



# SWARNANDHRA

## COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Accredited by National Board of Accreditation, AICTE, New Delhi, Accredited by NAAC with "A" Grade – 3.32 CGPA, Recognized under 2(f) & 12(B) of UGC Act 1956, Approved by AICTE, New Delhi, Permanent Affiliation to JNTUK, Kakinada Seetharampuram, W.G.DT., Narsapur-534280, (Andhra Pradesh)

### DEPARTMENT OF MECHANICAL ENGINEERING

#### TEACHING PLAN

Course Code	Course Title	Semester	Branches	Contact Periods /Week	Academic Year	Date of commencement of Semester
19EEX002	NON CONVENTIONAL ENERGY SOURCES	V	Mechanical Engineering	5	2021-22	4-10-2021

#### **COURSE OUTCOMES**

1	Show the need of energy conversion and the analysis of solar radiation. (K1)
2	Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface and solar thermal systems. (K4)
3	Identify the methods and analysis of Wind energy generation and its maximum power point techniques. (K3)
4	Explain basic principle and working of hydro and tidal energy systems. (K2)
5	Explain the Biomass, Fuel cells and Geothermal energy, its mechanism of production and its applications (K2)

UN IT	Out Comes / Bloom's Level	Topics No.	Topics/Activity	Text Book / Reference	Contact Hour	Delivery Method	
I	CO1: Show the need of energy conversion and the analysis of solar radiation. (K1)	<b>Unit-1. FUNDAMENTALS OF ENERGY SYSTEMS:</b>					Chalk & Talk, PPT, Videos Animations
		1.1	Introduction , Energy conservation principle	T1,T2	2		
		1.2	Energy scenario (world and India)	T1,T2	1		
		1.3	Solar radiation: Outside earth's atmosphere.	T1,T2	1		
		1.4	Earth surface – Analysis of solar radiation data	T1, T2	2		
		1.5	Geometry	T1, T2	2		
		1.6	Radiation on tilted surfaces	T1,T2	2		
		1.7	Numerical problems	T1, T2	1		
		1.8	Utilization of different energy Applications around the world	T1,T2	1		
				<b>Total</b>		<b>12</b>	



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		Unit-2. 2. SOLAR THERMAL SYSTEMS				
<b>II</b>	CO2: Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface and solar thermal systems. (K4)	2.1	Liquid flat plate collections	T1, R3	2	Chalk & Talk, PPT, Videos Animations
		2.2	Liquid flat plate collections Performance analysis	T1, R3	2	
		2.3	Introduction to solar air heaters	T1, R3	2	
		2.4	Concentrating collectors	T1, R3	2	
		2.5	solar pond	T1, R3	2	
		2.6	Numerical problems.	T1, R3	1	
		2.7	Solar Thermal Applications around the world	T1, R3	1	
				<b>Total</b>	<b>12</b>	

		Unit-3. WIND ENERGY				
<b>III</b>	CO3: Identify the methods and analysis of Wind energy generation and its maximum power point techniques. (K3)	3.1	Sources of wind energy	T2, R2	1	Chalk & Talk, PPT, Videos Animations
		3.2	Wind patterns – Types of turbines	T2, R2	2	
		3.3	Horizontal axis and vertical axis machines	T2, R2	2	
		3.4	Kinetic energy of wind	T2, R2	2	
		3.5	Betz coefficient – Tip-speed ratio – Efficiency – Power output of wind turbine	T2, R2	1	
		3.6	Selection of generator (synchronous, induction)	T2, R2	1	
		3.7	Maximum power point tracking	T2, R2	1	
		CBS	Recent developments on turbines used in wind power		1	
		<b>Total</b>	<b>11</b>			
		Unit-4. HYDRO AND TIDAL POWER SYSTEMS				
<b>IV</b>		4.2	Basic working principle	T1, T2	2	
		4.3	Classification of hydro systems: Large, small, micro	T1, T2	2	



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<b>CO4: Explain basic principle and working of hydro and tidal energy systems. (K2)</b>	4.4	measurement of head and flow –	T1, T2	1	Chalk & Talk, PPT, Videos Animations
	4.5	Energy equation – Types of turbines –	T1, T2,	1	
	4.6	Numerical problems.	T1, T2	2	
	4.7	Tidal power – Basics	T2		
	4.8	Kinetic energy equation – Numerical problems	T1	1	
	4.9	Wave power – Basics	T1	2	
	4.10	Kinetic energy equation	T1	1	
	CBS	Collaborative works on Hydro and Tidel applications		1	
<b>Total</b>				<b>13</b>	
<b>V</b>	<b>Unit 5. BIOMASS, FUEL CELLS AND GEOTHERMAL SYSTEMS</b>				
	5.1	Biomass Energy:	T1, T2,	1	Chalk & Talk, PPT, Videos Animations
	5.2	Fuel classification –	T1, T2, R3	1	
	5.3	Pyrolysis – Direct combustion of heat –	T1, T2, R3	2	
	5.4	Different digesters and sizing.	T1, T2, R3	2	
	5.5	Fuel cell: Classification of fuel for fuel cell	T1, T2, R3	1	
	5.6	Fuel cell voltage – Efficiency	T1, T2, R3	2	
	5.7	VI characteristics. Geothermal: Classification –	T1, T3	1	
	5.8	Dry rock and hot acquifer –	T1, T3	1	
	5.9	Energy analysis	T1, T3	1	
	CBS	Biomass based Projects and applications		1	
<b>Total</b>				<b>13</b>	
<b>CUMULATIVE PROPOSED PERIODS</b>				<b>Total</b>	<b>61</b>



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Text Books:	
S.No.	
T1	John Twidell and Tony Weir, Renewable Energy Resources Taylor and Francis -2 <sup>nd</sup> edition, 2013
T2	G.D.Rai, Non-conventional sources of Energy Kanna Publications 6 <sup>th</sup> edition 2009.
T3	Ramesh & Kumar, Renewable Energy Technologies, Narosa Publishing, 3 <sup>rd</sup> edition, 1997.
Reference Books:	
S.No.	
R1	John Andrews and Nick Jelly Energy Science: Principles, Technologies and Impacts, , Oxford University Press, 2 <sup>nd</sup> edition, 2017.
R2	Godfrey Boyle , Renewable Energy, Oxford university, 3rd edition, 2013.
R3	Ahmed and Zobia, Ramesh C Bansal, Handbook of renewable technology, World scientific, Singapore. 2010.
Web Details	
1	<a href="https://www.classcentral.com/course/swayam-non-conventional-energy-resources-13039">https://www.classcentral.com/course/swayam-non-conventional-energy-resources-13039</a>
2	<a href="https://onlinecourses.nptel.ac.in/noc22_ge14">https://onlinecourses.nptel.ac.in/noc22_ge14</a>

	Name	Signature with Date
i. Faculty	Dr. Francis luther king.M	
ii. Course Coordinator	Mr. B. Srinivas	
iii. Module Coordinator	Dr. R. Lalitha Narayana.	
iv. Programme Coordinator	Dr. A. Gopichand	

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