Continuing Professional Development Energy and Power Courses
Boost the productivity of your energy assets, structures, strategy and operations

“Brilliant delivery and very well organised and the material covered all the aspects any professional risk engineer would need to cover.”

Sina Bartley, SK Projects & Engineering Limited, Participant of the Risk and Reliability Engineering course, 2015
Welcome to Cranfield’s Energy short courses

The changing energy landscape presents exciting opportunities and the potential to lead in new technologies and services related to low carbon energy and power generation. Discover our world leading short courses.

Boost the productivity of your energy asset structures, strategy, people and operations with Cranfield University’s world leading energy short courses.

We run a wide range of courses that help you build capability and skill to operate and run viable, secure, reliable and affordable plants whilst meeting challenging carbon reduction targets.

Offshore engineering advantage
The field of offshore engineering is laden with opportunities that test your organisation’s ability to rise to new heights of skill, expertise and courage. These offshore engineering courses will help you gain a powerful advantage:

- Advanced Offshore Inspection and Evaluation.
- Fundamental and Practical Offshore Inspection and Monitoring.
- Offshore Inspection.
- Offshore Pipeline Design and Installation.

Productivity improvement programmes
When improving plant performance, leveraging productivity improvements is a lower cost, very powerful way to realise business targets. Discover programmes on:

- Process Plant Operation.
- Advanced Control Systems.
- Fluid Mechanics and Loading.

“The course was very interesting, covering a wide range of aspects of the subject and giving a thorough understanding of combined heat and power and its application.”

Eugen Frantiu, British Gypsum/Saint-Gobain, Participant of the Combined Heat and Power course, 2015
Advanced Control Systems

This course introduces systematic approaches to the design and analysis of control systems for industrial applications. To deal with various energy challenges we are facing today, advanced control systems play an important role in various industrial sectors. It introduces systematic approaches to the design and analysis of control systems for industrial applications. These approaches will be exercised through a number of hands-on sessions to ensure delegates will be able to apply techniques learned in their actual work. The course will be delivered by a team of leading academics and experienced industrial engineers in industrial automation systems.

Course objectives
- 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.

Who should attend?
The course will be of particular interest to automation engineers employed in various industries, such as process, energy, water, oil & gas, pharmaceutical and food industries, who are involved with process automation and control, either in the design or development of control systems, their application, operation and management.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/acs
or call an advisor on:
T: +44 (0)1234 754189
Anaerobic Digestion of Waste

This short course will provide you with an understanding of waste anaerobic digestion process and design, a technical overview of the processing and recovery of energy from organic materials, and the organic fraction of municipal solid waste by anaerobic digestion.

Course objectives
- Understand the biochemistry of anaerobic digestion.
- Scope and evaluate the requirements of anaerobic digestion of waste.
- Critically evaluate factors that influence anaerobic digestion and approaches to optimise anaerobic digestion process.
- Describe the key requirements of quality protocols.
- Identify and evaluate energy requirements of anaerobic digestion process.

You will learn the importance of controlling and understanding variables such as:
- VFA (Volatile Fatty Acid).
- Ripley ratio.
- Carbon to Nitrogen ratio.
- pH.
- Gas flow rate.
- Temperature.
- Acidity.
- Mixing.

Who should attend?
Knowledge gained through this course will improve the confidence of plant operatives and will enable them to contribute more to improvements in optimising methane yields and profitability.

Course duration
One day

Upgrade this course
This course is part of an MSc module.
Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/adw
or call an advisor on:
T: +44 (0)1234 754189

www.cranfield.ac.uk/energyshortcourses
The aim of the course is to provide students with an advanced knowledge of the sources of biomass available for liquid biofuels production and the range of technologies used for conversion of the biomass into biofuels. It covers characterisation of biomass and biofuels, conversion processes and existing technologies, and applications of biofuels including their use in alternative engines.

Course objectives
On completion of the course, you will:

- 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.
- Get familiar with the concept of biorefinery and critically evaluate the potential of biorefining processes.

Who should attend?
The course will be of particular interest to process, project and consultant engineers involved in bioenergy, petrochemical and chemical industries. The course would be also of benefit for researchers who need to understand the background of their research, and managers who want to understand technical issues to aid decision making in the biofuels sector.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/bpt
or call an advisor on:
T: +44 (0)1234 754189
To mitigate climate change while meeting energy demand, the UK and other developed countries have set ambitious targets to reduce carbon emissions through Carbon Capture and Storage (CCS). This short course introduces different technologies and strategies for CO2 emission reduction from power generation and energy intensive industries. The course will be delivered by a team of leading researchers working on different aspect of CO2 capture from material, process modelling through to integration.

**Course objectives**

- Explain different carbon capture approaches and carbon separation technologies.
- Demonstrate an in-depth understanding of post-combustion carbon capture with chemical absorption.
- Evaluate critically the advantages and limitations of various carbon capture approaches and separation technologies.
- Demonstrate the ability to select different carbon separation technologies for different scenarios of power plants based on performance index.

**Who should attend?**

This Carbon Capture Technologies course is suitable for engineers in the power generation or energy sectors and researchers who have aspiration to work in this challenging field.

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**Course duration**

Five days

**Upgrade this course**

This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

**Book online**

www.cranfield.ac.uk/cct

or call an advisor on:

T: +44 (0)1234 754189
This Carbon Transport Technologies course intends to integrate topical issues in the structural design and operation, as well as environmental aspects, of pipelines and other systems used for the transport of carbon, mainly produced as part of the Carbon Capture and Storage (CCS) process.

**Course objectives**

- Gain a systematic understanding of carbon transport systems.
- Demonstrate an in-depth awareness of current practice and its limitations on issues of corrosion and safety of carbon transport pipelines.
- Be able to evaluate methodologies applied to the structural integrity of carbon transport systems for design component/material and selection.
- Develop a critical and analytical approach towards the economy and environmental aspects of carbon transport pipelines.

**Who should attend?**

Delegates with an engineering/applied science degree or relevant industrial experience will benefit most from the course content. Typical roles include engineers (staff, senior, principal), executives, technical staff and consultants.

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**Course duration**

**Five days**

**Upgrade this course**

This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

**Book online**

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

or call an advisor on:

**T: +44 (0)1234 754189**
Combined Heat and Power

There is increasing pressure for all organisations to satisfy their demand for heat and electricity in a more cost-effective, carbon-clean and energy-efficient way. By generating heat and power simultaneously, Combined Heat and Power (CHP) – also known as Cogeneration - offers the most significant opportunity to enhance the overall efficiency, reduce energy costs and improve environmental performance, while ensuring at the same time an increased flexibility and reliability of energy supply.

Course objectives
The course will build up the delegates’ understanding and knowledge of CHP technologies with conventional fuels and renewables. More specifically, on completion of the course, delegates will be able to:

• Explain the operational characteristics of the major components of a CHP plant and appraise their design and off-design performance.
• Discuss technical, economic and environmental risks and benefits of various CHP technologies
• Apply appropriate methods available to assess financial viability of a cogeneration system considering several factors.
• Identify the most appropriate plant size and select a suitable cogeneration system.
• Outline the optimisation and development of the CHP technology in response to current and future challenges, market outlook and users’ requirements.

Who should attend?
The course is of benefit to project engineers, consultant engineers, designers and energy managers in the oil, gas, power and process industries. It is appropriate for both user industries and manufacturers of CHP equipment and is becoming of interest to architects and consulting engineers of building complexes. It will also be useful to local and central government officers with responsibility for energy policy.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/chp
or call an advisor on:
T: +44 (0)1234 754189
Natural gas is the fuel of the 21st century, so much so that the International Energy Agency has suggested we are entering a Golden Age of Gas. Unconventional gas from hydraulic fracturing, gas hydrates, coal bed methane, underground gasification, and bio-gas are increasingly being incorporated into the natural gas supply system. Each of these has its own challenges, and some of them are immensely controversial, various nations have declared moratoria on their development because of environmental concerns.

Nonetheless the economic potential of such sources is so large that there is already a commitment in the UK to proceed from the highest levels, and in the USA, the development of such gas sources will likely ensure coal fired power is phased out, and will also transform its chemical industry, with possibly devastating results for the European industry. In the light of these developments a proper understanding of both the potential and risks associated with the development of such resources is critical to anyone interested in the world energy outlook.

**Course objectives**

- Explain why natural gas is the preferred fossil fuel (in terms of its handling, and combustion properties with different types of energy systems) and explain both its benefits and challenges if it is to be used in a carbon constrained world.
- Demonstrate a systematic understanding of the different sources from which natural gas is likely to be extracted, and explain what the limits to those resources are, and what environmental and economic issues are associated with its extraction, including any geographical or geological related issues.
- Critically evaluate the environment issues associated with the use of unconventional natural gas.

**Who should attend?**

This course is delivered through a balanced combination of lectures and practical sessions and suitable for various gas production industry practitioners.

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**Course duration**

Five days

**+10 credits**

Upgrade this course

This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

**Book online**

www.cranfield.ac.uk/cugp

or call an advisor on:

T: +44 (0)1234 754189
This short course covers both fundamental and applied fluid mechanics topics required to understand the aero/hydrodynamic characteristics of wind, wave and tidal current energy systems. Some very recent topics such as modelling of tidal turbine arrays are also discussed.

Course objectives
- Explain how the wind, waves and tides are formed, factors that influence their distribution and predictability.
- Review the fundamental equations for fluid behaviour, characterisation of flow structures and forces and moments acting on lifting bodies.
- Evaluate and select the most appropriate engineering performance model to undertake the simulation of a practical problem and critically assess the solution.

Who should attend?
Those who are interested in fundamental aero/hydrodynamic design of offshore renewable energy systems, such as wind, wave and tidal current energy devices and their arrays.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/dmfed
or call an advisor on:
T: +44 (0)1234 754189
Energy Production, Emissions Control, Carbon Capture and Transport

Energy supply involves the integration of electricity and heat generation technologies (along with nuclear and renewable options) combined with the transmission and distribution to customers. This short course provides a basic understanding of current and future systems, the technologies required for compliance with current environmental legislation and the developments to meet future restrictions on the emission of greenhouse gases, primarily CO2.

Course objectives
- Demonstrate an understanding of the various technologies used in electricity and heat generation and their current status of development.
- Demonstrate an understanding of methods developed to control emissions and other residues, including their advantages, disadvantages and commercial readiness.
- Demonstrate an understanding of the issues associated with energy supply and the impact of global warming.
- Demonstrate an understanding of methods for the control of greenhouse gas emissions and their integration into energy systems, including CO2 capture, transport and storage.

Who should attend?
The course is for engineers, scientists, technical managers/operators and post graduate researchers working in the field of low carbon conversion technologies. It will also be valuable to individuals and company representatives involved in technical/environmental services and energy departments. Delegates from specific industries that will benefit mostly from this course include those from the power utilities, original equipment manufacturers, heavy industries, consultancies, low carbon technology companies, as well as small and medium enterprises that provide services to these industries.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/epec
or call an advisor on:
T: +44 (0)1234 754189
Engineering Stress Analysis: Theory and Simulations

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. The examination of Finite Element Analysis (FEA) for various practical applications (e.g., engineering components, composite structures, rotating disks, cracked geometries) in conjunction with relevant case studies will allow delegates to combine theoretical understanding with practical experience in order to develop their skills to model and analyse complex engineering problems.

Course objectives

- Develop a strong foundation on stress analysis and demonstrate the ability to analyse a range of structural problems.
- Understand the fundamentals of FEA, 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.
- Develop skills in using the most widely applied commercial finite element software package (ABAQUS) and some of its advanced functions.
- Understand the importance of mesh sensitivity analysis and validation of finite element models.

Who should attend?

Those involved in the design and analysis of engineering components and structures, structural engineers, pipeline engineers, PhD students and Post-docs who are working on FEA related projects.

Course duration

Five days

Upgrade this course

This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online

Visit www.cranfield.ac.uk/esa or call an advisor on: T: +44 (0)1234 754189
Engineering Structural Integrity: Energy and Power Applications

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.

Course objectives
The course aims to give 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.

Who should attend?
Practising engineers in industry, particularly in the power and energy sectors, who deal with large steel structures and components. Engineers from the building and construction industry would find this course useful, as would those from the naval architecture and offshore engineering field.

- Design Engineers.
- Structural Design Engineers.
- Material Specification Engineers.
- Test Engineers.
- Civil and Structural Engineers.
- Mechanical Engineers.
- Ship Design and Stress Engineers.
- Research Engineers.
- Stressing and Design Engineers.
- Certification Engineers.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/esi
or call an advisor on:
T: +44 (0)1234 754189
The aim of this course is to provide a theoretical and applied understanding of fluid mechanics and fluid loading on offshore and sub-sea structures. Practical applications where the aerodynamic, the hydrostatic and hydrodynamic loads typically acting on marine structures (oil & gas, offshore renewable energy) are analysed and discussed.

Course objectives
The course aims to give delegates 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 aims to present the dynamics of floating bodies, from simple hydrostatics to complex dynamic response in waves.

Who should attend?
Engineers working or wishing to work in the traditional offshore industry, offshore renewable energy (wind, wave and tidal energy).

- Design Engineers.
- Dynamic Modelling Engineers.
- Test Engineers.
- Mechanical Engineers.
- Offshore Oil & Gas Support Structures Design Engineers.
- Offshore Wind Turbine Support Structures Engineers.
- Research Engineers.
- Certification Engineers.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/fml
or call an advisor on:
T: +44 (0)1234 754189
Fuels and Energy Conversion

This course introduces conventional/bio fuels and aspects of the fuels’ preparation and handling and provides the fundamentals of the energy conversion process/equipments (eg, combustion, gasification and pyrolysis) from these fuels. Thermodynamics analysis, process simulations and experimental methods in energy conversion systems will be discussed in detail. Furthermore H2 generation, storage and utilization, fuel cells and carbon capture technologies (CCT) will be discussed as a part of the clean energy generation scenarios. The main applications of the fuel energy conversion systems will be presented throughout the module.

Course objectives
• Articulate the main principles, terminology and key issues related to the major energy conversion systems.
• Describe and explain the major energy conversion systems related to the use of fossil and related fuels and explain the difference between conventional and renewable fuels.

Who should attend?
• Those looking for a job in Energy Industry.
• Those seeking a PhD research in Energy Systems.
• Engineers from Power Generation and Oil & Gas Industries.
This course provides essential knowledge of gearing, from the fundamentals of gear design, through to more complex appreciation of the involute system - which is surprisingly less widely understood, even by some in the industry. Cranfield provides the much needed education in this area, and addresses the need for this specialist course with Gear Design.

Course objectives
This course is intended to give a basic understanding of gear geometry and design procedures. A brief introduction to manufacture is included, as is metrology and tolerancing. Gear load capacity will be considered mainly by reference to existing design standards including ISO 6336, and gauging dimensions will also reference British and International Standards.

Who should attend?
The course will be of benefit to those with some previous experience and also those who have recently become involved with gearing.
Heat Transfer

This 5-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.

Course objectives
• 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.

Who should attend?
Engineers who work in the energy, process, or chemical industry, design practices or services.

-course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/ht

or call an advisor on:
T: +44 (0)1234 754189
An advanced introduction to the fundamentals of operation and characteristics of combustion systems, and their application to modelling and design of energy-efficient furnaces and boilers. The course will be of particular interest to engineers employed in the heat and power generation, energy, and process industries.

**Course objectives**

- Evaluate combustion processes based on a comprehensive understanding of the governing principle laws and appraise various fuels and their characteristics.
- Analyse the performance of various combustion systems, and evaluate techniques to reduce the formation and emission of pollutants in stationary and mobile combustion systems.
- Assess the operation of furnaces and boilers based on a fundamental understanding of the governing laws, and debate issues influencing the design/selection of furnaces and boilers and future trends.
- Design energy-efficient furnaces and boilers based on successful application of heat transfer and combustion modelling.

**Who should attend?**

This course will be of particular interest to engineers employed in the heat and power generation, energy, and process industries.

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**Course duration**

**Five days**

**Upgrade this course**

This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

**Book online**

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

or call an advisor on:

T: +44 (0)1234 754189
Understanding materials is key to minimising unexpected plant downtime. Whether in conventional power generation or novel renewable energy systems, selecting the correct materials for the job is essential for balancing costs, maintenance periods, operational flexibility etc. This course offers a firm introduction, starting with the basics of materials science, such as atomic structure, and working through to real-world energy system examples aimed to enable the student to understand the structure and properties of materials, and to apply this knowledge to the use of materials in energy systems.

Course objectives
- Understand the basic principles of material structures on a micro and macro scale, and be able to relate microstructure to mechanical performance.
- Have a broad knowledge of how the chemical composition, microstructure and processing route for steels and non-ferrous alloys influence the resulting mechanical properties.
- Be able to relate fracture, and corrosion behaviour to particular alloy specifications.
- Understand the basis of selection of specific materials (steels, stainless steels, non-ferrous alloys, polymers, composites, corrosion resistant alloys and concrete) for different applications in energy systems.
- Know how to apply design codes, and their relevance to specification of materials in energy systems.
- Have knowledge of the specifications, composition, structure and properties of the various steels and non-ferrous alloys.

Who should attend?
This course is delivered through a balanced combination of lectures, examples classes and student presentations and will be of particular interest to specialist materials and structural engineers working with a range of energy systems.
This short course will enable you to understand the structure and properties of materials, and to apply this knowledge to the use of materials in the offshore environment.

**Course objectives**
- Understand the basic principles of material structures on a micro and macro scale, and be able to relate microstructure to mechanical performance.
- Have a broad knowledge of how the chemical composition, microstructure and processing route for steels and non-ferrous alloys influence the resulting mechanical properties.
- Be able to relate fracture, corrosion and welding behaviour to particular alloy specifications.
- Understand the basis of selection of specific materials (steels, stainless steels, polymers, composites, copper and nickel based corrosion resistant alloys and concrete) for different applications offshore.
- Know how to apply design codes, and their relevance to specification of materials in offshore applications.
- Have knowledge of the specifications, composition, structure and properties of the various steels and non-ferrous alloys.

**Who should attend?**
This course is delivered through a balanced combination of lectures, examples classes and student presentations and will be of particular interest to specialist structural and materials engineers working offshore, for example in oil and gas production industry or the renewable energy field.

**Course duration**
Five days

**Upgrade this course**
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

**Book online**
www.cranfield.ac.uk/moe

or call an advisor on:
T: +44 (0)1234 754189
Multiphase Flows for Oil and Gas Production

Correct sizing of pipeline and risers is fundamental to ensuring trouble free operation of any oil and gas production systems. This course introduces a systematic approach to the design of multiphase transportation systems and the interaction between the upstream reservoir and the downstream processing plant.

Course objectives
- Demonstrate a thorough analytical understanding of multiphase flows.
- Have a comprehensive knowledge of software tools and critical awareness of their limitations.
- Competently design multiphase transportation pipelines for oil/gas and gas/condensate duties under steady state and transient operating conditions.
- Interface with other oil/gas or related industry disciplines in a design or operating environment.

Who should attend?
The course will be of particular interest to engineers in oil and gas exploration, production and operating companies, consultants, contractors, service providers and equipment suppliers involved in design and operation. Researchers who need to understand the background and application of their research. Managers who want to understand the technical issues to aid decision making.

Course duration
- Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
- www.cranfield.ac.uk/mfo
or call an advisor on:
- T: +44 (0)1234 754189
Inspection and Structural Health Monitoring are fundamental to maintaining fitness-for-service of offshore Oil and Gas and Renewable Energy structures, particularly as these age. This course is aimed at developing an appreciation of inspection and monitoring techniques so you understand how to plan inspections and also how to interpret results.

This five-day course is offered in full or in parts to satisfy the different requirements of engineers and practitioners. The first three days of the course aims to cover the fundamentals and practical elements of offshore inspection and monitoring, while the remaining two days address advanced aspects of offshore inspection and evaluation.

The course structure is unique by providing delegates the opportunity of practical sessions in a professional development short course. Fifty percent of the attendees’ time is spent in lab sessions and interactive workshops.

**Course objectives**
- Understand the concepts and fundamentals of offshore inspection methods and systems.
- Demonstrate the capabilities and limitations of each inspection method.
- Be familiar with relevant international standards.
- Be able to assess the quality of inspection using different methods and select the most appropriate one for different applications.
- Utilise inspection outcomes to evaluate damage in offshore structures.

**Who should attend?**
The course will benefit mechanical, structural, pipeline, industrial engineers who are or plan to be involved in inspection of offshore structures and components.

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**Course duration**
Five days

**Upgrade this course**
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

**Book online**
[www.cranfield.ac.uk/oi](http://www.cranfield.ac.uk/oi)
or call an advisor on:
T: +44 (0)1234 754189
This course introduces systematic approaches to the design and analysis of control systems for industrial applications.

Course objectives
• Understand the basic procedures in offshore pipeline design and installation.
• Be able to select appropriate components for an installation.
• Have a knowledge of the capabilities and limitations of different pipelaying techniques.
• Understand the problems caused by fluids carried within pipelines.

Who should attend?
The course will benefit mechanical engineers, civil engineers, naval architects, structural engineers, professionals from the oil & gas industry and professionals who deal with offshore structures.
Offshore Renewable Energy – Technology

The availability of energy sources has been extremely important for mankind since the age of industrialisation. At present, a number of energy sources are utilised on a large scale: coal, oil, gas cover 80% and nuclear energy covers about 7% of the global primary energy supply. Although gas, oil and coal reserves may still be available until the end of this century, ultimately it will get increasingly difficult and costly to extract these resources to satisfy an increasing global energy demand. Besides, the issue of global warming has resulted in growing pressure to switch to renewable sources (eg solar, wind, wave, tidal, geothermal, ocean thermal etc) to reduce carbon emissions. This course aims to provide knowledge and understanding of the technologies used in capturing renewable sources of energy from the marine environment.

Course objectives
- Apply a sound knowledge of the various technologies that have been developed and proposed for harnessing offshore wind energy, wave energy and tidal steam energy.
- Identify and apply the science, technology and engineering that is directly transferable from the offshore oil and gas industry, to the offshore renewable energy sector.
- Work effectively within the offshore renewable energy sector (having gained skills and knowledge from other parts of the course). Benefit from an awareness of present research and technical developments in this field.

Who should attend?
The course will benefit naval architects, mechanical, electrical, civil/structural engineers and technicians who are or plan to be involved in the development of offshore wind and marine energy.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/oret
or call an advisor on:
T: +44 (0)1234 754189

www.cranfield.ac.uk/energyshortcourses
This course introduces and analyses electrical machines and power electronic systems for high-power applications; for example, industrial and traction drives, small-scale power generation, and power system control. In addition, the course examines the operation, characteristics, and capabilities of commonly used systems and introduces aspects of electrical transmission and distribution.

Course objectives
- Assess the key features and operational advantages of electric machines and their converter systems.
- Identify and appraise the main configurations and components of an electric power conversion system comprising electric machines and converters.
- Critically evaluate the steady-state characteristics of different subsystems in an electric power conversion application.
- Assimilate suitable stakeholder requirements and make recommendations for different system designs, include the appropriate component sizing and control methods in a power conversion application.
- Appreciate the operations of electric power systems, and identify all key subsystems.
- Design and plan future extensions or modifications of existing power systems.
- Systematically develop computer simulation models of the electromechanical systems and use those models to evaluate the effectiveness of different technology options and control methods.

Who should attend?
Delegates should have a good understanding of electrical principles; resistance, capacitance and inductance, basic RLC circuits, Ohm’s and Kirchhoff’s laws, DC systems and AC (single phase and three phase) circuits.
Power Generation Systems

This 5-day course offers an advanced introduction to the principles of operation, configuration, characteristics and key implementation issues of various types of power plants. It will be of particular interest to engineers employed in the heat and power generation industries.

**Course objectives**

- Recognise and demonstrate a comprehensive understanding of the fundamentals and laws governing energy conversion.
- Debate issues related to the performance of conventional power-generation plants.
- Propose appropriate technologies for improving energy-utilisation efficiency of power-generation plants.
- Assess the need of a particular industrial/commercial site for a CHP system, identify the appropriate systems and undertake design, sizing and economic analyses.
- Critically review technologies employed for fuel-cell systems and advances in their applications.
- Continue to advance their knowledge and assimilate new future technologies.

**Who should attend?**

This course will be of particular interest to engineers employed in the heat and power generation industries.

Course duration

Five days

Upgrade this course

This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online

www.cranfield.ac.uk/pgs

or call an advisor on:
T: +44 (0)1234 754189
Practical Thermal Conversion Systems Masterclass

A two or three day practical thermal conversion masterclass course for those working in the field of advanced thermal conversion. This course will be delivered in collaboration with ERDF BioThermal Renewable Energy Demonstrator Project for SMEs in the East of England. The course provides an overview of the science and operational principles of gasification, including practical experiments with pilot scale facilities alongside data analysis and an overview of business considerations. Participants will gain hands-on training with exposure on new horizons in thermal conversion scenarios to meet the growing pressure for low carbon sources of energy.

The course is limited to ten delegates due to health and safety priorities, therefore we encourage you to apply early to ensure a place.

Course objectives
On completion of this short course you will have experienced a series of practical activities alongside simulation development and group discussion, to achieve the following objectives:

- Understanding fundamental gasification principles & how to apply them to a process plant.
- Understanding gasification strategies using a problem-solving process.
- Gaining knowledge of the range of techniques for managing gasification plant performance.
- Evaluating and undertaking performance reviews of processes configurations objectively.
- Recognising gasification problems and how to troubleshoot and improve system performance.
- Learn how to run a gasification and gaining the ability model and communicate this performance within a team.

Who should attend?
The course provides an understanding of gasification for engineers, scientists, technical managers/operators and postgraduate researchers working in the field of advanced thermal conversions. It will also be valuable to individuals and company representatives involved in technical services and troubleshooting departments. Delegates from specific industries that will benefit mostly from this course include those from the power utilities, original equipment manufacturers, waste industries, consultancies, renewable companies, as well as small and medium enterprises that provide services to these industries.

Course duration
Two or three days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/ptcs

or call an advisor on:
T: +44 (0)1234 754189
This course introduces the principles, methods and instrumentation of some typical process measurement systems for applications in industries and engineering such as oil and gas, pharmaceutical and chemical engineering. This short course is part of an MSc Course that is accredited by IMechE and the Energy Institute. In this course the delegates will take practical sessions in a unique industrial-scale pilot plant in our laboratory.

Course objectives
• Understand the types and technologies for measuring and/or monitoring of different process variables, e.g. pressure, temperature, flow rate, fluid density and viscosity and chemical contents.
• Understand the factors which affect the operation of a process measurement system.
• Understand the factors which have to be considered when selecting a process measurement system.
• Gain the knowledge to propose the most appropriate measurement system for a given process application.

Who should attend?
This short course will be of particular interest to engineers and consultants employed in the process, chemical, water, power, oil and gas industries, who are involved with process instrumentation and control, process management, and require an update on state of the art technologies used in industrial process measurement.

Course duration
Five days

Upgrade this course
This course is part of an MSc module.
Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/pms
or call an advisor on:
T: +44 (0)1234 754189
This short course aims to familiarise you with the principles, equipment design and operating characteristics of typical unit operations in process plants within chemical, petrochemical, water, oil and gas industries. The course includes an in-depth case study and workshop for current application of the theory.

Course objectives
• Demonstrate an in-depth understanding of operating characteristics of typical unit operations.
• Carry out design calculations for a wide range of unit operations.
• Propose the most appropriate selection of unit operations and operating conditions for a process plant for a given application.

Who should attend?
This course will be of particular interest to engineers or researchers in the chemical, petrochemical, water, oil and gas industries.
This course introduces techniques and tools for the design, modelling and optimisation of process plants. It provides in-depth training on using Aspen HYSYS software to model and simulate industrial processes. Based on this, techniques of process optimisation and design are to be introduced.

Course objectives

• Demonstrate an understanding of the key steps in carrying out process plant design.
• Demonstrate a familiarity of the techniques and tools for steady and dynamic process simulation.
• Competently apply basic process optimisation principles.
• Design and analyse the performance of a process plant using simulation tools.

Who should attend?
This would be of particular interest to engineers or researchers in the chemical, petrochemical, water, oil and gas industries.

Course duration

Five days

Upgrade this course

This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online

www.cranfield.ac.uk/psd

or call an advisor on:
T: +44 (0)1234 754189
Production Technology and Chemistry

This short course explores the properties of produced fluid and its evolution from reservoir to production facilities. The impact and methods of wax, hydrate and asphaltines control will be examined. Basic downstream processing plant operation, separation and chemical treatment will also be introduced. The course is delivered with the support of practising engineers and leading consultants in the field.

Course objectives

• Demonstrate a comprehensive knowledge of current production systems and chemistry.
• Competently design flow assurance transportation systems for production chemistry related issues.
• Interface with other oil/gas or related industry disciplines in a design or operating environment.

Who should attend?

The course will be of particular interest to engineers in oil and gas exploration, production and operating companies, consultants, contractors, service providers and equipment suppliers involve in design and operation. Researchers who need to understand the background and application of their research and managers who want to understand the technical issues to aid decision making.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/ptc
or call an advisor on:
T: +44 (0)1234 754189
This short course covers the fundamentals of pumping systems design with special emphasis on the importance of pump, equipment and systems interaction. The course will be delivered by practitioners with over 100 years of combined experience in the field.

Course objectives
• Have a comprehensive knowledge of pumping technology, principles and design.
• Gain a thorough understanding of interactions between equipment and the effects of operation.
• Confidently carry out a systemic hydraulic analysis of a simple pumping system.
• Specify and select the most appropriate pump for a given application.

Who should attend?
The course will be of particular interest to engineers employed in the process industries (including oil and gas, water and power) who are involved in pump system design, pump and equipment selection. It will also benefit those who work in operation and maintenance of pumping systems. Those with an engineering or applied science degree will receive the most benefit from the course or those with relevant industrial experience.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/pps

or call an advisor on:
T: +44 (0)1234 754189
Reliability Engineering and Asset Risk Management

The Reliability Engineering and Asset Risk Management course provides the knowledge and skills necessary to calculate values of reliability and risk of components, systems and assets in a variety of industries.

Course objectives
- Have a good knowledge of the asset risk management techniques and maintenance strategies used in different industries.
- Be familiar with various proactive maintenance policies (age and block maintenance, RCM, RBM, CBM, PdM, TPM).
- Understand the concept and applications of Monte-Carlo simulation in system reliability and availability modelling.
- Have a basic understanding of system’s life-cycle and understand the financial implications involved with assessing the maintenance and risk factors of offshore projects.

Who should attend?
The course will benefit mechanical, structural, pipeline, industrial engineers and technicians who are or plan to be involved in reliability engineering and risk management of industrial assets.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/rearm
or call an advisor on:
T: +44 (0)1234 754189
An understanding of the principles of onshore 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 solar technologies (thermal and PV), onshore wind, biomass and waste technologies, geothermal and hydroelectric technologies.

Course objectives

- 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.

Who should attend?
Those with a broad interest in developing renewable energy technologies and wish to gain the fundamental understanding of the technologies available. This includes energy and facility managers, consultants, local government planners and those working in an entirely different sector considering a change in career path.

Course duration
Five days

Book online
www.cranfield.ac.uk/energyshortcourses

www.cranfield.ac.uk/ret
This course aims to introduce 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 process across a variety of engineering disciplines and related applications. Attending this course will develop directly applicable skills through practical engagement of the most widely applied methods.

Course objectives

• Demonstrate a systematic knowledge of the fundamentals of risk management and reliability engineering, and a critical awareness of their application on relevant engineering problems.

• Evaluate and select appropriate techniques for risk analysis (qualitative and quantitative), failure consequences assessment, and methods for control/mitigation through decision support systems and other relevant methods/tools.

• Develop a critical and analytical approach to the collection and stochastic modelling of data in the application of Quantitative Risk Assessment (QRA) methods.

• Demonstrate a comprehensive understanding of the development and use of standards and asset integrity management.

Who should attend?

This training is suitable for mechanical, process, energy engineers and professionals that want to obtain knowledge on applied aspects of risk and reliability engineering.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online
www.cranfield.ac.uk/rre
or call an advisor on:
T: +44 (0)1234 754189
The purpose of this course is to provide the student with a number of methods available for calculating the complete dynamical performance of rotors, solving problems such as synchronous and non-synchronous whirl, sensitivity to unbalance, threshold of instability, torsional behavior of branched systems, the analysis of steady and cyclic stress distributions caused by unbalance and other vibration phenomenon.

Course objectives

• Model mathematically a variety of rotating machines ranging from reciprocating engines to turbomachines, compressors, gas and steam turbines, pumps and fans to other rotating machines.
• Demonstrate the ability to solve design problems varying from consumer annoyance to machine survival.
• Be acquainted with the different techniques used in the industry for the analysis of rotordynamic problems.
This course enables you to understand and be able to apply the basic concepts of risk and reliability analysis in the offshore environment.

**Course objectives**

- Be able to explain the concept of RAMS (Reliability, Availability, Maintainability and Safety) and its application in the offshore energy industry.
- Have a basic understanding of reliability analysis techniques and the mathematical basis of risk and reliability.
- Be able to apply various tools (e.g. fault tree and event tree analysis, FMEA/FMECA, HAZOP, reliability block diagram) in risk and reliability assessment of offshore energy systems.
- Appreciate the role of human error and equipment failure in accident causation.
- Understand how the above relate to the preparation of offshore safety cases.

**Who should attend?**

The course will benefit mechanical, structural, pipeline, industrial engineers and technicians who are or plan to be involved in risk and reliability assessment of offshore assets.
Stress Analysis Through Finite Element Modelling

This course brings together theoretical and computational stress analysis through Finite Element simulations, allowing you to appreciate how the two disciplines interact in practice and what their strengths and limitations are. The examination of Finite Element Analysis (FEA) for various practical applications (e.g., engineering components, composite structures, rotating disks, cracked geometries) in conjunction with relevant case studies will allow you to combine theoretical understanding with practical experience in order to develop their skills to model and analyse complex engineering problems.

Course objectives

- 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.
- Develop skills in using the most widely applied commercial finite element software package (ABAQUS) and some of its advanced functions.
- Understand the importance of mesh sensitivity analysis and validation of finite element models.

Who should attend?

Those involved in the design and analysis of engineering components and structures, structural engineers, pipeline engineers, PhD students and Post-docs who are working on FEA related projects.

Course duration

Five days

Upgrade this course

This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

Book online

www.cranfield.ac.uk/satfem

or call an advisor on:

T: +44 (0)1234 754189
Subsea Oil and Gas Exploitation

This short course will provide you with a knowledge and understanding of the equipment and procedures employed in the exploration and production of offshore oil and gas.

Course objectives
- Have a basic understanding of (petroleum) reservoir engineering.
- Have a knowledge of the equipment needed and procedures practiced for the extraction of natural hydrocarbons (oil and gas) from offshore locations.
- Understand the problems encountered and potential dangers involved during the extraction of oil/gas.
- Understand how procedures/equipment have developed in order to minimise the potential dangers.
- Understand the requirements in terms of equipment for the production of oil and gas in offshore and subsea locations.
- Have an overview of the factors to be considered in the development of an offshore/subsea oil/gas field.

Who should attend?
- Professionals from oil and gas industry.
- Subsea engineers.
- Pipeline engineers.
- Naval architects.
- Mechanical engineers.
- Civil engineers.
- Chemical engineers.
- Electrical engineers.
- Geologists.

Course duration
Five days

Upgrade this course
This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

www.cranfield.ac.uk/soge

T: +44 (0)1234 754189

Book online
This course provides a theoretical, applied and experimental understanding of the main engineering fields involved in the design and the operation of hydrodynamic testing facilities (such as wave tanks, towing tanks and water circulation channels) and aerodynamic testing facilities (ie wind tunnels).

**Course objectives**

- Critically evaluate the tools and techniques available for physical testing of wind, wave and tidal energy devices and their supporting structures.
- Assess the limitations of sub-scale testing and evaluate consequences for full scale performance.
- Identify the most common issues and regulatory requirements for certifying wind, wave and tidal energy devices in the UK.

**Who should attend?**

This course will be of interest to those involved in the design and testing of marine renewable energy converters.

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**Course duration**

Five days

**Upgrade this course**

This course is part of an MSc module. Participants can accumulate credits towards a postgraduate qualification.

**Book online**

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

or call an advisor on:

T: +44 (0)1234 754189
A fundamental introduction to the techniques and technologies employed for the design and operation of thermal energy systems:
- Heat-Exchangers.
- Heat-Exchanger Networks.
- Refrigeration.
- Air-Conditioning.

Course objectives
- Apply the principles of heat transfer, thermodynamics and fluid mechanics in the design of heat exchangers.
- Apply pinch technology for the design of heat exchanger networks.
- Understand the issues related to the efficient use of thermal energy and apply the relevant techniques and technologies.
- Analyse and design refrigeration and air-conditioning systems, employing competent knowledge of their principles.

Who should attend?
This course will be of particular interest to engineers employed in the heat and power generation, process, and oil and gas industries or building services.
Organisations who have attended Cranfield energy courses

- Alstom
- BBSRC
- Bill & Melinda Gates Foundation
- BOC
- BP
- Centrica
- Department of Energy & Climate Change
- Dong Energy
- Economic & Social Research Council
- EDF Energy
- Energy Technologies Institute
- E.ON
- EPSRC
- European Turbine Network
- GE Oil & Gas
- NERC
- NSFC
- Rolls-Royce
- RWE
- Saudi Aramco
- Shanks
- Siemens
- SSE
- Statoil
- Total
- Vattenfall
- Wood Group Kenny
To book now, contact:

E: professionaldevelopment@cranfield.ac.uk
T: +44 (0)1234 754189
www.cranfield.ac.uk
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 by taxi. London Luton, Stansted and Heathrow airports are 30, 90 and 90 minutes respectively by car, offering superb connections.

If accommodation is required, please make your own arrangements at Mitchell Hall or the Cranfield Management Development Centre.

More information can be found at www.venuecranfield.co.uk