

# **AI-Driven Decision Systems for Energy Planning**

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## **Module Descriptor**

Module Code: REN7AID  
Version: V1.00  
Status: Final  
Date: 05/11/2025

## Summary Module Details

### Module details

**Module Title:** AI-Driven Decision Systems for Energy Planning

**Module Leader:** Dr Mahmoud Dhimish

**Module Mode:** Supported online learning

**Semester:** Spring (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 focuses on the use of intelligent decision-support systems to guide complex choices in clean energy planning. Unlike earlier module, Data, AI and Ethics for Sustainable Energy Engineering, which introduce the fundamentals of AI and data-driven methods, this module emphasises strategic decision-making under uncertainty, multi-criteria optimisation, and the balancing of technical, economic, and societal trade-offs.

Students will work with advanced modelling techniques, stochastic methods, and optimisation frameworks to address planning challenges such as renewable integration, infrastructure expansion, and energy policy design. Drawing on industry and international case studies, students will apply decision-support tools to evaluate competing transition pathways, manage risk, and justify evidence-based strategies for resilient and sustainable energy futures.

## Taken on which Programmes

MSc Renewable Energy and AI (C)

**Core (C) or Elective (E)**

## Module Aims

This module aims to:

- Introduce decision-support systems and optimisation approaches for renewable and sustainable energy planning.
- Provide practical experience in applying AI and machine learning models to support clean energy decision-making.
- Explore how intelligent decision systems address uncertainty, risk, and trade-offs in energy planning.
- Develop critical skills for evaluating the effectiveness and ethics of decision-support tools in clean energy contexts.
- Strengthen professional readiness by engaging students with authentic planning datasets and industry-informed decision scenarios.

## Module Learning Outcomes

- LO1. Critically evaluate and apply the concepts, techniques, and applications of intelligent decision systems in energy engineering.
- LO2. Apply AI/ML-based models and interpret results to support the design, forecasting, and planning of renewable energy systems.
- LO3. Evaluate trade-offs, uncertainties, and resilience strategies in clean energy planning using decision-support tools.
- LO4. Critically assess the ethical, societal, and environmental implications of AI-driven energy decision-making.

## Indicative Module Content

### Module topics

- Introduction to Decision-Support Systems: Definitions, applications, and role in energy planning.
- Optimisation and Decision Frameworks: Multi-criteria decision analysis, stochastic modelling, lifecycle assessment.
- Artificial Intelligence in Energy Systems: Neural networks, fuzzy logic, reinforcement learning, and hybrid models.

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- Forecasting and Planning: Demand forecasting, renewable energy variability, grid integration challenges.
- Risk and Uncertainty: Sensitivity analysis, scenario planning, and resilience frameworks.
- Ethics and Responsibility: Transparency, fairness, and accountability in AI-enabled decision-making.
- Practical Skills: Application of decision-support tools to industry datasets and international case studies, including scenario analysis and resilience testing.

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, LO4	<b>Assessment 1</b> Coursework	2,500	50%
LO1, LO2, LO3, LO4	<b>Assessment 2</b> 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).

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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.