

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**  
**IBRAHIMBAGH, HYDERABAD – 500 031**  
**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**Non-Conventional Energy Sources (Open Elective-I)**  
**SYLLABUS FOR B.E. III SEMESTER**

L: T: P (Hrs/Week):2:0:0	SEE Marks: 60	Course Code: <b>U23OE310EE</b>
Credits:2	CIE Marks: 40	Duration of SEE: 3Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
The course will enable the students to:	On completion of the course, students will be able to
To provide a survey of the most important renewable energy resources and the technologies for harnessing these resources within the framework of a broad range of simple to state- of -the-art energy systems.	<ol style="list-style-type: none"> <li>1. Demonstrate the generation of electricity from various Non-Conventional sources of energy and solar power generation</li> <li>2. Illustrate the generation of energy from wind and generation of energy from waste</li> <li>3. Demonstrate the generation of energy by biomass and fuel cells</li> <li>4. Illustrate the ocean and geo thermal energy generation</li> </ol>

**UNIT-I: Introduction and Solar Energy:**

**Introduction:** Need for Non-conventional energy sources, Types of Non-Conventional energy sources. Renewable energy across the Global and in India. Renewable energy for rural applications, Renewable energy for urban, industrial and commercial applications

**Solar Energy:** Solar cell fundamentals: Semiconductors, Photovoltaic effect, Solar PV cell, module, panel, array, Solar cell operating characteristics: Voltage-current characteristic, energy losses, maximizing the performance. Applications of solar energy, Solar energy program in India, Case study

**UNIT-II: Wind Energy and Waste to Energy:**

**Wind Energy:** Nature of wind, Basic components of Wind Energy Conversion System (WECS), Power extraction from the wind, Applications of wind energy. Wind energy program in India, Case Study

**Waste to Energy:** Key issues, Waste recovery management, Case study

**UNIT-III: Biomass Energy and Fuel Cells:**

**BiomassEnergy:** Definition, Bio fuels, Biomass resources, Biomass conversion technologies: Incineration- Thermo chemical conversion- Bio- chemical conversion. Advantages and disadvantages of biomass energy, Case study

**Fuel Cells:** Definition-Classification of fuel cells, Principle of operation, Hydrogen-oxygen fuel cell, Alkaline fuel cell, Proton exchange membrane fuel cell, Molten carbonate fuel cell, Solid oxide electrolyte cells, Comparison of fuel cells- Advantages and Disadvantages of fuel cells-Applications of Fuel cells. Case study

**UNIT-IV: Ocean Energy and Geothermal Energy:**

**Ocean Energy:** Ocean thermal electric conversion (OTEC) methods: Open cycle and Closed cycle- Principles of tidal power generation-Advantages and limitations of tidal power generation, Case study

**Geothermal Energy:** Geothermal resources- Vapour dominated geothermal plant- Liquid dominated geothermal plant- Applications of Geothermal Energy, Case study

**Learning Resources:**

1. B H KHAN, Non-Conventional Energy Resources, McGraw Hill, 2<sup>nd</sup> Edition, 2009.
2. G. S. Sawhney, Non-Conventional Energy Resources, PHI Learning Pvt Ltd, 2012
3. ShobhNath Singh, Non-Conventional Energy Resources, Pearson, 2016
4. G.D. Rai, Non-Conventional Energy Sources ,Khanna Publishers, New Delhi, 2011.
5. Ashok Desai V, Non-Conventional Energy, Wiley Eastern Ltd, 1990.
6. Mittal K.M, Non-Conventional Energy Systems, Wheeler Publishing Co. Ltd, 1997.
7. Ramesh R, Kurnar K.U, Renewable Energy Technologies, Narosa Publishing House, New Delhi, 1997.

The break-up of CIE : Internal Tests+Assignments+Quizzes

1. No. of Internal Tests	:	<input type="text" value="2"/>	Max. Marks for each Internal Test	:	<input type="text" value="30"/>
2. No. of Assignments	:	<input type="text" value="2"/>	Max. Marks for each Assignment	:	<input type="text" value="5"/>
3. No. of Quizzes	:	<input type="text" value="2"/>	Max. Marks for each Quiz Test	:	<input type="text" value="5"/>

Duration of Internal Tests :90 Minutes