POWER GENERATION SYSTEMS

III Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEE003	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

COURSE OBJECTIVES (COs):

I. Demonstrate thermal power generation systems including major subsystems.
II. Illustrate hydroelectric power generation systems along with pumped storage plants.
III. Understand basic working principles of nuclear power generation systems.
IV. Apply knowledge of solar and wind power generation systems in design and implementation to obtain clean energy.

COURSE LEARNING OUTCOMES (CLOs):

At the end of the course, the student will have the ability to:

1. Demonstrate the layout and working principle of thermal power plant.
2. Analyze the principle and operation of different energy conversion systems.
3. Classify the various types of renewable energy sources.
4. Compare the various hybrid energy systems in electrical system.
5. Use the renewable energy sources to meet the constraints in electrical and electronics engineering field.
6. Explain the working of hydro power plant and its importance in the power system
7. Discuss the principles and operations of photovoltaic effect.
8. Describe the layout and working of solar power plant in electrical systems.
9. Build the flow chart of maximum power point tracking system.
10. Illustrate the principle of various types of solar concentrators.
11. Demonstrate the construction and working principle of wind energy systems.
12. Discuss the principle and operation of induction generator in wind energy system.
13. Demonstrate the importance of wind energy system and types of turbines.
14. Generalize the construction and working of nuclear power plant in power systems.
15. Illustrate the effect of non-renewable energy sources on the environment.
16. Apply the concepts of renewable energy sources to solve real-world applications.
17. Possess the knowledge and skills for employability and to succeed national and international level competitive examination.

UNIT-I	THERMAL POWER STATIONS	Classes: 09

Thermal Power Stations: Line diagram of thermal power station, paths of coal, steam, water, air, ash and flue gasses, description of thermal power station components, economizers, boilers, super heaters, turbines, condensers, chimney and cooling towers.

UNIT -II	HYDROELECTRIC POWER STATIONS	Classes: 09
Hydroelectric Power Stations: Elements, types, concept of pumped storage plants, storage requirements, mass curve and estimation of power developed from a given catchment area, heads and efficiencies, simple problems.		
UNIT -III	**SOLAR ENERGY AND PHOTOVOLTAIC SYSTEMS**	**Classes: 09**
Solar Energy: environmental impact of solar power, physics of the sun, solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation, solar radiation data, solar concentrators, collectors, thermal applications, design of standalone solar systems, simple problems. Photovoltaic systems: Photovoltaic effect, semiconducting materials, band gap theory, photo emission of electrons, cell configuration, types of solar cells, cell properties, device physics, electrostatic field across the depletion layer, voltage developed, I-V characteristics, module structure and fabrication, output power and efficiency, fill factor, maximum power point tracking (MPPT), solar grid connected inverters, simple Problems		
UNIT -IV	**WIND ENERGY**	**Classes: 09**
Wind Energy: sources and potential, power from wind, betz criterion, components of wind energy conversion system, types of turbines, horizontal and vertical axis wind turbines, aerodynamics, momentum theory (actuator disk concept), operational characteristics, blade element theory, types of generating systems for wind energy, permanent magnet generators, dc generators, induction generators, doubly fed induction generators, applications of wind energy, safety and environmental aspects, simple problems		
UNIT -V	**NUCLEAR POWER STATIONS**	**Classes: 09**
Nuclear Power Stations: nuclear fission and chain reaction, nuclear fuels, principle of operation of nuclear reactor and components, types of nuclear reactors, pressurized water reactor, boiling water reactor and fast breeder reactor, radiation hazards, shielding and safety precautions, applications.		

Text Books:

1. C L Wadhawa,"Generation, Distribution and Utilization of Electrical Energy", New Age International Limited, New Delhi, 3rd Edition, 2010.
2. V.K Mehata, Rohit Mehta, "Principles Of Power Systems", 4th Edition, 2014.
3. G D Rai, "Non-Conventional Energy Sources", Khanna Publishers, 1st Edition, 2011.
4. G N Tiwari, M K Ghosal, "Fundamentals of Renewable Energy Sources", Narosa Publications, New Delhi, 1st Edition, 2007.

Reference Books:

1. J B Gupta, "A Course in Electrical Power", S K Kataria and Sons, New Delhi, 15th Edition, 2013.
2. M V Deshpande, "Elements of Power Station design", Prentice Hall India Learning Private Limited, New Delhi, 1st Edition, 1992.
3. Mukund R Patel, "Wind and Solar Power Systems", CRC Press, 1st Edition, 1999.
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa.

Web References:

1. https://www.solarpowernotes.com
2. https://www.electrical4u.com/power-plants-types-of-power-plant
3. https://www.iare.ac.in

E-Text Books:

1. https://www.amazon.in/Electrical-Power-Engineering-Reference-Applications
2. https://www.nitt.edu
3. https://www.textbooksonline.tn.nic.in