

EE405PC: POWER SYSTEM - I

II Year B.Tech. EEE II-Sem

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Prerequisite: Basic Electrical Engineering, Electrical Machines-I, Electrical Machines-II**Course Objectives:**

- To understand the different types of power generating stations.
- To examine A.C. and D.C. distribution systems.
- To understand and compare overhead line insulators and Insulated cables.
- To illustrate the economic aspects of power generation and tariff methods.
- To evaluate the transmission line parameters calculations
- To understand the concept of corona

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand the concepts of power systems.
- Understand the operation of conventional generating stations and renewable sources of electrical power.
- Evaluate the power tariff methods.
- Determine the electrical circuit parameters of transmission lines
- Understand the layout of substation and underground cables and corona.

UNIT - I**Generation of Electric Power**

Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant. **Non-Conventional Sources (Qualitative):** Ocean Energy, Tidal Energy, Wave Energy, wind Energy, Fuel Cells, and Solar Energy, Cogeneration and energy conservation and storage.

UNIT - II

Economics of Generation: Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

UNIT - III

Overhead Line Insulators & Insulated Cables: Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators. Introduction, insulation, insulating materials, Extra high voltage cables, grading of cables, insulation resistance of a cable, Capacitance of a single core and three core cables, Overhead lines versus underground cables, types of cables.

UNIT - IV

Inductance & Capacitance Calculations of Transmission Lines: Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors-transposition, bundled conductors, and effect of earth on capacitance.

Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona, interference between power and Communication lines.

UNIT-V

A.C. Distribution: Introduction, AC distribution, Single phase, 3-phase, 3 phase 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

DC Distribution: Classification of Distribution Systems.- Comparison of DC vs. AC and Under-Ground vs. Over- Head Distribution Systems.- Requirements and Design features of Distribution Systems.-Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

TEXT BOOKS:

1. W.D.Stevenson –Elements of Power System Analysis, Fourth Edition, McGraw Hill, 1984.
2. C.L. Wadhwa –Generation, Distribution and Utilization of Electrical Energy, Second Edition, New Age International, 2009.

REFERENCE BOOKS:

1. C.L. Wadhwa –Electrical Power Systems, Fifth Edition, New Age International, 2009
2. M.V. Deshpande –Elements of Electrical Power Station Design, Third Edition, Wheeler Pub. 1998
3. H.Cotton& H. Barber-The Transmission and Distribution of Electrical Energy, Third “V.K Mehta and Rohit Mehta”, “Principles of Power Systems”, S. Chand& Company Ltd, New Delhi, 2004.