Sem.	Course Code	ELECTIVE COURSE I (B) - Renewable Energy Sources	Total Marks: 100		Hours Per Week	Credits
V	17UAOET506		CIA: 25	ESE: 75	4	4

OBJECTIVES

- To create awareness towards the Renewable Energy Sources
- To understand the Operation, Feasibility and Viability of various Renewable Energy Resources

COURSE OUTCOMES:

At the end of the course, Students will be able to

- CO1: Recall the requirement of alternative energy sources
- CO2: Understand the implementation of solar energy systems
- CO3: Exposed to the basics of wind energy extraction
- CO4: Analyse the various resources of biomass energy and their conversion systems
- CO5: Evaluate the hybrid storage systems

UNIT I:

Energy Scenario: Introduction – Energy Resources Utility – Renewable Resources – Non-Renewable Resources – Measurement of Energy – New Technologies in Energy Resources – Environmental Impacts of Alternative Energy Sources – Environmental Issues – Global Warming – Proper utilization and the difficulties in Renewable Energy Resources.

UNIT II:

Solar Thermal Systems: Solar Radiation at the Earth Surface – Electricity from Solar Energy – Solar Constants – Diffuse Solar Radiation – Solar Radiation Measurements – Solar Radiation Data

Types of Collectors: Conversion of Solar Radiation into Heat – Flat Plate Collectors – Concentrating Collectors

Photo Voltaic Technology: Evolution of Photovoltaic cell – Power Generation – Applications of Solar Photovoltaic Systems

Solar Cell: Solar Cell Principle – Solar Cell Configuration – Conversion Efficiency and Power Output – Solar Cell Arrangements.

UNIT III:

Wind Energy: Wind Energy Basics – Nature of the Wind – Wind Power – Power extracted from Wind – Wind distribution and Wind Speed Prediction – Wind Power Systems – Types of Turbine – Stand-Alone and Grid Connected Operation – Environmental Aspects.

UNIT IV:

Biomass: Various Resources – Energy Content – Status of Biomass Energy - Advancements – Conversion of Biomass into Solid, Liquid and Gaseous forms.

Wave Energy: Energy and Power from Waves – Wave Energy Conversion Devices – Geothermal Energy – Ocean Thermal Electric Conversion Systems – Advantages and Disadvantages

UNIT V:

Energy Storage and Hybrid System: Battery Types – Battery Design – Flywheel Energy Relations – Flywheel Design and Components – Fuel Cell Energy – Storage Systems – Ultra Capacitors

Text Book:

S. Sindhuja and P. Sivakumar – Renewable Energy Sources – First Edition 2011: Reprint 2013 – Anuradha Publications, Chennai

Reference Books:

1. Solar Energy Utilization – G. D. Rai - 5th Edition, Latest Reprint 2016 - Khanna Publications, Delhi
2. Solar Energy – C. G. Agarwal - S. Chand & Co, NewDelhi.
3. Biophysics - Dr. S. Thiravia Raj - Saras Publications - Nagerkoil

QUESTION PAPER PATTERN		
SECTION - A	**SECTION - B**	**SECTION - C**
10 x 1 = 10 Marks (Multiple Choice, Four options) Two questions from each unit	**5 x 7 = 35 Marks** (Either or choice) Two questions from each unit	**3 x 10 = 30 Marks** (Answer any three Questions) One Question from each unit