

## POWER GENERATION SYSTEMS

<b>III Semester: EEE</b>																		
Course Code	Category	Hours / Week			Credits	Maximum Marks												
AEE003	Core	L	T	P	C	CIA	SEE	Total										
		3	1	-	4	30	70	100										
<b>Contact Classes: 45</b>		<b>Tutorial Classes: 15</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>											
<p><b>I. COURSE OVERVIEW:</b>            This course deals with the basic theory, construction, operation, performance characteristics and application of electromechanical energy conversion devices such as synchronous and asynchronous machines. It also facilitates the study of the alternating machines which are the major part of industrial drives and agricultural pump sets.</p> <p><b>II. OBJECTIVES:</b>  <b>The course should enable the students to:</b>            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.</p> <p><b>III. COURSE OUTCOMES:</b>  <b>After successful completion of the course, students should be able to:</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 80%;">CO 1 <b>Demonstrate the layout and working principle of thermal power plant.</b></td> <td style="width: 20%; text-align: right;">Understand</td> </tr> <tr> <td>CO 2 <b>Understand the power developed in hydro-electric power station under various storage capacities.</b></td> <td style="text-align: right;">Understand</td> </tr> <tr> <td>CO 3 <b>Analyze I-V characteristics of the solar energy conservation and deduce the maximum power point tracking algorithm.</b></td> <td style="text-align: right;">Analyze</td> </tr> <tr> <td>CO 4 <b>Summaries the performance of different generators used in windenergy systems.</b></td> <td style="text-align: right;">Remember</td> </tr> <tr> <td>CO 5 <b>Explain the operating principle and applications of nuclear powerstation.</b></td> <td style="text-align: right;">Understand</td> </tr> </table> <p><b>IV. SYLLABUS:</b></p>									CO 1 <b>Demonstrate the layout and working principle of thermal power plant.</b>	Understand	CO 2 <b>Understand the power developed in hydro-electric power station under various storage capacities.</b>	Understand	CO 3 <b>Analyze I-V characteristics of the solar energy conservation and deduce the maximum power point tracking algorithm.</b>	Analyze	CO 4 <b>Summaries the performance of different generators used in windenergy systems.</b>	Remember	CO 5 <b>Explain the operating principle and applications of nuclear powerstation.</b>	Understand
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<b>UNIT - I</b>	<b>THERMAL POWER STATIONS</b>						<b>Classes: 09</b>											
Thermal power station: 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.																		
<b>UNIT - II</b>	<b>HYDROELECTRIC POWER STATIONS</b>						<b>Classes: 08</b>											
Hydroelectric power station: 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.																		
<b>UNIT - III</b>	<b>SOLAR ENERGY</b>						<b>Classes: 14</b>											
Solar radiation: 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.		
<b>UNIT - IV</b>	<b>WIND ENERGY</b>	<b>Classes: 09</b>
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.		
<b>UNIT - V</b>	<b>NUCLEAR POWER STATIONS</b>	<b>Classes: 05</b>
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.		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. C L Wadhawa, "Generation, Distribution and Utilization of Electrical Energy", New Age International Limited, New Delhi, 3<sup>rd</sup> Edition, 2010.</li> <li>2. G D Rai, "Non-Conventional Energy Sources", Khanna Publishers, 1<sup>st</sup> Edition, 2011.</li> <li>3. G N Tiwari, M K Ghosal, "Fundamentals of Renewable Energy Sources", Narosa Publications, New Delhi, 1<sup>st</sup> Edition, 2007.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. J B Gupta, "A Course in Electrical Power", S K Kataria and Sons, New Delhi, 15<sup>th</sup> Edition, 2013.</li> <li>2. M V Deshpande, "Elements of Power Station design", Prentice Hall India Learning Private Limited, New Delhi, 1<sup>st</sup> Edition, 1992.</li> <li>3. Mukund R Patel, "Wind and Solar Power Systems", CRC Press, 1<sup>st</sup> Edition, 1999.</li> </ol>		
<b>Web References:</b>		
<ol style="list-style-type: none"> <li>1. <a href="https://www.solarpowernotes.com">https://www.solarpowernotes.com</a></li> <li>2. <a href="https://www.electrical4u.com/power-plants-types-of-power-plant">https://www.electrical4u.com/power-plants-types-of-power-plant</a></li> <li>3. <a href="https://www.iare.ac.in">https://www.iare.ac.in</a></li> </ol>		
<b>E-Text Books:</b>		
<ol style="list-style-type: none"> <li>1. <a href="https://www.amazon.in/Electrical-Power-Engineering-Reference-Applications">https://www.amazon.in/Electrical-Power-Engineering-Reference-Applications</a></li> <li>2. <a href="https://www.nitt.edu">https://www.nitt.edu</a></li> <li>3. <a href="https://www.textbooksonline.tn.nic.in">https://www.textbooksonline.tn.nic.in</a></li> </ol>		
<b>Course Home Page:</b>		