

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MECHANICAL (THERMAL ENGINEERING) (21)

RENEWABLE ENERGY ENGINEERING

SUBJECT CODE: 2712109

M.E. 1<sup>st</sup> SEMESTER

**Type of course:** Major Elective - I

**Prerequisite:** Enthusiasm to learn the course

**Rationale:** The course is designed to give fundamental knowledge and relevant technologies of renewable energy engineering

### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	PA (V)		PA (I)			
					ESE	OEP	PA	RP		
4	2	0	5	70	30	30	0	20	0	150

### Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	<b>Commercial Energy Scenario:</b> Review of energy sources, present energy consumption/utilization pattern –sector-wise in India, environmental impact of fossil fuels, growth of energy sector and its planning in India	4	5
2	<b>Solar Energy :</b> Solar radiation at the earth's surface, solar radiation measurements, estimation of average solar radiation, solar thermal flat plate collectors, concentrating collectors, solar thermal applications; heating, cooling, desalination, drying, cooking, etc, principle of photovoltaic conversion of solar energy, types of solar cells, photovoltaic applications	19	25
3	<b>Wind Energy:</b> Power in the wind, Betz limit, site selection, wind energy conversion devices, characteristics, applications, offshore wind energy, Hybrid systems, safety and environmental aspects, wind energy potential and installation in India.	15	20
4	<b>Bio-Energy:</b> Biomass resources and their classification, biomass conversion processes, thermo chemical conversion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, alcohol production from biomass, bio diesel production, urban waste to energy conversion, biomass energy programs in India	10	25
5	<b>Other Types of Renewable Energy:</b> Principle of ocean thermal energy conversion (OTEC), ocean thermal power plants, ocean wave energy conversion, tidal energy conversion, geothermal energy, geothermal power plants, hydrogen & fuel cell - sources of energy	8	25

**Reference Books:**

1. Solar Energy: Principles of Thermal Collections and Storage by Sukhatme, S.P., McGraw Hill Publishing Co.
2. J. A. Duffie and W. A. Beckman, Solar Engineering of Thermal Process, 2<sup>nd</sup> Ed., John Wiley, New York
3. Soteris A. Kalogirou, Solar Energy Engineering – Process and Systems, Academic Press
4. Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd.
5. Kishore VVN, Renewable Energy Engineering and Technology, Teri Press, New Delhi
6. Bent Sorensen, Renewable Energy, Elsevier Academic Press, 3<sup>rd</sup> Edition
7. Peter Gevorkian, Sustainable Energy Systems Engineering, McGraw Hill
8. D. Y. Goswami, F Kreith and J. F. Kreider, Principles of Solar Engineering, Taylor and Francis, Philadelphia
9. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K.

**Course Outcome:**

After learning the course the students should be able to:

1. Understand the basic concept of renewable energy engineering.
2. Acknowledge, access and analysis various renewable energy system & technology.
3. Evaluate renewable energy related system for a particular application