Module Code	CE7J01
Module Name	J1: Wind Energy
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Asst. Prof. Breiffni Fitzgerald (breiffni.fitzgerald@tcd.ie) **Lecturer(s):** Asst. Prof. Breiffni Fitzgerald
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: LO1. Explain the impact of surface roughness and orography on wind speed profiles. LO2. Calculate wind speed at a given height using the log law and power Laws. LO3. Carry out siting assessment. LO4. Derive the Betz equation for wind power extraction using an idealized Wind turbine. LO5. Calculate power curve to analyse the impact of various control systems in a wind turbine. LO6. Explain concepts related to wind turbine design. LO7. Carry out analysis for stresses generated and fatigue design. LO8. Demonstrate ability to carry out aerodynamic analysis for a wind turbine. LO9. Describe and explain wake effects for wind farms. **Graduate Attributes: levels of attainment** To act responsibly - Attained To think independently - Enhanced To develop continuously - Enhanced To communicate effectively - Enhanced

[1] TEP Glossary

Module Content

To develop a detailed foundation of the issues associated with the development of wind energy for electrical energy supply. The module will focus on the current state of wind energy technology domestically and internationally and will consider the future development of wind resources. Content will include:

- Overview of wind energy and introduction to wind flow.
- Fluid mechanics for wind energy
- Wind resources and siting
- Ideal wind turbines and practical constraints. Power Curves
- Turbine design (tower, blades, gearbox, foundations)
- Aerodynamics ad aeroelasticity
- Wake effects and wind farm design
- Controls in wind turbines
- Offshore wind turbines, Joint wind and wave effects

Teaching and Learning Methods

Teaching strategies:

- Lectures
- Coursework
- Mini projects

Assessment Details[2]
Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Examination	Written examination on campus or on-line [3 hours]	All	70%	End of term
Coursework 1	Problem sheet	LO1 – LO4	5%	4
Coursework 2	Data analysis	LO2, LO3	25%	10

Reassessment Requirements

Reassessment Examination, 3 hours written exam, weighted 100%

Contact Hours and Indicative Student Workload[2]

Contact hours: 36
Independent Study (preparation for course and review of materials): 20

[2] TEP Guidelines on Workload and Assessment

	Independent Study (preparation for assessment, incl. completion of assessment): 70
Recommended Reading List	Wind Energy Explained: Theory, Design and Application (2009) Manwell, McGowen and Rogers, Wiley, 2nd Edition. Wind Energy Handbook (2001) Burton, Sharpe, Jenkins, Bossyani, John Wiley, New York.
Module Pre-requisite	N/A
Module Co-requisite	N/A
Module Website	N/A
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No
Module Approval Date	
Approved by	
Academic Start Year	1st September 2024
Academic Year of Date	2024/2025