EEEE 343 Electrical Power Systems A 48 hrs 1.0 units

Course Outline

Lecturer: Benard Mumo Makaa (www.benardmakaa.com)

Lecture Notes: https://www.benardmakaa.com/electrical-power-systems-a/

Course Outline

Purpose:

- Understand the fundamentals of electrical power systems.
- Understand the construction and various properties of underground cables.
- Understand grounding/earthing systems.
- Understand the mechanical and electrical design of transmission lines.

Learning Outcomes

- Explain the various types of power generation systems.
- Explain the various types of power distribution systems.
- Express and explain cost of electrical energy.
- Explain the various electrical supply systems.
- Design mechanical and electrical aspects of transmission lines.

Main Textbooks

- Principles of Power Systems by V.K.Mehta
- J. Duncan Glover, Thomas Overbye, Mulukutla S. Sarma (2016), Power System Analysis and Design, CL Engineering.
- Turan Gonen, (2016), Modern Power System Analysis, CRC Press.
- R.K. Rajput (2006), Power Systems Engineering, LAXMI Publications.

Week	Topic Covered	Sub-Topic/Activity
1.	Electrical Energy	Discussion on: • Importance of Electrical Energy. • Generation of Electrical Energy. • Sources of Energy. • Units of Energy. • Relationship among Energy Units. • Calorific Value of fuels. • Advantages of Liquid Fuels over the Solid Fuels and vice versa.
2.	Electrical Power generation	Discussion on: • Generating Stations. • Steam Power Station (Thermal Station). • Hydro-electric Power Station.

		• Diesel Power Station. • Nuclear Power Station. • Gas Turbine Power Plant. • Comparison of the various power plants.
3.	Economics of power supply	Discussion on: • Economics of Power Generation. • Cost of Electrical Energy. • Expressions for Cost of Electrical Energy. • Importance of High Load Factor.
4.	Variable Load on Power Stations	Discussion on: • Variable Load on Power Station. • Effects of variable load. • Load Curves. • Types of Loads.
5.	Supply Systems	Discussion on: • Electric Supply System. • Typical a.c. Power Supply Scheme. • Comparison of D.C. and A.C. Transmission. • Advantages of High Transmission Voltage. • Various Systems of Power Transmission.
6.	Supply Systems	Discussion on: • Elements of a Transmission Line. • Economic Choice of Conductor Size. • Economic Choice of Transmission Voltage. • Requirements of Satisfactory Electric Supply. CAT 1 Administration
7.	Supply Systems - War of currents	Discussion on: • **War of currents. AC vs DC**: Background, The competing systems, Edison's publicity campaign, Competition outcome, Remnant and existent DC systems. • **Wireless Power Transmission:** Wireless power techniques, Near field Transfer, Far-field Transfer, Transfer via Laser, Tesla's Dream, Timeline of history of the transmission of wireless energy.
8.	Overhead transmission lines	Discussion on: • Main Components of Overhead Lines. • Conductor Materials. • Line Supports. • Insulators. • Corona. • Factors Affecting Corona. • Sag in Overhead Lines.

9.	Overhead Transmission Lines	Discussion on: • Constants of a Transmission Line. • Resistance of a Transmission Line. • Skin Effect. • Classification of Overhead Transmission Lines.
10.	Underground cables	Discussion on: • Construction of Cables. • Insulating Materials for Cables. • Classification of Cables. • Types of Cable Faults.
11.	Neutral Grounding	Discussion on: • Classifications of Grounding/Earthing. • Equipment grounding. • System grounding. • Ungrounded Neutral System. • Neutral Grounding. • Methods of Neutral Grounding. • Voltage Transformer Earthing. CAT 2 Administration
12.	Revision	Revision for the end of semester exams
13.	End of semester exams	Administration of end of semester examination
14.	End of semester exams	Administration of end of semester examination