COURSE CONTENT

POWER SYSTEMS-I								
I Semester: EEE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
2530225	**Core**	2	0	0	2	40	60	100
Contact Classes:45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes:45**		
Prerequisites: Electrical Circuits-I & II.								

Course Overview:

This course covers the basics of electric power generation, substations, and AC distribution systems, including power plant operation, generation economics, AIS and GIS substations, and voltage drop analysis, providing a foundation in power system engineering.

Course Objectives:

1. To explain the operation of various conventional and renewable energy power plants.
2. To analyze the economic aspects of power generation and load management.
3. To describe the layout and components of air-insulated substations.
4. To compare the construction and performance of gas-insulated substations with air-insulated substations.
5. To calculate voltage drops in AC distribution systems under different loading conditions.

Course Outcomes: After Completion of the Course, Students should be able to

1. Explain the operation of various conventional and renewable energy power plants.
2. Analyze the economics of power generation considering load and cost factors.
3. Identify the components and layouts of air-insulated substations.
4. Compare air-insulated and gas-insulated substations in terms of design and performance.
5. Calculate voltage drops in AC distribution systems under different load conditions.

UNIT - I: Generation of Electric Power: Operation of Hydel, Thermal, Nuclear and Gas Power plant with layouts – Description of components – Choice of site - advantages and disadvantages, Introduction and description of components- renewable energy sources and plants (solar and wind).

UNIT - II: Economics of Power Generation: Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load curve, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariffs.

UNIT - III: Air Insulated Substations (AIS): Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

UNIT - IV: Gas Insulated Substations (GIS): Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar,

construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT - V: AC Distribution: Introduction, AC distribution, Single phase, 3-phase3 wire, 3-phase4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in AC Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

TEXT BOOKS:

1. C. L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", 2nd Edition, New Age International, 2009.
2. A.Chakrabarti, M.L. Soni, P.V. Gupta,U.S. Bhatnagar, "A Textbook on Power System Engineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
3. J.B.Gupta, A Course in Power Systems" Katson Books, 11th Edition, 2016.

REFERENCE BOOKS:

1. C.L.Wadhwa, "Electrical Power Systems", 5th Edition, New Age International, 2009.
2. M.V.Deshpande, "Elements of Electrical Power Station Design", 3rd Edition, Wheeler Pub.1998.
3. H.Cotton & H.Barber, "The Transmission and Distribution of Electrical Energy", 3rd Edition, 1970.
4. W.D.Stevenson, "Elements of Power System Analysis",4th Edition, Mc Graw Hill,1984.
5. V. K. Mehta and Rohit Mehta, "Principles of Power Systems", S. Chand & Company Ltd, New Delhi, 2004.

ELECTRONIC RESOURCES:

1. **https://www.electrical4u.com/power-generation/**
2. **https://www.electrical4u.com/economics-of-power-generation/**
3. **https://www.electrical4u.com/substation/**
4. **https://www.electricaltechnology.org/2013/06/gas-insulated-substation.html**
5. **https://www.electrical4u.com/ac-distribution-system/**
6. **https://archive.nptel.ac.in/courses/108/104/108104051/**

MATERIALS ON LINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper–I
8. Model question paper–II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)