



Energy Systems Engineering Professional Experience Programme (PEP)

BE Degree in Energy Systems Engineering

The Energy Systems Engineering degree is an exciting new four-year honours degree programme which was developed in 2009 in response to a growing demand for professional engineers to work in the energy sector.

It is a multidisciplinary programme, focusing on fundamental engineering knowledge and skills in such areas as energy conversion, electrical power systems, energy demand management (e.g. buildings, transport, industry, etc.) energy informatics, along with modules on energy sources, energy policy, economics and associated environmental issues.

The programme provides students with the knowledge and skills to develop into professional engineers with a broad competence of energy systems engineering. There are optional modules providing technical focus for different sectors of the industry.



Primary areas of undergraduate training

Fundamentals of Structural Analysis:

Concepts of stress and strain, principal stress, shear force and bending moment diagrams, bending and shear stresses, methods of failure.

Principles of Building:

Planning and Development acts, building regulations, foundations, walls, roofing, floors, thermal properties, heat and sound insulation, general properties of buildings.

Sustainable Energy Resources:

Renewable energy resource assessment and availability, technologies for conversion of energy sources, environmental impacts of energy resource utilisation.

Fundamentals of Machine Design:

Gear analysis and dynamic analysis of mechanisms.

Fluid Mechanics:

Internal and external dynamics of liquids and gases, flow fields, pressure distribution, piping losses, boundary layers.

Materials:

Metals, alloys, plastics, composites, ceramics, processing technologies, material testing, deformation and fracture.

Electrical Power and Machines:

Electromagnetism, DC and AC machines, three-phase systems, power quality, rectifiers and energy conversion.

Control Systems:

Feedback, stability, performance analysis, control system design.

Electrical and Electronic Circuits:

DC and AC electrical circuit analysis; electronic components, circuits and systems; sensors and sensor systems

Energy Informatics

Software Design & Development, Systems Modelling, Data Analysis & Visualisation, Information & Communications Technology for SmartGrid.

Professional Development:

Communication skills, management and ethics in engineering.

Skills acquired

Students in the Professional Experience Programme have acquired the skills and techniques of modelling, analysing and designing to professional standards. These students also have considerable expertise and familiarity with computer based techniques, project management, report writing and presentation skills. In addition these students have specific skills relative to their specialist discipline in Civil, Mechanical or Electrical Engineering. Students choose their discipline for specialist project work at the beginning of third year.





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Work areas particularly suited to students of Energy Systems Engineering

- Energy management.
- Energy and environmental systems modelling.
- Structural analysis/design.
- Design of infrastructures for energy systems.
- Highway design.
- Environmental impact assessment.
- Design of mechanisms: structural components; fluid systems and thermal systems.
- Material characterisation, selection and processing techniques.
- Control and automation.
- Hydraulic and pneumatic systems.
- Manufacturing processes.
- Finite element analysis.
- Electrical machinery.
- Power systems.
- Component and circuit design.
- Computer aided design.
- Renewable energy resources and conversion technologies.
- Data gathering, processing, analysis and visualisation.
- Website development.

Final Year Individual Projects

Participating companies have the option of suggesting to students realistic industrial projects which are of specific interest or benefit to their own organisation. These projects may then become the basis of the student's final-year project. Listed below are members of staff and their expertise in different areas of Engineering.

Dr. Marcus Keane

Optimised operation of building energy systems
Industrial scale 'living laboratories' for sustainable buildings

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Dr. Stephen Nash

Offshore energy resource assessment and forecasting
Renewable energy conversion technologies

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Dr. Nathan Quinlan

Optimisation of shrouded wind turbines
Modelling of combustion

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Professor Sean Leen

High temperature materials for power plants
Manufacture of lightweight materials and structures

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Professor W.G. Hurley

Battery management system for standby power
Power electronics for renewable energy

Contact Information:

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Dr. Maeve Duffy

Power electronics for renewable energy sources (wind, hydro, PV)

Electrical drive system for a prototype electric vehicle (Shell eco-marathon)

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Dr. Hugh Melvin

Information & Communications Technology (ICT) for Energy systems

Contact Information:

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Dr. Rory Monaghan

Combustion and gasification

Building energy modelling

Distributed generation & CCHP

Lifecycle assessment

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