

Subject Code: 01ES0601
Subject Name: Renewable Energy Resources
B.Tech. Year: III (Semester-VI)

Objective: To study various sources of Renewable Energy Sources available on Earth

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, student will be able to:

1. To understand the availability of various Renewable Energy Resources.
2. To understand how to harness these Energy Resources.
3. To apply the principles to extract energy out of the resources.

Pre-requisite of course: Fluid flow, Heat transfer, Mass Transfer.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (I)	CSE (C)	Viva (V)	Term work (TW)	
3	2	0	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	Classification of Energy: Energy chain and common forms of usable energy - Present energy scenario - World energy status -Energy scenario in India - Introduction to renewable energy resources - Introduction to Solar Energy - Energy from sun - Spectral distribution of Solar radiation - Instruments for measurement of solar radiation-Solar radiation data Analysis.	4
2	Application of Solar Energy: Thermal applications - Introduction to Solar thermal collectors- Types - Principle of operation of different collectors - Flat plate - Evacuated tube collectors - Compound parabolic collectors - Solar air heaters - Solar dryers -solar cookers - solar stills - Solar ponds - concentrating collectors - line type - point type - Methods of Solar power generation - Power towers.	8

3	Bio Energy Sources: Energy through various processes - Energy through fermentation - Gasification - various types of Gasifiers -Pyrolysis - Fixed bed and fast Pyrolysis - Bio energy through digestion - Types of Digesters- Factors affecting the yield of products	8
4	Wind Energy: Resource assessment - types of wind turbines - selection of components - blade materials - power regulation - various methods of control - wind farms – site selection - off shore wind farms - Solar Wind Hybrid energy systems.	6
5	Ocean Energy: Power generation through OTEC systems - various types - Energy through waves and tides - Energy generation through geothermal systems – types.	8
Total Hours		42

References:

1. "Energy Sources 2nd Edition by G.D. Rai, Khanna Publishers, New Delhi.
2. Energy Technology by Rao & Parulaker, Khanna Publications, New Delhi.
3. World energy Resources, Charles E Brown, Springer 2002.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	25%	25%	20%	10%	-

Instructional Method:

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.



- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Online Web Resources:

1. <http://nptel.ac.in/courses/112105171/>
2. <https://ocw.mit.edu/courses/audio-video-courses/#chemical-engineering>
3. <http://www.msubbu.in/ln/fm/>