Advanced Digital Energy Systems

MSc, PgDip, PgCert

Energy supply is fundamentally important to our homes and workplaces. Future energy supply has to be stable, secure, not only affordable but also sustainable, which makes energy systems a complex problem. Digital Energy Systems is an emerging discipline using powerful digital tools and various digital models to solve and manage the increasingly complex modern energy systems. Within this discipline, digital tools and models (such as Artificial Intelligence and Blockchain technology) are used to analyse data from different energy systems and sources and drive new control and operational strategies and business models.

Who is it for?

This course is suitable for Electrical and Electronic Engineering, Computer Science, Mathematics, Engineering and Information Technology and Energy graduates and practicing IT or Energy engineers wishing to pursue a technical management career in the strongly growing digital energy sector. It develops professional engineers and scientists with the multidisciplinary skills and ability to analyse current and future energy engineering problems.

Course structure

- Eight taught modules (40%),
- Group project or dissertation (20%),
- Individual research project (40%).

Informed by industry

We have a world class reputation for our industrial-scale research and pilot-scale demonstration programmes in the energy sector. Close engagement with the energy and transport sectors over the last 20 years has produced long-standing strategic partnerships with the sectors' most prominent players. The strategic links with industry ensures that all of the material taught on the course is relevant, timely and meets the needs of organisations operating within the energy sector. This industry-led education makes our graduates some of the most desirable in the world for energy companies to recruit.

Future career

The international nature of this growing field allows Cranfield graduates to develop diverse and rewarding careers all over the world in industry, government or research.

Example careers:

- Energy Analyst – data science,
- Offshore Energy Analyst,
- Energy and Sustainability Analyst,
- Research Analyst – energy.

We aim to influence your career development from day one. This course will enable you to apply your learning through applied modules and real life assignments, industrially-relevant group and individual research projects; while equipping you with the engineering and management skills you need to make an immediate impact in your career.

Key information

Duration:
MSc: one year full-time, two to three years part-time.
PgDip, PgCert: one year full-time, two years part-time.

Start date:
Full-time: October.
Part-time: October.

Qualification:
MSc, PgDip, PgCert.

Location:
Cranfield campus.

Entry requirements
A first or second class UK Honours degree (or equivalent) in engineering, physics, maths or computer science and information technology/informatics disciplines. Other recognised professional qualifications or several years relevant industrial experience may be accepted as equivalent; subject to approval by the Course Director.

Overview of taught modules

Compulsory modules

(all the modules in this list need to be taken as part of this course).

Sustainable and Conventional Energy Technologies
This module aims to introduce you to the fundamentals of basic sustainable and conventional energy technologies with a view to distinguish key factors that should be considered in planning and operation.

Power Systems Analysis
The module aims to provide you with modelling and simulation skills of design, operation and control a complex power system. These skills are relevant to power industry, such as electricity system operators, power asset owners, distributed network operators, and power system consultancy companies.

Cybersecurity for Energy Systems
This module introduces the cyberspace aspects of digital energy systems. It will focus on threats, actors and exploitation of infrastructure. The module also covers security technologies available to support and protect digital energy systems, as well as security requirements and corresponding vulnerabilities.

Data Analytics and Blockchain
This module will introduce you to data analytics, overview challenges and solutions in this area, present approaches to predictive and descriptive data mining and explain unsupervised learning techniques suitable for new information discovery. Theory of Distributed Ledger Technology and Blockchain will also be introduced in this module. You may benefit from knowledge of basic concepts of statistics for performance assessment and evaluation, and the disruptive technology of Blockchain.

Artificial Intelligence for Energy Systems
With more and more measurement and control devices installed in energy systems, data analytics using AI technology to support planning and operation of energy systems has shown significant advantages. The scientific and technical concepts of machine learning and AI methods/tools and their potential advantages in the energy sector will be taught in this module. One example of this is to use smart metering data to analyse a network's hosting capacity of solar photovoltaic systems, and to analyse a power system's technical and non-technical energy losses. The module aims to provide you with data analytical skills from machine learning and AI technology, and evaluate the advantages/disadvantages of their applications in the energy industry. The module also aims to provide you with essential skills (eg. computer programming and coding likely in Matlab or R) for applying machine learning and AI in the energy industry.

Applications of Blockchain Technology
This module aims to provide you with data analytical skills to evaluate the advantages of application of Blockchain technology in the energy sector. In addition, you will learn essential computer coding skills of writing a private Blockchain network potentially to be used in the energy industry. The scientific and technical concepts of Blockchain technologies and examples of their applications in the energy sector will be taught in this module. The existing challenges in digital energy systems and potential areas of applying Blockchain and its advantages and disadvantages will be discussed in group sessions. A 2-day lab session for simulations will be carried out to allow you to have practical experience and skills in creating a private Blockchain network.

Energy Entrepreneurship
In this world of downsizing, restructuring and technological change, notions of traditional careers and ways of creating value have all been challenged. People are depending more upon their own initiative to realise success. Never, it seems, have more people been starting their own companies than now, particularly to exploit the World Wide Web. There's no single Government (in either the developed or the developing world), which is not paying at least lip service to enterprise development. The aim of this module is to provide you with knowledge and skills relevant for starting and managing new ventures across the entrepreneurial life cycle. Moreover, it will prepare you on how to prepare a business pitch to an investor.

Energy Systems Case Studies
The module aims to provide you with a deep understanding of the truly multidisciplinary nature of a real industrial project. Using a relevant case study, the scientific and technical concepts learned during the previous modules will be brought together and used to execute the analysis of the case study.

Group project

The group project is an applied, multidisciplinary, team-based activity. Often solving real-world, industry-based problems, you are provided with the opportunity to take responsibility for a consultancy-type project while working under academic supervision. Success is dependent on the integration of various activities and working within agreed objectives, deadlines and budgets. Transferable skills such as team work, self-reflection and clear communication are also developed.

Individual project

The individual project is the chance for you to focus on an area of particular interest to you and your future career. You will select the individual project in consultation with the Thesis Co-ordinator, your allocated supervisor and your Course Director. These projects provide you with the opportunity to demonstrate your ability to carry out independent research, think and work in an original way, contribute to knowledge, and overcome genuine problems in the energy industry. Many of the projects are supported by external organisations.

Accreditation and Rankings

In the QS World Rankings 2020, we were ranked 5th in the UK for Mechanical, Aeronautical and Manufacturing Engineering.

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For further information please visit
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