UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Wind and Solar Energy Systems
Module Code	ENG7015-B
Academic Year	2024/5
Credits	20
School	School of Engineering
FHEQ Level	FHEQ Level 7

Contact Hours	
Type	Hours
Directed Study	160
Laboratories	6
Seminars	6
Lectures	20
Tutorials	8

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 2

Module Aims

Renewable and Sustainable Energy sources will dominate the global energy landscape of the future, with particular emphasis upon the two main energy production technologies of Wind and Solar PVs as well as the required downstream storage through the development of multiple battery systems (IRENA, 2023).
This module will focus on two key renewable energy systems, Wind and Solar PV, which are expected to be dominant in global future energy generation.
The module aims to:
* Provide fundamental principles of Wind and Solar PV energy technologies.
* Equip students with in-depth technical skills in design, operation, maintenance, performance evaluation, and economic and environmental impact assessment of Wind and Solar PV energy systems.
* Provide practical skills in operating Wind and Solar PV energy systems in laboratory experiments.

Outline Syllabus
* Introduction to wind energy and solar PV energy * Wind energy resources and wind turbine technologies * Aerodynamics and design of wind turbines * Wind farm structure and analysis * Solar energy resources * Solar cells: operation principle and manufacturing * Photovoltaic systems design * Reliability, operation, and maintenance * Testing, monitoring, and performance evaluation * Economic and environmental impact assessment

Learning Outcomes	
Outcome Number	Description
01	Understand the concepts, operating principles and maintenance practices of Wind and Solar energy systems (AHEP M1, M2).
02	Understand the factors affecting the technical and economic performances and environmental impacts of Wind and Solar energy systems (AHEP M1, M2, M7).
03	Use practical laboratory/workshop skills to measure and analyse the operations and performance of Wind and Solar PV energy systems (AHEP M12).
04	Apply the concepts, principles and appropriate analytical and computational tools to design complex wind farm and solar PV energy systems (AHEP M1, M2, M3, M5, M6).
05	Work effectively as a member or leader of a team to deliver common objectives (AHEP M16).
06	Communicate their design, analysis and conclusions clearly to technical and non-technical audiences (AHEP M17).

Learning, Teaching and Assessment Strategy

The module will be delivered through a combination of lectures, tutorials, laboratory sessions and seminars.

* A series of lectures are organised interspersed with interactive tutorial sessions to help students acquire and strengthen knowledge and understanding of the topics in the syllabus on Wind and Solar energy technologies.

* Each student will have two laboratory sessions to perform the Wind and Solar PV systems operation and measure the performance of the systems. Students will work in small groups with the instructions of lab instructors/demonstrators to gain practical experience about the operations of Wind and Solar PV systems.

* Seminar sessions are organised for the student groups to work together in designing and analysing the Wind/Solar energy systems. Each group will present their ideas, design, explanations, evaluation and justifications in a professional style to the assessment panel of academics/guests with expertise in sustainable energy to receive constructive feedback on their projects during the seminar sessions.

To enhance student?s support and learning experience, the following approaches will be employed:

* Interactive tutorials are designed to further practice the knowledge learned and apply it in practical examples.
* Recent advancements and cutting-edge research are integrated in the lectures to help students develop knowledge and skills in the two key renewable energy technologies and beyond.
* Invited guest lectures from the industry and real-world case studies will be presented as appropriate to further link teaching to real applications and students? future career development.

The assessment of this module is presented in two forms:

1. Formative assessment is performed via:

* Regular tutorial sessions to provide feedback on the group project and provide support as needed, plus sessions prior to and after practical laboratory activities to prepare and support students with writing lab reports.

* Student groups (of 3-5 students per group) are expected to present their final designs in two seminar sessions at the end of the semester and receive feedback from the assessment panel/module tutors. Cross-assessment among different student groups and peer assessment within the same groups enable students to evaluate their work and learn from others.

2. Summative assessment is performed via:

* 001 ? Group project on Wind/Solar Energy systems design (70%): The student groups will receive a brief with the system's overall requirements and be expected to report the design of a Wind farm or a Solar PV farm that meets the requirements together with a comprehensive technical report (include peer assessment) with analysis of the system operational performance, economic and/or environmental assessment of their design. The student groups will present their design and justification to their peers and academics (30 mins per group, 15 mins for presentation +15 mins for Q&A).

* 002- Individual lab report on laboratory experiments (30%): Students are expected to perform experiments in the Renewable Energy Lab and report the system operational outputs individually.

Mode of Assessment			
Type	Method	Description	Weighting
Summative	Coursework - Written	Group coursework (report & presentation) on a selected project on wind or solar energy system design with tech analysis.	70%
Summative	Laboratory Report	Individual laboratory reports on lab experiments (1000 words)	30%
Formative	Coursework	Support and feedback on the progress of the group coursework on wind or solar energy system design	N/A
Formative	Laboratory Report	Feedback on lab experiments (60 mins)	N/A

Reading List
To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html

Please note:
This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.

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