



# BHAVAN'S VIVEKANANDA COLLEGE

OF SCIENCE, HUMANITIES AND COMMERCE

SAINIKPURI

Autonomous College, Affiliated to OSMANIA UNIVERSITY-

Accredited with 'A' Grade by NAAC

Syllabus-B Sc III Year PHYSICS

W.e.f the academic year: 2022-23

Semester VI- Course Name: Renewable Energy and Energy Harvesting

Course Code: GE523 (60 Hours)

Generic Elective

HPW: 4

CREDITS: 4

**COURSE OBJECTIVES:** The course is designed

**COB1:** to bring awareness regarding the necessity of alternate energy sources.

**COB2:** to impart knowledge about wind and bio-mass energy.

**COB3:** to introduce concepts of solar energy and its applications

**COB4:** to divulge fundamentals of thermal and ocean energy

## UNIT I

15 Hours

### Non-renewable energy and renewable energy resources

Non-renewable energy resources-Principles of power generation and transmission. A model of conventional thermal power plant. Advantages of conventional power plants. Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources.

Fossil fuels and nuclear energy, their limitation. Alternate sources of energy, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.

## UNIT II

15 Hours

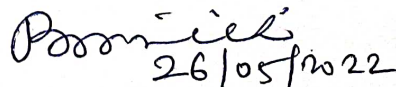
### Wind and Bio mass Energy

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power in wind, electronic interfaces, and grid interconnection topologies.

Principles of Bio Conversion, Energy from waste, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, LPG, and CNG

  
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Hyderabad-500 007. T.S.

  
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### UNIT III

15 Hours

#### Solar energy storage and its Applications:

Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non-convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.

### UNIT IV

15 Hours

#### Geothermal and ocean Energy

Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants, land and their economics. Carbon captured technologies, cell, batteries, power consumption, Environmental issues and Renewable sources of energy, sustainability.

#### Course outcome

By the completion of this course, students should

*CO1: understand necessity of alternate energy sources and conservation of conventional energy.*

*CO2: to impart knowledge about wind and bio-mass energy*

*CO3: to know importance of solar energy and its applications*

*CO4: to outline importance of usage of thermal and ocean energy*

#### Reference Books:

1. Non-conventional energy sources, B.H. Khan, McGraw Hill
2. Solar energy, Suhas P Sukhative, Tata McGraw - Hill Publishing Company Ltd.
3. Renewable Energy, Power for a sustainable future, Godfrey Boyle, 3<sup>rd</sup> Edn., 2012, Oxford University Press.
4. Solar Energy: Resource Assesment Handbook, P Jayakumar, 2009
5. Photovoltaics, J. Balfour, M. Shaw and S. Jarosek, Lawrence J Goodrich (USA).



HEAD  
Department of Physics  
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Poshiki  
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