

The logo is a white circle containing a stylized 'C' shape. Inside the 'C' is a smaller white circle, creating a ring-like effect. The text 'Cranfield' is in a bold, sans-serif font, and 'Energy and Power' is in a smaller, regular sans-serif font below it.

**Cranfield**  
Energy and  
Power

Continuing  
Professional  
Development

# Energy and Power

2019/20

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# Welcome



**Professor Phil Hart**  
Director of Energy and  
Power

Continuing professional development provides us all with updated skill sets and new opportunities to make our mark in the world. At Cranfield University, we offer a range of options to enable you to enhance your understanding and develop new competencies throughout your career. These include our large selection of technical short courses, part-time postgraduate study, as well as our innovative Level 7 apprenticeships and research degrees.

Choosing Cranfield University for your professional development gives you access to our knowledge and expertise across the energy and power sector. With an international community and a truly global reputation, our passion for the areas we operate in and our long-standing relationships with some of the most prestigious companies in industry mean that studying at Cranfield University will open doors for you.

Almost half our students study while in employment. Our focus on students both learning and applying knowledge means organisations can rest assured that their employees return to the workplace with significantly enhanced skills. We can also work with your organisation on a bespoke basis, to help you solve pertinent business issues and identify new ways of growing and future-proofing your business.

We have mutually beneficial relationships with nearly 1,500 organisations around the world; from the smallest owner-managed SMEs to the largest multinational conglomerates; British and international universities, non-government organisations and governments.

We are creating leaders in technology and management, unlocking the potential of people and organisations by partnering with business and governments to deliver transformational research, postgraduate education and professional development.

I look forward to welcoming you to Cranfield soon.



# Progression routes

Many of the short courses in this brochure are modules from our popular MSc programmes, as such these modules can be taken for credit. Participants can accumulate credits towards a postgraduate qualification. Typically a one-week course is worth 10 credits.

In order to receive Cranfield credits, delegates must register as an associate student and successfully pass the assessment associated with the course, this is usually an assignment or examination.

Your progression route to a postgraduate qualification (PgDip, PgCert, MSc, MDes) will depend on your chosen postgraduate course of study. Those wishing to take this route will need to check with us which short courses can be considered.

## Postgraduate Diploma

120 credits

Typically the PgDip represents the taught element of the associated MSc, although occasionally the curriculum requires a group project or integrated assessment.

## Postgraduate Certificate

60 credits

Comprises a subset of the syllabus for the taught element of the associated MSc/PgDip course.

## Master of Science

200 credits

Typically requires an individual thesis project on top of the taught elements.



# Climate and Environmental Protection short courses

- Advanced Control Systems,
- Advanced Reaction Kinetics for Energy,
- Biofuels and Biorefining,
- Computational Fluid Dynamics for Industrial Processes,
- Heat Transfer.

## Advanced Control Systems

**This course introduces systematic approaches to the design and analysis of control systems for industrial applications.**

On completion of the course you will:

- Gain comprehensive knowledge about structures of modern computer control systems,
- Develop an awareness of available design tools,
- Become familiar with the methodologies available for applying control in single loop,
- Gain an understanding of the dynamics of processes and modelling methods,
- Gain an understanding of the design process for continuous and discrete controllers for these systems,
- Understand advanced control techniques, such as Kalman Filter and Model Predictive Control.



Five days



This course is an MSc module.



[www.cranfield.ac.uk/acs](http://www.cranfield.ac.uk/acs)

## Advanced Reaction Kinetics for Energy

**This short course provides an understanding of the principles of chemical reaction kinetics, thermodynamics, along with heat and mass transfer phenomena governing chemical reactions.**

On successful completion of this course you will be able to:

- Implement fundamental chemical principals of reactions to transient systems,
- Evaluate the effect of catalysts, and mass and heat transfer phenomena on reaction kinetics,
- Critique varying kinetic models and resistances to reaction rates for different processes.



Five days



This course is an MSc module.



[www.cranfield.ac.uk/arke](http://www.cranfield.ac.uk/arke)



# Biofuels and Biorefining

**Obtain an advanced knowledge of the sources of biomass available for liquid biofuels production and the range of technologies used for conversion of biomass into biofuels.**

The course covers characterisation of biomass and biofuels, conversion processes and existing technologies, and applications of biofuels including their use in alternative engines.

On successful completion of this course you will be able to:

- Identify the range of biomass resources available for liquid biofuels production,
- Evaluate a range of technologies available for liquid biofuels production from biomass and analyse the potential for future reduction in costs through technological development,
- Explain the main theoretical concepts and practical implementation associated to biofuels engineering systems.



**Five days**



This course is an MSc module.



[www.cranfield.ac.uk/bpt](http://www.cranfield.ac.uk/bpt)

# Computational Fluid Dynamics for Industrial Processes

**This course introduces you to computationally-based flow modelling, applicable mainly to single and multi-phase flows.**

On successful completion of this course you will be able to:

- Understand the governing equations for thermo fluids and how to solve them computationally,
- Assemble and evaluate the different components of the CFD process,
- Appreciate the wide range of applications using CFD,
- Compare and contrast the various methods for simulating turbulent flows applicable to mechanical and process engineering,
- Set up the simulation and evaluate a practical problem using a commercial CFD package.



**Five days**



[www.cranfield.ac.uk/cfdip](http://www.cranfield.ac.uk/cfdip)

# Heat Transfer

**This five-day course provides you with an in-depth introduction of the fundamentals of heat transfer and practical tools for solving heat-transfer problems and design of heat-transfer equipment.**

On successful completion of this course you will be able to:

- Demonstrate an in-depth understanding of the principles governing the transfer of heat,
- Demonstrate knowledge of the techniques, tools and skills required to solve typical thermal-related engineering problems,
- Apply the knowledge gained, and acquire independently any further information, for the analysis of energy flows in complicated systems and the design of efficient heat-transfer equipment.



**Five days**



This course is an MSc module.



[www.cranfield.ac.uk/ht](http://www.cranfield.ac.uk/ht)

Providing a sustainable, secure and affordable energy supply is fundamentally important to our lives. Cranfield is advancing the potential solutions in energy and power to ensure our future needs are met.





# Renewable Energy Systems short courses

- Energy Economics and Policy,
- Principles of Renewable Energy Technologies,
- Renewable Energy Technologies: Systems.

## Energy Economics and Policy

**Concerns for energy security, threat of climate change, and uncertainties in the price of energy (the so-called 'energy trilemma') requires transformation of the ways in which energy is produced, delivered and consumed.**

On successful completion of this course you will be able to:

- Critically evaluate the purpose of energy policy, as well as the range of policy strategies and instruments,
- Explain how economic principles govern energy markets and the economics of energy supply,
- Evaluate the approaches for energy market regulation,
- Critically evaluate different approaches for the modelling of energy and environment interactions,
- Identify and evaluate the key issues facing the energy sector (i.e. smart technologies, energy security).



**Five days**



This course is an MSc module.



[www.cranfield.ac.uk/eep](http://www.cranfield.ac.uk/eep)

## Principles of Renewable Energy Technologies

**An understanding of the principles of renewable energy technologies is key to understanding the technological basis of the systems and applications, particularly with regards to the overall energy mix of a specific country.**

The course provides the fundamentals of the renewable energy technologies and their impact on global and national energy system. The purpose of this course is to introduce the basis for assessment of the performances of wind, wave and tidal, hydro-electricity, biomass and waste technologies, and geothermal technologies.

On successful completion of this course you will be able to:

- Articulate the fundamental principles, terminology and key issues related to the major onshore and offshore renewable energy technologies,
- Understand and critically compare the challenges for the development and operation of the major technologies,
- Identify gaps in the knowledge and discuss potential opportunities for further development.



**Five days**



This course is an MSc module.



[www.cranfield.ac.uk/ret](http://www.cranfield.ac.uk/ret)

# Renewable Energy Technologies: Systems

**This course provides detailed knowledge of renewable energy power generation using solar PV and Concentrating Solar Power (CSP) technologies, energy storage and distribution after generation of renewable energy.**

This course also provides you with knowledge in designing and analysing post-generation infrastructure using case studies of the latest technology developments in solar power generation, energy storage, distribution and corresponding renewable energy applications.

On successful completion of this course you will be able to:

- Critically evaluate the key benefits and challenges of solar PV, Concentrating Solar Power, energy storage, and distribution networks in renewable energy,
- Identify the appropriate energy storage and distribution methods for different types of renewable energy systems,
- Analyse the main configurations and components in solar power generation, energy storage and distribution networks for renewable energy systems.



**Five days**



This course is an MSc module.



[www.cranfield.ac.uk/rets](http://www.cranfield.ac.uk/rets)

We deliver high quality research, design and consultancy to assess and develop novel renewable energy technologies.





# Thermal Energy Systems and Materials short courses

- Advanced Maintenance Engineering and Asset Management,
- Engineering Stress Analysis,
- Fluid Mechanics and Loading,
- Risk and Reliability Engineering,
- Structural Integrity.

## Advanced Maintenance Engineering and Asset Management

**This course provides the knowledge and skills necessary to design advanced maintenance, monitoring and asset management strategies for complex engineering systems through the lifecycle.**

On successful completion of this course you will be able to:

- Identify and recognise the asset management best practices and advanced maintenance strategies for engineering systems in different industries,
- Analyse key and fundamental aspects of system's life-cycle and understand the financial implications involved with assessing the maintenance and risk factors,
- Differentiate between classical maintenance strategies and novel maintenance strategies and evaluate their main advantages and limitations,
- Determine the concept and utilise applications of Monte-Carlo Simulation and Bayesian Network in system reliability and availability assessment.



Five days



This course is an MSc module.



[www.cranfield.ac.uk/rearm](http://www.cranfield.ac.uk/rearm)

## Engineering Stress Analysis

**This course brings together theoretical and computational stress analysis through Finite Element simulations, allowing delegates to appreciate how the two disciplines interact in practice and what their strengths and limitations are.**

On successful completion of this short course you will be able to:

- Develop a strong foundation on stress analysis and demonstrate the ability to analyse a range of structural problems,
- Understand the fundamentals of Finite Element Analysis, be able to evaluate methodologies applied to the analysis of structural members (beams, plates, shells, struts), and critically evaluate the applicability and limitations of the methods and the ability to make use of original thought and judgement when approaching structural analysis,
- Demonstrate an in-depth awareness of current practice through case studies of engineering problems.



Five days



This course is an MSc module.



[www.cranfield.ac.uk/esa](http://www.cranfield.ac.uk/esa)

## Fluid Mechanics and Loading

**This course provides a theoretical and applied understanding of fluid mechanics and fluid loading. Practical applications where the aerodynamic, the hydrostatic and hydrodynamic loads typically acting on marine structures (oil & gas, offshore renewable energy) are analysed and discussed.**

The course aims to give you the tools to manage problems of structures-fluid interactions. A theoretical background on basic fluid mechanics is given, followed by a focus on aerodynamic and hydrodynamic loading on structures, particularly offshore and sub-sea. It also presents the dynamics of floating bodies, from simple hydrostatics to complex dynamic response in waves.

This course covers a wide range of principles and theories which fall within the following two broad subject areas:

- Principles of fluid dynamics,
- Dynamics of floating bodies.



**Five days**



This course is an MSc module.



[www.cranfield.ac.uk/fml](http://www.cranfield.ac.uk/fml)

## Risk and Reliability Engineering

**This course introduces the basic principles and fundamental techniques of risk and reliability analysis.**

Relevant concepts covered are of interest to most engineers as industry is increasingly adopting more risk-oriented approaches for optimisation of decision making processes across a variety of engineering disciplines and related applications. Delegates attending this course will develop directly applicable skills through practical engagement of the most widely applied methods.

On successful completion of this course you will be able to:

- Identify and analyse the concepts and principals of risk and reliability engineering and their potential applications to different engineering problems,
- Assess and analyse appropriate approaches to the collection and interpretation of data in the application of risk and reliability engineering methods,
- Evaluate and select appropriate techniques and tools for qualitative and quantitative risk analysis and reliability assessment.



**Five days**



This course is an MSc module.



[www.cranfield.ac.uk/rre](http://www.cranfield.ac.uk/rre)

## Structural Integrity

**This course provides a general understanding of pertinent issues concerning the use of engineering materials and practical tools for solving structural integrity and structural fitness-for-service problems. The focus of this course is on energy and power applications.**

The course gives you the background to oversee the implementation of engineering criticality and structural integrity based fitness-for-service assessments of large steel structures and components through an integrated understanding of engineering materials, fatigue, fracture mechanics, inspection and reliability models, tests and standards.

This course covers a range of core topics related to structural integrity, including but not limited to:

- Fatigue crack initiation and growth,
- Fracture mechanics,
- Non destructive testing methods.



**Five days**



This course is an MSc module.



[www.cranfield.ac.uk/esi](http://www.cranfield.ac.uk/esi)





# Part-time postgraduate study

**The following postgraduate programmes are available part-time over two-to-three years. They benefit from Cranfield's long-standing expertise for delivering high-quality master's programmes alongside being relevant to industry ensuring content meets the expectation of employers.**

If you already have short course credit points from an associated programme why not develop your skills further?

## Advanced Chemical Engineering

Chemical engineering is key in addressing global challenges relating to the sustainable supply of clean energy, food and water, through the production of chemicals, functionalised products and fuels. The MSc in Advanced Chemical Engineering provides technical and management training that employers increasingly demand from chemical engineers.

The course offers a **general** route or an **engineering** route and is unique in this respect.

## Advanced Mechanical Engineering

You will learn state of the art mechanical engineering methods, apply them to real world problems via industrially focused modules and research projects, whilst gaining the essential management skills to bring your ideas to life. Ranked in the UK top 5 for mechanical engineering, Cranfield offers a unique, postgraduate-only environment, with near-industrial scale engineering facilities and a teaching team with extensive experience of solving real world issues within industry.

## Advanced Process Engineering

This MSc is ideal for candidates with engineering and applied science backgrounds who want to dedicate their career to solving

global challenges via process engineering. Process engineers play a pivotal role in contributing to and meeting emission reduction targets and, subsequently, global warming mitigation. You will become proficient in the use of state-of-the-art approaches applied throughout the process development process to deal with the major operational and design challenges. You will receive the up-to-date technical knowledge and develop skills required for achieving the best management, design, control and operation of efficient process systems.

## Energy Informatics

Energy supply is fundamentally important to our homes and workplaces. Future energy supply has to be stable, secure, not only affordable but sustainable, which makes energy supply a systems engineering problem. Energy informatics is an emerging discipline that utilises powerful tools from modern information technology to analyse data from different energy systems and sources to solve energy supply problems.

## Energy Systems and Thermal Processes

Rational and economic use of energy, with the least damage to the environment, is vital for the future of our planet. Achieving energy efficiency and reducing

environmental pollution are increasingly important aspects of professional engineering. This course equips you with an in-depth understanding of the fundamental issues of energy thrift in the industrial and commercial sectors, enabling a successful career as an environmentally aware energy professional.

## Offshore Engineering

Offshore engineering is a rapidly developing discipline. In addition to its traditional relevance to the oil & gas industry, it is expanding to embrace the novel engineering challenges presented by the offshore renewable energy industry.

## Renewable Energy

A choice of study routes (management or engineering) enables you to specialise in developing the state-of-the-art technical skills required to design renewable energy systems, or to focus on managing renewable engineering projects and systems. Ranked in the UK top 5 for mechanical engineering, Cranfield offers a unique, postgraduate-only environment, unique engineering-scale facilities for the development of efficient renewable energy technologies with low CO2 emissions and a teaching team with extensive experience of solving real world renewable energy challenges.

[www.cranfield.ac.uk/studyenergy](http://www.cranfield.ac.uk/studyenergy)



# In-company and customised training

**How can you help your business and employees reach their full potential?  
Have you considered in-company training, tailored to your business needs?**

Our insight is rooted in our powerful industry links, world-class research and what works in practice. As such, we can make a real difference to you and your organisation, whether you are a multi-national company, a growing SME or a small start-up. Benefit from having tailor-made courses specific to your business needs, at a time and place that suits you.

We can provide a range of programmes from half-day workshops, to intensive week-long training, informed by the latest research and delivered by leading experts in the field.

Talk to us about how we can develop your staff and enhance performance in your organisation.

E: [shortcourse@cranfield.ac.uk](mailto:shortcourse@cranfield.ac.uk)



# Masterships® Master's-level apprenticeships

**Cranfield Masterships® are master's-level degrees which meet the requirements of the UK Government Level 7 Master's Degree Apprenticeship Standard. These enable you to use your Apprenticeship Levy to accelerate the development of your middle and senior managers, and employees in senior technical positions as they move into leadership positions.**

Our current Masterships® include:

- Bioinformatics Apprenticeship Standard,
- Postgraduate Engineer Apprenticeship Standard,
- Senior Leader Apprenticeship Standard,
- Systems Engineering Apprenticeship Standard,
- Through-life Engineering Services (TES) Specialist Standard.

[www.cranfield.ac.uk/masterships](http://www.cranfield.ac.uk/masterships)





# Research degrees

DBA

EngD

MRes

MPhil

PhD

**Our research degrees are also available to study part-time. As a part-time research student you will be in good company, over a third of all our students study part-time.**

Cranfield's dynamic, research intensive and specialised position means our research students are able to study exciting projects that have an impact globally and make a practical difference to the world.

There are three ways to study a research degree at Cranfield.

- **Funded research opportunities** – we offer a range of fully funded research opportunities, often in collaboration with Industry and research Councils.
- **Individual research projects** – self funding allows you to explore an area of research that you are passionate in, you will first need to develop a research proposal with support from an academic supervisory team.
- **Employment related research projects** – if you and/or your employer have a concept for a research project linked to your area of work then we can help develop and support this.

For more information on our research degree opportunities, entry requirements or to make the first step in an individual research project visit: [www.cranfield.ac.uk/research](http://www.cranfield.ac.uk/research)



# Staff

**One of the strengths of Cranfield is that we bring together a world-class group of experts to share their experiences. This large academic team is led by renowned sector experts, and is organised into research and teaching centres, as below:**



**Professor Philip Longhurst**, Head of Climate and Environmental Protection Centre



**Professor Chris Sansom**, Head of Centre for Renewable Energy Systems



**Professor Nigel Simms**, Head of Centre for Thermal Energy Systems and Materials



**Dr Nazmiye Ozkan**, Head of Centre for Energy Systems and Strategy

# Past attendees

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**Across our range of courses, we have welcomed many high-profile organisations. These include, but are not limited to:**

- Alstrom,
- BBSRC,
- BP,
- Department of Energy and Climate Change,
- Dong Energy,
- EDF Energy,
- E.ON,
- Saudi Aramco,
- Siemens,
- Total.



# Location

## How to find us

Cranfield University is located about halfway between London and Birmingham, and on the outskirts of Milton Keynes. Junctions 13 and 14 of the M1 are five minutes away and Milton Keynes railway station is 20 minutes away by taxi. London Luton, Stansted and Heathrow airports are 30, 90 and 90 minutes away respectively by car, offering superb connections.



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