

Academic Course Description

King Saud University
Electrical Engineering Department

EE340: Fundamentals of Power Systems

First Semester 1426/1427 (2005/2006)

Instructors: (1) **Dr. Nazar Hussain Malik**

Office: 2C-127

Phone: 467-6783

(2) **Dr. Yasin Khan**

Office: 2C-108/2

Phone: 467-9813

Text Books:

1. Ashfaq Husain, "Electrical Power Systems" 4th Edition, CBS Publishers & Distributors, India.
2. J. J. Grainger and W.D Stevenson, "Power System Analysis" McGraw Hill.

Support References : A collection of supplementary reading material is also provided.

Pre-requisites: EE202

Co-requisites : - - - -

Course Objectives: To clearly understand the basic concepts of the modern power system and power system components including transmission and distribution systems and grounding systems. Furthermore, modeling and analysis of transmission and distribution lines is also carried out and performance parameters identified.

Topics Covered: Power system components and representation; Transmission line and cables design and parameters; Analysis and performance evaluation of transmission and distribution lines; Electric insulators; Grounding systems; High voltage surges in power networks.

Class / Tutorial Schedule: Three lectures are assigned per week with 50 minute for each lecture session. There is also a 50 minute weekly tutorial session associated with this course.

Professional Component Contribution: Students can learn the analytical methods and modern tools for solution of problems associated with power system design and operation with special emphasis on transmission and distribution systems. They acquire the basic skills of how to

approach and deal with real life situations and solve simple simulated design and operating problems. Students must also utilize knowledge of mathematics, physics, system's control, circuits and basic engineering sciences in order to effectively analyze a diverse set of fundamental problems in power transmission and distribution systems.

Relationship to Program Objectives: This course contributes to the general objectives listed for an Electrical Engineering Department.

Objective A: By teaching the student how to formulate basic problems and model the associated configurations, circuits and systems related to a power system, this course support the objective of producing graduate with a strong foundation in basic sciences.

Objective B: By teaching students how to deal with electrical power systems and networks and solve basic power system problems, the course helps in the department's production of students with a strong foundation in electrical engineering.

Objective C: By motivating and encouraging students in discussions during lectures and tutorials to get basic information and skills in a group environment and provide individual opinion on alternative solutions to the design and operating problem related to power systems, this course supports the objective of producing graduate with good communication skills.

Objective D: By encouraging the students to learn pertinent ethical and professional standards in dealing with alternative methods of energy generations, transmission and distribution regarding system layout and operation and acquire mutual respect for diverse opinions, this course supports the objective of providing graduates with a broad based education so that they can appreciate diversity of opinion, better understand ethical issues and develop a more global perspective of the profession.

Objective E: By teaching how to design simple transmission and distribution systems and their individual components, this course supports the objective of producing graduates with relevant engineering design experience.

Evaluation: There are graded home works, two 2-hours mid-term exams and a three hour final exam. The grade distribution is as follows:

Two Mid-Term Exams.	45%
Home Works, Quizzes & Class Participation	15%
Final Exam	<u>40%</u>
Total	100%

Challenges and Actions taken to improve the Course: Some basic background and pre-requisite type material are often reviewed during the course, notably those related to the review of 3-phase systems, AC circuits and machines. Visits are arranged to the High Voltage Laboratory of the Electrical Engineering Department during the course in order to expose students to real life practical elements of the power system and factors which can cause malfunction in the operation of components such as insulators, bushings, cables and conductors, etc.

Weekly Teaching Plan

Week #	Deliverables
1	Basic Concepts and Power System Components
2	Series Resistance and Inductance of Transmission Lines
3	Series Inductance of Transmission Lines
4	Shunt Capacitance of Transmission Lines
5	Modeling and Analysis of Short, and Medium Transmission Lines
6	Modeling and Analysis of Long Transmission Lines
7	Reactive Compensation and Performance of Transmission Lines
8	Introduction to Underground Cables
9	Electrical Characteristics of Underground Cables
10	Method of Per Unit Calculations
11	Insulators
12	Distribution Systems
13	Surges in High Voltage Systems
14	Grounding Systems

September 19, 2005