

MODULE DESCRIPTOR

Module Title

Wind Energy Systems

Reference	ENM509	Version	1
Created	August 2023	SCQF Level	SCQF 11
Approved	September 2023	SCQF Points	15
Amended		ECTS Points	7.5

Aims of Module

To develop knowledge of concepts and principles applicable to wind energy extraction, design and operation of wind turbines under different environmental conditions, and an awareness of the role of wind energy in decarbonising global economies.

Learning Outcomes for Module

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

- 1 Appraise the advancements in the design of wind turbines.
- 2 Evaluate the performance and economics of wind turbines.
- 3 Assess the influence of meteorological aspects on the performance of wind turbines.
- 4 Design wind turbine and assess its performance using advanced numerical tools.

Indicative Module Content

Wind turbine design: Blade element momentum method, NACA blades, chord line and length, camber line and maximum camber, thickness, leading and trailing edges, pressure and suction sides, thin blades, rotor design, stator design, horizontal axis wind turbines, vertical axis wind turbines, fixed bottom offshore wind turbines and floating offshore wind turbines. Wind turbine aerodynamic performance: cut-in speed, rotational acceleration, stages of startup, tip speed ratio, rated speed, coefficient of power, actual and assumed operating points, cut-out speed, power curves, wind power density and capacity factor. Meteorological effects: transient wind, wind gusts, ice accretion, blade erosion, waves, wake dynamics and weather patterns.

Module Delivery

Blended delivery - Lectures and Guided Self Study.

Indicative Student Workload

	Full Time	Part Time
Contact Hours	35	35
Non-Contact Hours	115	115
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	150	150
<i>Actual Placement hours for professional, statutory or regulatory body</i>		

ASSESSMENT PLAN

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

Component 1

Type: Coursework Weighting: 100% Outcomes Assessed: 1, 2, 3, 4
 Description: Individual written report.

MODULE PERFORMANCE DESCRIPTOR**Explanatory Text**

Component 1 comprises 100% of the module grade. To pass the module, a D grade is required.

Module Grade	Minimum Requirements to achieve Module Grade:
A	A
B	B
C	C
D	D
E	E
F	F
NS	Non-submission of work by published deadline or non-attendance for examination

Module Requirements

Prerequisites for Module: None but a background in engineering will be beneficial.
 Corequisites for module: None.
 Precluded Modules: None.

INDICATIVE BIBLIOGRAPHY

- Colin G Anderson (2020) Wind Turbines: Theory and Practice; Illustrated edition, Cambridge University Press.
- Trevor Letcher (2017) Wind Energy Engineering: A Handbook for Onshore and Offshore Wind Turbines; 1st edition, Academic Press.
- James F Manwell, Jon G McGowan, Anthony L Rogers (2010) Wind Energy Explained: Theory, Design and Application; 2nd edition, Wiley.