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.

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Module Delivery

Full-time students: This module is delivered by a combination of lectures and tutorials. It will be supported by practical examples and activities including computer based laboratory exercises. Part-time students: This module is delivered by a combination of lectures and tutorials online. It will be supported by drop-in evening sessions and labs on campus. Assessments will primarily be online although exams will be held on campus with the full-time cohorts.

Indicative Student Workload	Full Time	Part Time
Contact Hours	40	40
Non-Contact Hours	110	110
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	150	150
Actual Placement hours for professional, statutory or regulatory body		

ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

Component 1

Type:	Coursework	Weighting:	30%	Outcomes Assessed:	3
Description:	Design problem.				

Component 2

Type:	Examination	Weighting:	70%	Outcomes Assessed:	1, 2, 4
Description:	Closed book examination.				

MODULE PERFORMANCE DESCRIPTOR

Explanatory Text

The module has 2 components and to gain an overall pass a minimum D grade must be achieved in each component. The component weighting is as follows: C1 is worth 30% and C2 is worth 70%.

		Coursework:						
		A	**B**	**C**	**D**	**E**	**F**	**NS**
Examination:	**A**	A	A	B	B	E	E	
	B	B	B	B	C	E	E	
	C	B	C	C	C	E	E	
	D	C	C	D	D	E	E	
	E	E	E	E	E	E	F	
	F	F	F	F	F	F	F	
	NS	Non-submission of work by published deadline or non-attendance for examination						

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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	Ptasinski, K.J., 2016. Efficiency of Biomass Energy: An Exergy Approach to Biofuels, Power, and Biorefineries. Hoboken, NJ, USA: John Wiley & Sons