern aspects of generation, transmission, and distribution are considered with appropriate inspection trips to operating electric power facilities (when available). The relationship between the facilities and their influence on our environment is examined. Topics included are: Three Phase AC systems, phasor and function of time analysis, per unit representation, transmission line parameters, delta-wye transformers, symmetrical components, short circuit analysis, and economic dispatch of electric generation.

Prerequisites: ESE 271

Credits: 3

3. Textbook

Power System Analysis and Design, J. Duncan Glover, Cengage 6th Ed., 2017 (ISBN-13: 978-1-305-63213-4)

4. Course Learning Objectives

Upon completion of this course, students will demonstrate the application of analytical techniques associated with the analysis of single phase and three phase AC electric power systems including:

- Characterization of voltage, current, complex real and reactive power as functions of time and as phasors;
- AC circuit analysis;
- Symmetrical component and per unit system analysis;
- Three phase transformers and transmission lines;
- Economic dispatch of electric power;
- Balanced and unbalanced short-circuit analysis;
- Environmental impact;

5. Student Learning Outcomes

	Student Outcomes	% contribution
1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	75%
2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	5%
3.	an ability to communicate effectively with a range of audiences.	5%
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	10%
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	5%
6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.	
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

6. Schedule

Lectures will be held on Zoom Mondays from 2:40 - 5:30 PM

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

Week 7.	First Exam. (Scheduled for Monday March 15: 2:40 - 5 PM
Week 8.	Review and Explain First Exam Solutions. Symmetrical Components.
Week 9.	Unbalanced Faults: Causes and Analysis of line-to-ground, line-to- line, double line to ground, and three phase faults.
Week 10.	Economic Dispatch with and without Transmission Line Losses. Form Teams for Virtual Field Trip. Explain Team Assignments.
Week 11.	Virtual Field Trip to an operating power plant.
Week 12.	Team presentations including: production of electric and thermal power; environmental impact; reliability and maintenance; fuel use and economics; federal/local regulations; community impact. Explain Team Assignments for Renewable and Advanced Power Systems,
Week 13.	Team presentations: Renewable and Advanced Power Systems. Electric Power Systems Environmental Impact.
Week 14	Review for Final.
Week 15	Final Exam (per University schedule)

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7. Assignments

7.1. Homework Assignments

Homework Assignments will be issued weekly. The assignment will be available on Blackboard. All assignments will be due the following week.

7.2. Team Homework Assignments

In addition to individual Homework Assignments, Team Homework Assignments will be issued weekly.

7.3. Team Projects

Team Projects will be assigned as scheduled

8. Grading

- Final grade will be determined as follows:

Homework, Quizzes, Projects, Participation	34%
First Exam	33%
Second Exam	33%
	100

9. Academic Honesty

Any academic dishonesty will result in a zero grade for the assignment for all parties involved.

All exam work must be entirely your own with no collaboration or outside materials/information. Any academic dishonesty on the midterm exams or the final exam will result in failing the course. The case will be submitted to the College of Engineering's Committee on Academic Standing and Appeals.

10. Student Accessibility Support Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, 128 ECC Building, (631) 632-6748, or at sasc@Stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

11. Academic Integrity Statement

Each student must pursue their academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

13. Critical Incident Management Statement

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.