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## MODULE DESCRIPTOR

### Module Title

Renewable Energy Systems

Reference	EN3571	Version	4
Created	April 2022	SCQF Level	SCQF 9
Approved	May 2017	SCQF Points	15
Amended	May 2022	ECTS Points	7.5

### Aims of Module

To provide students with the knowledge of various renewable energy resources, their environmental impact and the basic principles underlying the physical and technological design and use of renewable energy systems for power generation in our modern society.

### Learning Outcomes for Module

On completion of this module, students are expected to be able to:

- 1 Explain, in principle, how to assess the resources available from alternative energy sources.
- 2 Develop an understanding of physical and technological factors affecting the design of various renewable energy systems.
- 3 Use appropriate numerical techniques relevant to the design and assessment of renewable energy technologies in terms of their potential to contribute towards power generation.
- 4 Discuss the environmental impacts and main factors that determine the role of alternative energy sources in regional, national and world's sustainable energy supply systems.

### Indicative Module Content

Renewable energy introduction: resources, environmental impacts, resources, energy consumption, regional, national and global targets. Wind power: the resource, energy and power in the wind, components of a wind turbine, aerodynamics and blade design, turbine control strategies, electrical energy production, environmental impact, commercial development. Biomass and biofuels: extracting the energy; agricultural residues, energy from refuse, energy crops; environmental benefits and impact. Wave power: resource assessment, generation and factors affecting generation, types, sea states, measuring waves, wave energy converters: components, classification, types, performance; wave scaling. Tidal power: resource assessment, generation and factors affecting generation, types, tidal patterns, tidal turbines, operation, types, performance; tidal barrages. Solar power: solar radiation spectrum; photovoltaics; principles, types and electrical characteristics; remote and grid connected systems, BIPV systems; economics and environmental impact.



**Module Requirements**

Prerequisites for Module	Successful completion of stage 2
Corequisites for module	None.
Precluded Modules	None.

**INDICATIVE BIBLIOGRAPHY**

- 1 Twidell, J.W. and Weir, A.D., 2015. Renewable Energy Resources, 3rd ed. Florence: Taylor and Francis
- 2 Narbel P.A., Hansen J.P., Lien J.R., 2014. Energy Technologies and Economics. Cham: Springer
- 3 MacKay, D.J.C, 2009. Sustainable energy- without the hot air, Cambridge: UIT
- 4 Ptasiński, K.J., 2016. Efficiency of Biomass Energy: An Exergy Approach to Biofuels, Power, and Biorefineries. Hoboken, NJ, USA: John Wiley & Sons