ESE 350: Electric Power Systems
Syllabus – Spring 2020

2019-2020 Catalog 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.

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

Prerequisite: ESE 271

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

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 single phase and three phase AC electric power systems including: 1) characterization of voltage, current, real and reactive power, 2) AC circuit analysis, 3) symmetrical component and per unit system analysis, 4) three phase transformers and transmission lines, 5) economic dispatch of electric power, 6) balanced and unbalanced short-circuit analysis and 7) environmental impact.

Notes:

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

Homework, Weekly Quiz, Class Participation	20%
Team Projects	14%
First Exam	33%
Second Exam	33%
	100

ESE 350 Syllabus (cont.)

Week 1.	Overview: Generation, Transmission Distribution and Utilization. Historical perspective of electric power systems development. Single phase function of time and phasor analysis.
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.	Overhead and Underground Transmission Lines: series resistance, series inductance, shunt capacitance, line compensation, insulation, lightning, surge arresters, corona, shielding, and radio / TV interference.
Week 5.	Three Phase Power Transformers: equivalent circuit, impedance, factory impedance measurement circuitry, per-unit analysis, delta-wye phase shift.
Week 6.	Review: Week 1 – Week 5
Week 7.	First Exam.
Week 8.	Review and Explain First Exam Solutions. Balanced Three Phase Faults, Symmetrical Components.
Week 9.	Unbalanced Faults: Causes and Analysis of line-to-ground, line-to- line, and double line to ground faults.
Week 10.	Economic Dispatch with and without Transmission Line Losses. Form Teams for Field Trip. Explain Team Assignments.
Week 11.	Field Trip to 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

Class/laboratory Schedule: 3 lecture hours per week.