University of Management & Technology
School of Engineering
Department of Electrical Engineering

EE-317 Power SystemFundamentals

Lecture Schedule	See EE Timetable on website	**Semester**	Fall 2013
Pre-requisite	N/A	**Credit Hours**	3
Instructor(s)	Asif Hussain[1] Usman Ali[2] Imran Ali[3]	**Contacts**	asif.hussain@umt.edu.pk[1] usman.ali@umt.edu.pk[2] imran.ali@umt.edu.pk[3]
Office		**Office Hours**	See office windows
Teaching Assistant	None	**Contact**	N/A
Office	N/A	**Office Hours**	N/A

Course Description

This introductory course will deal with the basic concepts involved in power systems, structure of modern power system, study of the conventional and nonconventional sources of electrical energy, calculation of transmission line parameters: inductance of single conductor, inductance of single and three phase lines, capacitance of single and three phase lines, basic considerations and distribution system layout, distribution substations and protection of the power system

Expected Outcomes

The course strongly supports expected outcomes a, b, d and i of the HEC Electrical Engineering Curriculum.Upon completion of this course, students will become familiar with:

- Basic structure of the power generating stations including generation, transmission and distribution of electrical energy
- The basic concepts of single phase and three phase system
- Power transmission system
- Power distribution system
- Design of the distributor for the power distribution system
- Overview of the protection of power system equipment

Books

Textbook:

- Power System Analysis, By HadiSaadat 4th Edition[1]

Reference Books:

- Power System Analysis by John J. Grainger, William D. Stevenson[1]
- Electrical Power Distribution & Transmission by L.M. Faulkenberry& W. Coffer[2]
- Principles of Power Systems by V.K. Mehta, Rohit Mehta[3]

Grading Policy

Details and timings for the assessment of this module are as follows:

Theory Part:

Exam (Weightage)	**Duration**
MidTerm Exam (25%)	60 minutes
Final Exam (50%)	120-150 minutes
Quiz (at least 5 per semester) (15%)	10-15 min each
Assignment (at least 5 per semester) (10%)	Take home

Course Schedule and Lecture Plan

Lecture	Topics	Textbook (TB) / Reference Readings(RB)
1 – 2	**Introduction to Power System**	Lecture Slides
3 – 6	**Basic Concepts of Single and Three Phase System:** Power in Single and Three Phase AC Circuits, Balanced 3-phase voltages,Basic Three-Phase Circuit Connections, Power Factor Correction,Advantages of balance three-phase systems, Unbalanced Three-Phase Systems. Voltage-drop calculations for single-phase and three-phase systems, Per Unit System, Conversion of delta connected three phase to Wye Connected Three phase system.	Chap # 02 of RB[1]
7 – 8	**Overview of Power Generating Plants:** Detailed study of Steam power plant, Hydro-electric power plant and Diesel power plant	Chap # 02[2.1 – 2-12] of RB[3]
9	**Power Flow Through Transmission Lines** Skin effect, Ferranti effect and Corona loss	Notes
10 – 12	**Transmission Line Parameters:** Types of Transmission Lines, Inductance of a conductor due to internal flux, Flux linkages between two points external to an isolated conductor, Inductance of a single phase two wire line, Flux linkages of one conductor in a group, Inductance of composite conductor lines, Inductance of three phase lines symmetrical and unsymmetrical spacing, Inductance calculation for bundled conductors	Chap # 04[4.1-4.8] of TB[1]
13 – 14	**Capacitance of Transmission Lines** Electric field of a long straight conductor, The potential difference between two points due to a charge, Capacitance of a two wire line, Capacitance of a three phase line with symmetrical and unsymmetrical spacing, Capacitance calculation for bundled conductors	Chap # 04[4.10-4.14] of TB[1]
Mid Term Exam (8th Week)		
17 – 18	**Transmission Line Model and Performance:** Short line model, medium line model, Long line model	Chap # 05[5.1 – 5.4] of TB[1]
19 – 20	**Variable Loads on Power Stations:** Structure of electric power system, Variable loads on power system, Load curves, Important terms and factors, Type of loads	Ch#03[3.1-3.9] of RB[3]
21	**Power Factor Improvement:** Power factor and Power triangle, Causes and disadvantages of low power factor, Power factor improvement, Calculation of power factor correction, Importance of power factor improvement, Meeting the increased kW demand on Power Stations,	Ch#06 of RB[3]
23 – 25	**Mechanical Design of Overhead Lines:** Main components of overhead lines, Conductor material, Line supports, Insulators and their types, Corona, Factor effecting Corona, Advantages and disadvantages in Corona, Important terms, Methods of reducing Corona effect, Sag in over-head lines, Calculation of Sag	Ch#08[8.1-8.5, 8.10 – 8.16] of RB[3]
26	**Distribution** Basic Considerations and Distribution System Layout, Distribution Substations	Chap # 12 of RB[3]
27 – 29	**AC Distribution:** A.C. distribution calculation, Methods of solving A.C. distribution problems, 3-Phase unbalanced loads, Four-wire star connected unbalanced loads	Chap # 14[14.1-14.3] of RB[3]

30 – 32	**Neutral Grounding:** Grounding or Earthing, Equipment grounding, System Grounding, Un-grounded neutral system, Neutral grounding, Advantages of neutral grounding, Methods of neutral grounding, Grounding techniques, Voltage transformer Earthing, Grounding transformer	Chap # 26 of RB[3]
Final Term Exam (Comprehensive)		