Module specification

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Module Code	ENG6B7
Module Title	Smart Grids, Storage, and Energy Mix
Level	6
Credit value	20
Faculty	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
MEng/BEng (Hons) Renewable and Sustainable Engineering	Core

Pre-requisites

N/A

Breakdown of module hours

Learning and teaching hours	15 hrs
Placement tutor support	0 hrs
Supervised learning e.g., practical classes, workshops	15 hrs
Project supervision (level 6 projects and dissertation modules only)	hrs
Total active learning and teaching hours	30 hrs
Placement / work-based learning	0 hrs
Guided independent study	170 hrs
Module duration (total hours)	200 hrs

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Initial approval date	22nd Aug 2022
With effect from date	Sept 22
Date and details of revision	
Version number	1

Module aims

- To develop a comprehensive depth of knowledge and clear understanding of major theories and principles of domestic, industrial, and business energy demand and low carbon supply.
- To model, analyse and assess smart grids, energy storage with several low carbon energy supply mixes to satisfy a range of criterion.

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

1	To appraise and interpret a range of energy demand and typical energy supply profiles from renewable energy schemes.
2	To evaluate how energy storage can be optimally integrated into energy models
3	To design an optimum smart grid solution, using a range of energy sources and criterion through a self-created methodology.
4	To assess the advantages of localised smart grids and the decentralization of a distributed electricity grid.

In addition to the module learning outcomes, students will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: C7.

Assessment

Indicative Assessment Tasks:

100% Examination: To produce an optimum renewable energy and storage energy model to supply a given demand profile. Indicative exam time: 3 hours.

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

Derogations

A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

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

- Energy grids
- Energy demand profile modelling
- Wind energy production profile modelling
- Solar energy production profile modelling
- Hydro energy production profile modelling
- Energy storage systems and modelling
- Smart grid supply and demand balancing
- Optimising solutions with a range of criterion I.e., cost, reliability, carbon emissions etc.

Indicative Bibliography:

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

Essential Reads

D.B. Rutledge, *Energy: Supply and Demand.* Cambridge University Press, 2019.

Other indicative reading

Lecture resources

https://www.energyinst.org/

Employability skills – the Glyndŵr Graduate

Each module and programme are designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

Core Attributes
Engaged
Enterprising
Creative
Ethical

Key Attitudes
Commitment
Curiosity

Resilience
Confidence
Adaptability

Practical Skillsets
Digital Fluency
Organisation
Leadership and Team working
Critical Thinking
Emotional Intelligence
Communication