Course Title: Renewable energy and energy harvesting	Course code: 24MJPH3S
Total Contact Hours: 30	Course Credits: 02
Internal Assessment Marks: 10 marks	Duration of SEE: 1.5 hours
Semester End Examination Marks: 40 marks	

Course Outcomes (CO's):

At the end of the course, students will be able to:

1. Understand the fundamental principles of renewable energy sources and their importance in sustainable development.
2. Analyze different energy harvesting techniques and their efficiency for practical applications.
3. Apply concepts of solar, wind, and bioenergy systems in real-world energy solutions.
4. Evaluate the environmental and economic impact of renewable energy technologies.

Renewable energy and energy harvesting (24MJPH3S)

Unit	Description	Hours
1	**Introduction to Renewable Energy Sources** Overview of Energy Sources: Renewable vs. non-renewable energy, global energy demand, environmental impacts. Solar Energy: Basics of solar radiation, photovoltaic (PV) effect, solar thermal systems, applications. Wind Energy: Wind power generation principles, wind turbines, efficiency, and grid integration. Hydropower and Ocean Energy: Hydroelectric plants, tidal and wave energy, environmental considerations. (6 h) Hands on Session: 1) Solar Cell, 2) Wind energy, 3) Solar Thermal power. Modelling: 1) Hydropower, 2) Tidal (10 h)	16
2	**Energy Harvesting Technologies** Piezoelectric Energy Harvesting: Principles, materials, and applications. Thermoelectric Energy Conversion: Seebeck effect, thermoelectric generators, efficiency analysis. Electromagnetic Energy Harvesting: Basics of inductive and capacitive energy harvesting, micro-power applications. Bioenergy: Biomass energy conversion, biofuels, microbial fuel cells. (6 h) Hands on Session: 1) Seebeck effect, 2) Peltier effect 3) EMF induction Modelling: 1) Biomass, 2) Biofuel (8 h)	14

References

1. Boyle, G. (Ed.). (2012). *Renewable Energy: Power for a Sustainable Future* (3rd ed.). Oxford University Press.
2. Godfrey, B. (2017). *Renewable Energy Engineering and Technology: Principles and Practice*. CRC Press.
3. Priya, S., & Inman, D. J. (Eds.). (2009). *Energy Harvesting Technologies*. Springer.
4. Leonov, V., & Fiorini, P. (Eds.). (2018). *Energy Harvesting for Self-Powered Wearable Devices*. Springer.
5. Twidell, J., & Weir, T. (2015). *Renewable Energy Resources* (3rd ed.). Routledge.
6. Kalogirou, S. A. (2014). *Solar Energy Engineering: Processes and Systems* (2nd ed.). Academic Press.