



DAYANANDA SAGAR COLLEGE OF ENGINEERING

ShavigeMallechwara Hills, Kumaraswamy Layout, Bangalore-560078
(An Autonomous Institute affiliated to VTU, Approved by AICTE & ISO 9001: 2008 Certified)
Accredited by National Assessment & Accreditation Council (NAAC) with 'A' Grade

RENEWABLE ENERGY SOURCES

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING.

Course code: 19EE6IERES

Credits: 03

L: P: T: S: 3: 0: 0: 0

CIE Marks: 50

Exam Hours: 03

SEE Marks: 50

Course objectives:

1. To make the students understand with the basic concepts of non-conventional energy sources and similar technological systems.
2. To discuss the power generation by different non-conventional energy sources.
3. To discuss the principles of OTEC and production of electricity.
4. To instil the basic knowledge about emerging technologies in renewable sector.

Course outcomes:

At the successful completion of the course, the students are expected to have/be able to:

CO1	List and explain the main sources of energy and their primary applications in the India, and the world.
CO2	Describe the challenges and problems associated with the use of various energy sources.
CO3	Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.
CO4	List and describe the primary renewable energy resources and technologies.
CO5	Explore and explain the need for emerging technologies.

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	0	0	0	0	0	0	0	0	0	0	0
CO2	3	2	0	0	0	0	1	0	0	0	0	1
CO3	3	3	2	0	0	0	1	0	0	0	0	1
CO4	3	3	3	3	0	0	1	0	0	0	0	1
CO5	3	3	3	0	0	0	1	0	0	0	0	1

Program Outcomes:

Engineering Knowledge, problem analysis, Engineer and Society, Environment and sustainability and Ethics

Unit	Course Content	Hours	COs
1	Introduction: Types of energy sources, their availability, need of alternative energy sources, Non-conventional energy sources, Classification of alternative fuels. Scenario of conventional auto fuels, oil reserves of the world. Fuel quality aspects related to emissions. Technological up gradation required business driving Factors for alternative fuels. Implementation barriers for alternative fuels. Roadmap for alternative fuels.	8	CO1 CO2 CO4
2	Solar Energy Basics: Introduction, Basic principle of operation PV cell, Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, concentrating dish type, Solar driers, Solar Green Houses. Wind Energy: Introduction, principle of wind energy conversion. Types of wind machines, applications of wind energy. Site selection considerations. Advantages and disadvantages of WEC systems.	8	CO2 CO4 CO5
3	Biomass Energy: Biogas or Biomethane. History, properties and production of Biogas, classification of biogas plants, biogas storage and dispensing system. Advantages of biogas, hazards and emissions of biogas. Methanol, Ethanol, Butanol, Straight vegetable oil, Biodiesel.	8	CO4 CO5
4	Energy from Ocean: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants– Single basin and Double basin type, Advantages and Limitations of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC	8	CO3 CO4 CO5
5	Emerging Technologies: Fuel Cell, Small Hydro Resources, Hydrogen Energy, and Wave Energy. (Principle of Energy generation using block diagrams, advantages and limitations). Energy Storage: Introduction, Necessity of Energy Storage, and Methods of Energy Storage-Battery storage, super capacitor storage, Superconducting Magnetic Energy Storage (SMES) (brief description using block diagram representation)	8	CO5

SELF STUDY COMPONENT:

Unit 2: Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green Houses

Text Books:

1. Mukund R Patel “Wind and Solar Power Systems Design, Analysis and Operation” Taylor and Francis publishers, 2nd Edition, 2006, ISBN 978-0-8493-1570-1.

2. G. D. Rai, "Non-Conventional Sources of Energy", Khanna Publishers, 4th Edition, 2007.
3. S.S.Thipse "Alternative Fuels". Jaico Publishing House; First edition (25 November 2010). ISBN-10: 8184950780

Reference Books:

1. Sukhatme, "Solar Energy", 2nd Edition, TMH, 2006.
2. Renewable Energy Sources- Twiddle Elbs, 3rd Edition, 2006, ISBN-10: 0419253203.
3. Solar Energy Hand Book – edited by William. C. Dickinson ASISES, Network, ISBN -13: 978-0865716216.
4. Partain, L. D., "Solar Cells and Their Applications". John Wiley & Sons, 3rd edition, 2003, ISBN: 9780470539675.
5. Green, M.A., et al. Solar Cell Efficiency Tables (Version 30). 2007. Prog. Photovolt: Res.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	Tests	Assignments	AAT1	AAT2
Marks (Out of 50)	30	10	05	05
Remember	10		02	01
Understand	15	05	01	02
Apply	05	05	02	02
Analyze				
Evaluate				
Create				

***AAT 1– Alternate Assessment Tool 1: Quiz**

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	Marks Theory(50)
Remember	10
Understand	20
Apply	20
Analyze	
Evaluate	
Create	

About Renewable Energy Sources:

Climate change is giving a major setback in daily life of living things. There is an urgent need for shift of utilization of energy towards renewable energy. This subject helps the students in understanding the global scenario of energy utilization and how the shift from non renewable to renewable energy will cause the potential changes for sustainable world.

The expected global growth in the renewable energy sector will be a crucial need for qualified and skilled engineers with specialist knowledge of the relevant technology. This subject focuses on viable sustainable and renewable sources of energy conversion based on systems using solar, wind and other sources.