Renewable Energy and Sustainable Power Systems

Module Descriptor

Module Code:	REN7ESP
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Renewable Energy and Sustainable Power Systems

Summary Module Details

Module details

Module Title: Renewable Energy and Sustainable Power Systems

Module Leader: Dr Mahmoud Dhimish

Module Mode: Supported online learning / residential short course

Semester: Autumn (UK) / residential short course

Level: 7

Credits: 20

Learning Hours: 200

Contact & Study Hours

Support online learning study mode

Directed Study Time: 60 hrs (30%)

Self-directed Study Time: 70 hrs (35%)

Assessment Study Time: 70 hrs (35%)

Residential short course study mode

Pre-residential directed study time: 40 hours (20%)

Residential (face to face intensive teaching, assessment and workshops) time: 50 hours (25%)

Post-residential directed study time and assessment study time: 110 hours (55%)

Assessment Type

Coursework: 100%

Module Summary

This module introduces the technical foundations of renewable energy and sustainable power systems, exploring the role of renewable technologies in achieving global decarbonisation goals. Students will study the principles, performance, and integration of key renewable energy sources, including solar PV, wind, hydro, and bioenergy, while examining how these interact with power networks, storage, and demand-side management. Emphasis is placed on system design, grid integration, and the challenges of delivering resilient and sustainable energy infrastructure.

Renewable Energy and Sustainable Power Systems

Learning is supported through lectures, case studies, and virtual labs based on real-world datasets supplied by industry partners, ensuring students gain experience with the same data and tools used in professional practice. Assessments are similarly designed around industry-informed scenarios, enabling students to analyse renewable energy performance and evaluate sustainable power solutions within the wider context of the clean energy transition.

Taken on which Programmes

MSc Renewable Energy and AI (C)

Residential Short Course Delivery Programme (E)

Core (C) or Elective (E)

Module Aims

This module aims to:

- Provide students with a solid grounding in the technical principles and operation of renewable energy technologies.

- Develop the ability to critically evaluate system performance and integration challenges in sustainable power systems.

- Enable students to apply engineering analysis tools to model and optimise renewable energy generation and storage.

- Foster awareness of the role of renewable power systems in supporting decarbonisation, resilience, and global sustainability targets.

- Engage students in applied learning through industry datasets and real-world case material to strengthen professional readiness.

Module Learning Outcomes

LO1.	Analyse the principles, performance, and operation of renewable energy technologies (solar, wind, hydro, bioenergy).

LO2.	Evaluate the role of storage, demand-side management, and smart grids in supporting sustainable power systems.

LO3.	Apply system modelling approaches to assess renewable integration within power networks.

LO4.	Critically appraise challenges of scalability, resilience, and sustainability in renewable power systems.

Indicative Module Content

Module topics

- Global Energy Transition: Drivers for decarbonisation, policy frameworks, and net zero targets.

- Solar Photovoltaics: Cell principles, module technologies, performance metrics, degradation and reliability.

- Wind Energy: Aerodynamics, turbine technologies, site assessment, and operational performance.

- Hydropower and Marine: Principles of hydroelectricity, tidal, and wave energy.

- Bioenergy: Biomass, biofuels, and integration into sustainable energy systems.

- Energy Storage: Batteries, hydrogen, and emerging storage technologies.

- Grid Integration: Smart grids, demand-side response, distributed energy systems.

- System Modelling and Analysis: Simulation methods, case studies, and scenario analysis.

This content will be reviewed and updated regularly to reflect the legal, moral and financial changes in professional standards and practice, and the evolving body of knowledge regarding social science research.

Overview of Summative Assessment

Module learning outcomes	Assessment	Word count or equivalent	Weighting
LO1, LO2, LO3, LO4	**Assessment 1** Coursework	2,500	50%
LO1, LO3, LO4	**Assessment 2** Coursework	2,500	50%

Module Pass Mark (as a weighted average of all assessments): 50%

Key Module Learning Resources

Core Sources and Texts

The core reading resources within each module will be provided via the specific Virtual Learning Environment (VLE) module pages and within the e-Library. Additional reference material and supplementary resources to support your studies are available through the University e-Library.

Module tools

Students will have access to study materials, dedicated academic support, student forums, and learning activities via an online learning platform (VLE).

The module page on the VLE is broken down into structured study weeks to help students plan their time, with each week containing a mixture of reading, case studies, videos/recordings and interactive activities to go through. Online webinars/seminars led by the Module Leader can be attended in real time and provide opportunities to consolidate knowledge, ask questions, discuss topics and work through learning activities together. These sessions are recorded to support students who cannot attend and to enable students to recap the session and work through it at their own pace. Module forums on the VLE provide further opportunities to discuss topics with other students, complete collaborative work and get extra help from the module team.

Professional online resources

The e-Library provides access to trusted, quality online resources, selected by subject specialists, to support students' study. This includes journals, industry publications, magazines, academic books and a dissertation/work-based library. For a list of the key industry specific and education resources available please visit the VLE e-Library.

Other relevant resources

Access is also provided to further information sources that include the British Library and Open University UK catalogues, as well as providing a monthly current awareness service entitled, ***Knowledge Foundations*** - a compendium of news, research and resources relating to the educational sector and the Built Environment.

The module resource list is available on the module VLE page and is updated regularly to ensure materials are relevant and current.

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