

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

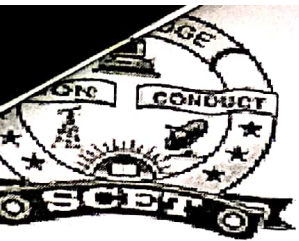
TEACHING PLAN

Course Code	Course Title	Semester	Branches	Contact Periods /Week	Academic Year	Date of commencement of Semester
19EEXO02	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)	Unit-1. FUNDAMENTALS OF ENERGY SYSTEMS:					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		
			Utilization of different energy Applications around the world		1		
		CBS	Total			12	



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II	CO2: Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface and solar thermal systems. (K4)	Unit-2. 2. SOLAR THERMAL SYSTEMS				Chalk & Talk, PPT, Videos Animations
		2.1	Liquid flat plate collections	T1, R3	2	
		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		1	
		CBS		Total	12	

III	CO3: Identify the methods and analysis of Wind energy generation and its maximum power point techniques. (K3)	Unit-3. WIND ENERGY				Chalk & Talk, PPT, Videos Animations
		3.1	Sources of wind energy	T2, R2	1	
		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	
			Total	11		

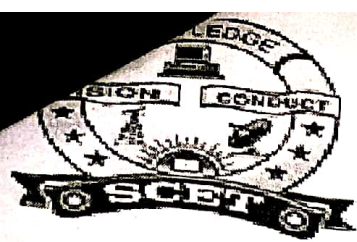
IV		Unit-4. HYDRO AND TIDAL POWER SYSTEMS			
		4.2	Basic working principle	T1, T2	2
		4.3	Classification of hydro systems: Large, small, micro	T1, T2	2



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	CO4: Explain basic principle and working of hydro and tidal energy systems. (K2)	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	
Total					13	
Unit 5. BIOMASS, FUEL CELLS AND GEOTHERMAL SYSTEMS						
V	CO5: Explain the Biomass, Fuel cells and Geothermal energy, its mechanism of production and its applications (K2)	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 aquifer –	T1, T3	1	
		5.9	Energy analysis		1	
		CBS	Biomass based Projects and applications		1	
Total					13	
CUMULATIVE PROPOSED PERIODS					Total	61



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Text Books:

S.No.	
T1	John Twidell and Tony Weir, Renewable Energy Resources Taylor and Francis -2 nd edition, 2013
T2	G.D.Rai, Non-conventional sources of Energy Kanna Publications 6 th edition 2009.
T3	Ramesh & Kumar, Renewable Energy Technologies, Narosa Publishing, 3 rd edition, 1997.

Reference Books:

S.No.	
R1	John Andrews and Nick Jelly Energy Science: Principles, Technologies and Impacts, , Oxford University Press, 2 nd edition, 2017.
R2	Godfrey Boyle , Renewable Energy, Oxford university, 3rd edition, 2013.
R3	Ahmed and Zobaa, Ramesh C Bansal, Handbook of renewable technology, World scientific, Singapore. 2010.

Web Details

1	https://www.classcentral.com/course/swayam-non-conventional-energy-resources-13039
2	https://onlinecourses.nptel.ac.in/noc22_ge14

	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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