

SWARNANDHRA

College of Engineering & Technology(Autonomous)

Seetharamapuram, NARSAPUR, W.G. Dt., 534 280.

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Course Code	Course Title(Regulation)	Sem	Branch	Contact Hrs/Week	Sections
16EEXO02	NON CONVENTIONAL ENERGY SOURCES(R16)	VI	MECH/CIVIL	4	

COURSE OUTCOMES: Students are able to

CO1: Analyze the solar radiation, performance of liquid flat plate collectors and design of PV system sizing and classifying various maximum power point techniques

CO2: Classification of various types of wind turbines, summarize Betz coefficient, Tip-Speed ratio and selection of generators(synchronous, induction)

CO3: Determine large, small, micro hydro systems and types of turbines. Kinetic energy equation for tidal power and wave power.

CO4: Classification of various Biomass fuels, Efficiency, VI characteristics and Geothermal energy analysis

Unit no	Out Comes	Topics/Activity	Ref Text book	Total Periods	Delivery Method	
1	CO1: Analyze the solar radiation, performance of liquid flat plate collectors and design of PV system sizing and classifying various maximum power point techniques	1. Fundamentals of Energy Systems		15	Chalk & Talk, PPT, Active Learning & Tutorial	
		1.1	Energy conservation principle			T1,T3
		1.2	Energy scenario (world and India)			T1
		1.3	Solar radiation: Outside earth's atmosphere Earth surface			T1,T3
		1.4	Analysis of solar radiation data			T1
		1.5	Geometry			T1,T3
		1.6	Radiation on tilted surfaces			T1,T3
		1.7	Numerical problems			T1,T3
2	CO1: Analyze the solar radiation, performance of liquid flat plate collectors and design of PV system sizing and classifying various maximum power point techniques	2. Solar Thermal Systems	T2,R2	16	Chalk & Talk, PPT, Active Learning & Tutorial	
		2.1	Liquid flat plate collections			T2,R2
		2.2	Performance analysis			T2,R2
		2.3	Transmissivity			T2,R2
		2.4	Absorptivity			T2,R2
		2.5	Product collector efficiency factor			T2,R2
		2.6	Collector heat removal factor			T2,R2
		2.7	Numerical problems			
		2.8	Introduction to solar air heaters			
2.9	Concentrating collectors and solar pond					
3	CO1: Analyze the solar radiation, performance of liquid flat plate collectors and design of PV system sizing and classifying various	3. Solar Photovoltaic Systems	T1,R1		Chalk & Talk, PPT, Active Learning & Tutorial	
		3.1	Balance of system			T1,R1
		3.2	IV characteristics			T1,R1

	maximum power point techniques	3.3	System design: Storage sizing, PV system sizing.	T1,R1	10	
		3.4	Maximum power point techniques: Perturb and observe (P&O) technique Hill climbing technique	T1,R1		
4	CO2: Classification of various types of wind turbines, summarize Betz coefficient, Tip-Speed ratio and selection of generators(synchronous, induction)	4. Wind Energy		T1,R1	6	Chalk & Talk, PPT
		4.1	Wind patterns	T1,R1		
		4.2	Kinetic energy of wind	T1,R1		
		4.3	Betz coefficient	T1,R1		
		4.4	Tip– speed ratio,efficiency, Power output of wind turbine			
		4.5	Selection of generator(synchronous, induction)			
		4.6	Maximum power point tracking			
5	CO3: Determine large, small, micro hydro systems and types of turbines. Kinetic energy equation for tidal power and wave power.	5. Hydro and Tidal power systems			8	Chalk & Talk, PPT
		5.1	Basic working principle	T1,R1		
		5.2	Classification of hydro systems: large, small, micro	T1,R1		
		5.3	Measurement of head and flow , Energy equation	T1,R1		
		5.4	Types of turbines	T1,R1		
		5.5	Numerical problems			
		5.6	Tidal power: Basics and Kinetic energy equation			
		5.7	Numerical problems			
		5.8	Wave power , Basics and Kinetic energy equation.			
6	CO4: Classification of various Biomass fuels, Efficiency, VI characteristics and Geothermal energy analysis	6. Biomass, fuel cells and geothermal systems		T1,T3	10	Chalk & Talk, PPT, Active Learning & Tutorial
		6.1	Biomass Energy: Fuel classification, Pyrolysis,Direct combustion of heat	T1,T3		
		6.2	Different digesters and sizing			
		6.3	Fuel cell: classification , Efficiency and VI characteristics.	T1,T3		
		6.4	Geothermal: classification , Dry rock and aquifer	T1,T3		
MID II EXAMINATION DURING ELGTHEENTH WEEK						
END EXAMINATIONS						

Text Books	
1.	BhaveshBhalja, R.P. Maheshwari, NileshG. Chothani, ,Protection and SwitchGear , Oxford University Press, 2013
2.	T.S. Madhava Rao ,Power system protection- Static Relays with microprocessor applications, TMH
3.	C. CHRISTOPOULOS and A. Wright ,Electrical Power System Protection, Springer publications
REFERENCE BOOKS	
1	Badari Ram, D.N Viswakarma, Power System Protection and Switchgear ,TMH Publications.
2.	Paithankar and S.R. Bhide ,Fundamentals of Power System Protection , PHI, 2003.
3	C R Mason , Art & Science of Protective Relaying – Wiley Eastern Ltd.

D.NAGESWARA RAO

Faculty

Head of the Department

Principal