

Systems Thinking and Infrastructure for the Renewable Transition

Module Descriptor

Module Code: REN7STR
Version: V1.00
Status: Final
Date: 05/11/2025

Summary Module Details

Module details

Module Title: Systems Thinking and Infrastructure for the Renewable Transition

Module Leader: TBC

Module Mode: Supported online learning

Semester: Autumn (UK)

Level: 7

Credits: 20

Learning Hours: 200

Contact & Study Hours

Directed Study Time: 60 hrs (30%)

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

Assessment Study Time: 70 hrs (35%)

Assessment Type

Coursework: 100%

Module Summary

This module introduces systems thinking as a framework for analysing, designing, and managing the infrastructure required to support the renewable energy transition. Students will learn how to model energy systems holistically, considering interdependencies between technical, social, environmental, and economic dimensions. Using digital tools and scenario modelling (including digital twins), the module provides the knowledge and practical skills to evaluate system-wide impacts, infrastructure resilience, and pathways for achieving net zero.

The module is delivered through lectures, interactive labs, and scenario-based exercises grounded in real-world datasets and case studies provided by industry partners. This applied approach equips students with the analytical and professional skills needed to navigate the complexities of energy infrastructure planning and renewable system integration at multiple scales.

Taken on which Programmes

MSc Renewable Energy and AI (C)

Core (C) or Elective (E)

Module Aims

This module aims to:

- Develop students' understanding of systems thinking and its application to sustainable energy infrastructure.
- Provide the tools to analyse energy systems at multiple scales, from local microgrids to national and global infrastructure.
- Enable students to apply scenario modelling and digital twin approaches to explore alternative transition pathways.
- Equip students to critically assess the social, technical, and economic trade-offs inherent in infrastructure planning for renewable integration.
- Expose students to real-world infrastructure challenges through applied datasets and industry-informed modelling tasks.

Module Learning Outcomes

- LO1. Critically analyse systems thinking principles and apply them to the analysis of energy systems.
- LO2. Use scenario modelling and digital twin tools to simulate renewable energy transitions and infrastructure design.
- LO3. Critically evaluate the interdependencies between renewable energy technologies, infrastructure, and policy frameworks.
- LO4. Propose and justify strategies for building resilient, sustainable, and adaptive energy infrastructures.

Indicative Module Content

Module topics

- Introduction to Systems Thinking: Principles, tools, and applications in engineering and energy.
- Infrastructure for the Renewable Transition: Grid integration, smart cities, transport electrification, hydrogen infrastructure.
- Digital Tools for Systems Modelling: Digital twins, simulation platforms, lifecycle analysis.
- Scenario Planning and Foresight: Long-term energy transition modelling, risk and uncertainty.

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- Interdisciplinary Perspectives: Economic, social, environmental, and regulatory contexts.
- Resilience and Adaptation: Planning for shocks, climate change impacts, and system vulnerabilities.
- Practical Skills: Digital Infrastructure Lab 1 & 2 – scenario modelling and digital twin applications, using datasets from industry partners to analyse system resilience and future energy transition pathways.

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	5,000	100%

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

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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.