22REE201 FUNDAMENTALS OF RENEWABLE ENERGY SOURCES

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Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Fundamentals of Renewable energy, Maintenance of different renewable energy devices.

COURSE DESCRIPTION AND OBJECTIVES:

The main objective is to make the student aware of the various basic aspects of energy and their uses and impart knowledge about the different classifications of energy sources and major renewable energy sources and technologies. To familiarize the students with different bioenergy sources and production technology.

MODULE-1

UNIT-1 **8L+0T+8P=16 Hours**

INTRODUCTION TO ENERGY:

Concept and limitation of Renewable Energy Sources (RES), Criteria for assessing the potential of RES, Classification of RES, Solar, Wind, Geothermal, Biomass, Ocean energy sources, Comparison of renewable energy sources with non-renewable sources.

UNIT-2 **8L+0T+8P=16 Hours**

SOLAR ENERGY:

Energy available from Sun, Solar radiation data, solar energy conversion into heat through, Flat plate and Concentrating collectors, different solar thermal devices, Principle of natural and forced convection drying system

Solar Photo voltaic: p-n junctions. Solar cells, PV systems, Stand alone, Grid connected solar power station, Calculation of energy through photovoltaic power generation and cost economics.

PRACTICES:

- Study of different types of solar cookers.
- Study of solar water heating system.
- Study of natural convection solar dryer & forced convection solar dryer.
- Study of solar desalination unit.
- Study of solar greenhouse for agriculture production.
- Study of solar photovoltaic cell characteristics.

MODULE-2

UNIT-1 **8L+0T+8P=16 Hours**

WIND ENERGY:

Energy available from wind, General formula, Lift and drag. Basis of Wind energy conversion, Effect of density, Frequency variances, Angle of attack, Wind speed, Types of Windmill rotors, Determination of torque coefficient, Induction type generators, Working principle of wind power plant.

SKILLS:

- ✓ *Identify various renewable energy sources.*
- ✓ *Design and development of a solar water heater and solar cooker.*
- ✓ *Production of biogas and producer gas.*
- ✓ *Differentiate various biogas plants and gasifiers.*

UNIT-2 **8L+0T+8P=16 Hours**

BIO-ENERGY:

Pyrolysis of Biomass to produce solid, liquid and gaseous fuels. Biomass gasification, Types of gasifier, various types of biomass cook stoves for rural energy needs.

Biogas: Types of biogas plants, biogas generation, factors affecting biogas generation and usages, design consideration, advantages and disadvantages of biogas spent slurry.

PRACTICES:

- Design of biogas plants.
- Study of a biomass gasifiers.
- Study of a biomass improved cook-stoves.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply renewable energy sources in agriculture energy sector.	Apply	1	1, 2, 3, 9
2	Analyze the principle of construction and working of the various renewable energy devices.	Analyze	1	1, 2, 9, 12
3	Analysing the usage and maintenance of different renewable energy devices.	Analyze	2	1, 2, 9, 12
4	Ability to design and development of solar water heater, solar cooker, windmill, biogas plant and gasifier.	Create	2	1, 2, 9, 12

TEXT BOOKS:

1. G.D.Rai, “Non-Conventional Energy Sources”, Khanna Publishers, Delhi. 2013.

REFERENCE BOOKS:

1. Mathur, A.N and Rathore N.S. ”Biogas production, management and utilization”. Himanshu Publication. Delhi, 2005.
2. Rathore N. S., Kurchania A. K. and Panwar N. L.“Non-Conventional Energy Sources”, Himanshu Publications, 2007.
3. Rathore N. S., Kurchania A. K. and Panwar N. L. “Renewable Energy, Theory and Practice”, Himanshu Publications, 2007.
4. Sukhatme, S.P and Nayak, J.K “Solar Energy: Principles of Thermal Collection and Storage”, Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2010.