

**JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE, JAIPUR**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Name of Subject: - POWER GENERATION SOURCES**

**Subject Code: - 7EE6-60.2**

**Year /Sem :- IV / VII**

**Name of Faculty: - 1) MR, Lalit kumar sharma , Assistant Professor**

**2) Mr. Satyendra kumar, Assistant Professor**



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Open Electives Syllabus  
B. Tech.: IV Year- VII & VIII Semester

## 7EE6-60.2: Power Generation Sources.

Credit: 3  
3L+0T+0P

Max. Marks: 150(IA:30, ETE:120)

End Term Exam: 3 Hours

SN	CONTENTS	Hours
1	INTRODUCTION: World energy status, Current energy scenario in India, Environmental aspects of energy utilization, Environment - Economy - Energy and Sustainable Development, Energy planning.	4
2	Conventional Energy Generation Methods: Thermal Power plants: Basic schemes and working principle. Gas Power Plants: open cycle and closed cycle gas turbine plants, combined gas & steam plants-basic schemes. Hydro Power Plants: Classification of hydroelectric plants. Basic schemes of hydroelectric and pumped storage plants. Nuclear Power Plants: Nuclear fission and nuclear fusion. Fissile and fertile materials. Basic plant schemes with boiling water reactor, heavy water reactor and fast breeder reactor. Efficiencies of various power plants	8
3	SOLAR ENERGY: Basic concepts, Solar radiation – Measurement, Solar thermal systems – Flat plate and concentrating collectors, Solar passive space - Solar heating and cooling techniques – Solar desalination – Solar Pond - Solar cooker - Solar dryers-Solar furnaces - Solar pumping, Solar green house- Solar thermal electric power plant – Solar photo voltaic conversion – Solar cells – PV applications, Hybrid systems.	6
4	WIND ENERGY: Introduction-Availability- Wind power plants , Power from the wind, Wind energy conversion systems, site characteristics, Wind turbines types – Horizontal and vertical axis-design principles of wind turbine – Blade element theory, Magnus effect- Performance. Wind energy Applications – Hybrid systems, Wind energy storage, Safety and environmental aspects.	6
5	BIOMASS ENERGY: Biomass – usable forms- composition- fuel properties – applications, Biomass resources, Biomass conversion technologies - direction combustion - pyrolysis – gasification -anaerobic digestion, Bioethanol and Biodiesel Production - Economics - Recent developments.Energy farming, Biogas technology - Family biogas plants, Community and institutional biogas plants – design consideration – applications.	4
6	OTHER RENEWABLE ENERGY SOURCES: Tidal energy – Wave energy – Open and closed OTEC Cycles – Small hydro – Geothermal energy – Social and environmental aspects.Fuel cell technology - types, principle of operation – applications.Hydrogen energy production - Storage – transportation – utilization.	8



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## Open Electives Syllabus

### B. Tech.: IV Year- VII & VIII Semester

#### **TEXT BOOKS**

1. Godfrey Boyle, "Renewable Energy", Power for a Sustainable Future, Oxford University Press, U.K, 1996.
2. Twidell.J.W & Weir.A, "Renewable Energy Sources", EFN Spon Ltd., UK, 1986
3. Tiwari.G.N, "Solar Energy – Fundamentals Design", Modelling and applications, Narosa Publishing House, NewDelhi,2002

#### **REFERENCES:**

1. Freris.L.L, "Wind Energy Conversion systems", Prentice Hall, UK, 1990.
2. Veziroglu.T.N, "Alternative Energy Sources", Vol 5 and 6, McGraw-Hill, 1978
3. Johnson Gary.L, "Wind Energy Systems", Prentice Hall, New York, 1985.
4. "Energy planning in Developed countries (U.N.)", Oxford University Press, 1984.
5. G.D. Rai, "Non Conventional Energy Sources", Khanna Publishers, New Delhi, 1999.
6. S.P. Sukhatme, "Solar Energy", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997
7. "Renewable energy sources of conversion technology:N.K Bansal", Manfred Kleen Man and Michael Meliss, TMH Publication.
8. Kothari P, K C Singal and Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies", PHI Pvt. Ltd.,New Delhi, 2008

## COURSE OUTCOME

**CO1:** To explain the current energy scenario in India.

**CO2:** To analyze the conventional energy generation method.

**CO3:** To Explain the different types of renewable energy and their sources.

			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
7EE6- 60.2	Power Generation Sources	CO-1	3	2	3	2			2							
		CO2	3	2	2	2	2					2	2			
		CO3	3	2	2		2	2	2		2	2	2	2	2	2

Department of Mechanical Engineering

LECTURE PLAN

**Subject :Power Generation sources  
(7EE6-60.2)**

Year/sem:IV/ VII

Faculty-Mr. lallit kumar sharma / Mr. Satyendra kumar

Unit No./ Total lec. Req.	Lecture No.	Topics	Objective of Unit	Outcome of Lecture(Student will be able to...)	Book Refered	From page to
<b>Unit -1 (6)</b>	<b>1</b>	1. Introduction	To give detail knowledge Primary and secondary energy and world energy Comumption and production	Interact about the energy	T1	(T1)1-17
		2.Primary and Secondary Energy				
	<b>2</b>	3. Commercial and Non commercial Energy		compare between different types of energy	T1	(T1)18-30,117
		4. Renewable and Non-Renewable Energ				
	<b>3</b>	5. World energy consumption		know the world energy demand and supply	T1,T3	(T1)121,(T3)21
		6. Energy Demand / Production				
		6.a.Reasons of Increase of Energy Demand				
		6.b.World Energy Production				
	<b>4</b>	7. Trend of International Energy Prices		know about energy scenario in india	T1,T3	(T1)125,(T)323
		8.Current energy scenario in india: facts & figures				
	<b>5</b>	9. Natural Gas		understand about natural gas and oil as fuel	T1	(T1)950
		10. Oil and Gas				
11. Electricity and other energy forms						
<b>6</b>	12.effect of Energy utilization on enviroment	know about the enviroment effect of	T1,T2	(T1)927,(T2)669		

		13. Pollution Control System		energy production		
<b>Unit -2 (10)</b>	<b>7</b>	1. Thermal Power Plant and classification	To understand the working and essential component of thermal power plants (hydro, nuclear, coal)	know about the basic scheme of thermal power plant	T1	(T1)214
		2a. Working Principle				
	<b>8</b>	2.b. Rankine Cycle		understand the working principle of TPP	T1	(T1)230
		3. General Layout of thermal power plant				
	<b>9</b>	4. Main and auxiliary Equipment of power Plant		understand the Different equipments used in power plants	T1,T2	(T1)164,(T2)159
		5. Advantages and disadvantage				
	<b>10</b>	6. Selection parameters of power plant		know about the gas power plants	T1	(T1)177,181
		6.a. Gas Turbine Power Plant				
	<b>11</b>	6.b. Layout of Gas Power Plant		understand the design and layout of gas power plants	T1	(T1)183,198
		7. Open cycle Gas Power Plant				
	<b>12</b>	8. Closed Cycle Gas Power Plants		know about closed and open gas plants	T1,T3	(T1)263,(T3)164
		9. COMBINED STEAM & GAS POWER PLANTS				
	<b>13</b>	10.a. Advantages of gas turbine power plant		know the essential elements of hydro power plants	T1	(T1)328
		11. HYDROPOWER PLANT				
		11.a. Essential Elements Of Hydro Power Plant				
<b>14</b>	12. WORKING OF HYDRO POWER PLANT	know the essential elements of nuclear power plants	T1	(T1)346		
	13. Nuclear Power Plant					
<b>15</b>	14. Requirements of Fission Process	know the principle of nuclear power plants	T1	(T1)328		
	15. Nuclear Reactor					

	<b>16</b>	16. Pressurized water reactor(PWR)		know about PWR and BWR	T1	(T1)307
		17. Boiling Water Reactor(BWR)				
		18. CANDU(Canadian-Deuterium-Uranium) REACTOR				
<b>unit-3 (13)</b>	<b>17</b>	1 Liquid Metal Cooled Reactor	To understand the working and essential component of Solar and wind power plants	know about Liquid metal cooled reactors and waste disposal	T1,T3	(T1)332,418,(T3)163
		1.a. Advantages of SGR				
		1.b. Nuclear Waste Disposal				
	<b>18</b>	2. Safety Measures for Nuclear Power Plants		understand the Safety and site selection of nuclear power plant	T1	(T1)361
		2.a. Nuclear Plant Site selection				
	<b>19</b>	3. NUCLEAR MATERIAL		know the different material used in nuclear power plant	T1,T2	(T1)388,(T2)249
		3.a. FISSILE MATERIAL				
		3.a.1. ISOTOPES OF FISSILE MATERIALS				
	<b>20</b>	4. FUSION ABLE MATERIAS		know the different material used in nuclear power plant	T1	(T1)382
		4.a. OTHER MATERIALS				
	<b>21</b>	5. EFFICIENCY OF POWERPLANTS		know about effeiciency of power plants	T1	(T1)393
		6. Basic concepts				
	<b>22</b>	7. Solar thermal systems		understand the woking of solar power plants	T1	(T1)449-470
7.a Flat plate and concentrating collectors						
<b>23</b>	7.b Solar passive space	know the working and essentials of solar power plants	T2	(T2)313		
	7.c Solar desalination					
<b>24</b>	8.Solar thermal electric power plant	understand the various pricipals of wind energy	T1,T2	(T1)468,T2-317		
	9.Solar photo voltaic conversion					

		10. Wind power plants				
	<b>25</b>	10.a Power from the wind		know the working of wind energy plants	T1,T3	(T1)423,(T3)242
		10.b Wind energy conversion systems				
		10.c site characteristics				
		10.d Wind turbines types				
	<b>26</b>	11. Blade element theory		know the wind energy conversion system and power of wind	T1	(T1)422
		12. Wind energy Applications				
	<b>27</b>	13. Safety and environmental aspects.		understand the Biomass energy	T1,T3	(T1)427,(T3)279
		14. BIOMASS ENERGY				
		15. applications, Biomass resources				
	<b>28</b>	16 fuel properties		know the need of biomass energy and conversion technologies	T3	(T3)653
		17. Biomass conversion technologies				
	<b>29</b>	18. pyrolysis		understand the pyrolysis and gasification	T1,T3	(T1)466,591(T3)597
		19. gasification				
		20. Bioethanol and Biodiesel Production				
<b>Unit - 4 (5)</b>	<b>30</b>	1. Recent developments. Energy farming	To understand the working and essential component of Bio mass power plants	know the recent scenario of energy farming	T1	(T1)486
		2. Biogas technology				
	<b>31</b>	3. Community and institutional biogas plants		know about design consideration in biomass plants	T1	(T1)519
		4. design consideration				
	<b>32</b>	4.a. application		know about design consideration in biomass plants	T1	(T1)540
		4.b. Advantages				

	<b>33</b>	5. OTHER RENEWABLE ENERGY SOURCES		undertant the need of other renewable sources	T1	(T1)508
		5.a Tidal energy				
		6. Troubles in Lubrication				
	<b>34</b>	7. Turbocharging		understand the open and closed OTEC cycles	T1,T3	(T1)595,(T3)607
		8. Wave energy				
<b>Unit -5 (4)</b>	<b>35</b>	1.Open and closed OTEC Cycles	To describe the importance of different othe fuels /Energy souces.	the use Geothermal and small hydro energy	T3	(T3)654
		2. Small hydro Energy				
	<b>36</b>	3. Geothermal energy		analysis the social impact of enegy genraion	T1	(T1)822
		4. Social and environmental aspects				
	<b>37</b>	5. Fuel cell technology		know about Hydrogen energy	T3	(T3)704
		6. Hydrogen energy productio				
	<b>38</b>	7. Hydrogen Transportation		understand about Principal of opration of hydrogen energy	T3	(T3)709
		8. principle of operatio				
<b>BS-1</b>	<b>39</b>	Latest Trends Solar energy			T4	
<b>BS-2</b>	<b>40</b>	Different Materials used in energy produciton with advantages			T4	
<b>Recommended books:</b>						
T1-Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K, 1996.						
T2- Twidell.J.W & Weir.A, "Renewable Energy Sources", EFN Spon Ltd., U.K						
T3- Tiwari.G.N, "Solar Energy – Fundamentals Design", Modelling and applications, Narosa Publishing House, NewDelhi,2002						