Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG5B2
Module Title	Wind and Hydro Energy Engineering
Level	5
Credit value	20
Faculty	FACE (Faculty of Arts, Computing & Engineering)
HECoS Code	100175
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng / MEng Renewable and Sustainable Engineering	Core
BEng Low Carbon Energy, Efficiency, and Sustainability	Core
BEng (Hons) Civil Engineering	Option
BSc Civil Engineering Studies	Option

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	20 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	16 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	36 hrs
Placement / work-based learning	0 hrs
Guided independent study	164 hrs
Module duration (total hours)	200 hrs

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Initial approval date	22nd August 2022
With effect from date	September 2022
Date and details of revision	Jul 2024: addition of Civil Engineering programmes
Version number	2

Module aims

- To equip the student with the capability to master complex specialised skills around renewable energy with an overarching background of planning various renewable energy schemes and the prediction of energy output.
- The enable student to act on their own investigations and initiative together with critical decision making to supply optimum solutions to a specific energy grid demand.
- To challenge the student to develop critical evaluation and selection skills from wind and hydro energy supply profiles matched with storage through self-created methodologies, synthesising ideas, and information to generate an energy secure solution.

Module Learning Outcomes - at the end of this module, students will be able to:

1	Demonstrate an engineering knowledge of the theory, practice, and functionality of wind energy production.
2	Demonstrate an engineering knowledge of the theory, practice, and functionality of hydro energy systems.
3	Analyse ways in which wind and hydro energy sources can be assessed to predict output in a variety of situations.
4	Apply knowledge and design skills to select wind energy and hydro energy solutions for real world scenarios using self-created evaluation.
5	Evaluate the environmental consequences (both positive and negative) of wind energy and hydro energy sources using life cycle analysis.

Assessment

Indicative Assessment Tasks:
This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

100% coursework: The student will work in group (2-3 students per group) to design wind and hydro energy schemes using specialist software and interpret their energy profile. The student will then be tasked with finding the most efficient solution to supply energy using a self-created methodology with a wide range of considerations. Indicative word count: 3000 words per student plus software screenshots and/ or download self-generated reports.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1,2,3,4,5	Coursework	100

Derogations

A derogation from regulations has been approved for this module which means that whilst the pass mark is 40%, each element of assessment requires a minimum mark of 30% for the module to be passed overall.

Learning and Teaching Strategies

The module is taught through a combination of lectures and workshops. An active and inclusive approach is used to engage learners in the topics and will involve individual, group work and flipped *learning* experiences aligned to the university's Active Learning Framework (ALF). The approach offers students a flexible and adaptive learning experience that can accommodate a range of options that includes both on campus learning and remote learning where appropriate.

The Moodle VLE and other on-line materials and resources will be available to support learning. ALF offers a balance between the classroom elements and digitally enabled activity incorporating flexible and accessible resources and flexible and accessible feedback to support learning.

Indicative Syllabus Outline

Wind Energy:

- Wind energy components.
- Wind statistical analyses.
- Principles of wind energy.
- Theoretical power production.
- Aerodynamics, Betz limit.
- Turbine Types.
- Social, economic, legal, and environmental constraints.
- Wind energy reliability, sustainability, and maintainability of energy production process.
- RETScreen (or similar) software, wind farm design.
- Prediction of potential energy.
- Wind energy project design and evaluation.

Hydro energy

- Hydroelectric power. Introduction, components, principles of hydro energy, types of hydro devices,
- River Hydro: High verses low head, prediction of potential energy, costs, benefits. Energy production potential. Design of schemes.
- Wave energy: Introduction, components, principles and nature of wave energy, types of wave energy devices, prediction of energy production. Theoretical and practical design considerations. Design of schemes.

Indicative Bibliography:

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads

E. Hossain, and S. Petrovic, *Renewable Energy Crash Course: A Concise Introductio*n. Springer, 2021.

Other indicative reading
Lecture notes

Online tools