

# GUJARAT TECHNOLOGICAL UNIVERSITY

## COURSE NAME : NON-CONVENTIONAL ENERGY SOURCES

### 1. RATIONALE :

Energy is an important input in all sectors of country's economy. Standards of living of a country can be directly judged by per capita consumption of energy. Energy sources in general can be broadly categorized as -

- (i) Conventional sources of energy — like fossil fuels such as coal, oil, gas, atomic and hydroelectric energy and
- (ii) Non-conventional sources of energy — such as solar, wind, ocean, geothermal, and bio-mass etc

In general conventional sources of energy are widely used in our daily life and nearly 92% of our energy requirements are met from such sources only. Unfortunately their availability is not universal i.e. in some countries, they are available in plenty whereas in some other countries they are to a very little extent. On the contrary, the non-conventional sources of energy are available everywhere in abundance and may not be exhausted soon.

It is a known fact that resources of conventional fossil fuel in the world in general and our country in particular is limited. The rate at which we are using them, it is likely to be exhausted in near future. As we cannot think of human life without energy, it is, therefore, very essential that non conventional sources of energy be tapped invariably. Students will develop awareness about the technologies involved in tapping such energy resources and then putting them in use effectively for the service of mankind. They may also be apprised of the problem of the limited availability of energy and so to take effective measures to save energy.

### 2. SCHEME OF TEACHING :

TOPIC NO.	NAME OF TOPIC	LECT. HOURS
1.	Renewable Sources of Energy	4
2.	Solar Energy	12
3.	Wind Energy	6
4.	Bio-mass Energy	12
5.	Other Alternative Sources of Energy	4
6.	Energy Conservation and auditing	4
	<b>Grand Total</b>	<b>42</b>

### 3. OBJECTIVES :

1. Understand conventional sources of energy.
2. Identify non-conventional (renewable) sources of energy.
3. Understand the concept of solar radiation.
4. Use and operate different appliances based on solar radiation.

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5. Understand the concept of wind energy and its applications like wind mill wind farm etc.
6. Understand feasibility of as a source of energy
7. Identify different types of biomass energy plants.
8. Apply principles of conservation of energy
9. Understand the concept of energy auditing, energy saving etc.
10. Identify newer and newer renewable sources of energy.

### **4. TOPICS AND SUB-TOPICS :**

#### **TOPIC 1 : RENEWABLE SOURCES OF ENERGY.**

- 1.1 Renewable Sources of Energy such as Hydro, Solar, Wind, Bio-mass, Tidal and Geothermal - their availability and limitations.
- 1.2 Energy crisis and energy demand projection.

#### **TOPIC 2 : SOLAR ENERGY :**

- 2.1 Solar radiation.
- 2.2 Photovoltaic Cell.
- 2.3 Pyranometer.
- 2.4 Solar Thermal Collectors
- 2.5 Solar air heaters.
- 2.6 Solar constant
- 2.7 Solar Cell.
- 2.8 Materials of Solar Cell.
- 2.9 Applications of solar energy

#### **TOPIC 3 : WIND ENERGY :**

- 3.1 Wind map of India, mean wind speed, and wind density during different months in specific areas.
- 3.2 Types of wind mills, their assembly and applications as electric converters, pumping motors
- 3.3 Concept of wind farms, its applications.

#### **TOPIC 4 : BIO-MASS ENERGY :**

- 4.1 Bio-mass as a source of energy.
- 4.2 Energy plantation.
- 4.3 Pyrolysis, Classification and Anaerobic fermentation.
- 4.4 Types of Biogas plants.

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- Their comparative status
- Design and
- Applications.

### **TOPIC 5 : OTHER ALTERNATE SOURCES OF ENERGY :**

- 5.1 Tidal power, sites for tidal power plants in India.
- 5.2 Micro hydel power station
- 5.3 Geothermal energy.
- 5.4 Limitations and applications of such power plants.

### **TOPIC 6 : ENERGY CONSERVATION AND AUDITING :**

- 6.1 Conservation of energy in
  - Domestic appliances and industries
- 6.2 Use of fuel efficiently in vehicles.
- 6.3 Waste recycling.
- 6.4 Fuel gases and heat recovery.
- 6.5 Energy demand management.
- 6.6 Energy accounting and auditing.

## **5. REFERENCES :**

### **(1) Solar Energy :**

- Principles of thermal collection and storage
- by S.P. Sukhatame, Tata McGraw Hills.
- Solar Energy Utilization
- G.D. Rai, Khanna Publishers, Delhi.
- Wind Energy Data for India
- Anna Mani & D.A. Mooley, Allied Publishers.

### **(2) Biogas Technology**

- K.C. Khandelwal, S.S.Mahdi, Tata MGH

### **(3) Power Plant Engg.**

- G.R. Nagpal, Khanna Publishers, Delhi.

### **(4) Energy resources and supply**

- J.T. MacMillan, R. Morgan, R.B. Murray,
- John Willy & sons, New York.

### **(5) Principles of energy conservation**

- A.W. Culp, Tata MGH