

# SWITCH On Skills

## Materials for Energy

This course is designed to guide the student through the main concepts of Materials for Energy Production, Storage and Usage. The module explores materials used in the various energy sectors. Scientific concepts will be backed up using real-life examples. At the end of this course, the student will be able to demonstrate an appreciable understanding of materials research that is critically important to the energy sector and, more importantly, the Energy Trilemma (i.e issues related to energy security, energy equity and environmental sustainability).

### Who Should Attend

This course is ideally suited for professionals in the energy sector, ranging from engineers and technicians to R&D professionals looking to deepen their understanding of materials and their pivotal role in energy technologies and sustainability. It would also greatly benefit educators and policymakers who wish to stay abreast of the latest advancements in materials science within the energy domain. Entrepreneurs eyeing ventures in the energy sector, business leaders, and energy consultants will find the course immensely beneficial in enhancing their technical acumen, aiding them in making well-informed decisions. Moreover, environmentalists and sustainability advocates seeking to understand the technical underpinnings of energy materials would find the course enlightening. The blend of technical and non-technical outcomes makes this course a well-rounded choice, providing an integrated lens through which to explore and solve energy-related engineering problems, making it a compelling proposition for anyone keen on making strides in the energy sector.

### Aims

To impart a comprehensive understanding of the diverse energy sectors, with a focus on the critical role of materials in energy production, storage, and usage. The course seeks to delve into both non-renewable and renewable energy technologies, exploring contemporary challenges and future considerations within the context of the Energy Trilemma. Through modules covering power generation, transport, efficiency, and new materials, attendees will be equipped to evaluate and contribute to the evolving landscape of energy solutions. Additionally, the course aims to instigate a deeper understanding of the regulatory framework and targets governing the energy sector, along with discussions on carbon capture and the implications for materials research, thereby preparing attendees to navigate and innovate within the complex interplay of materials science and energy technology.

## Learning Outcomes

By the end of the module, the student should be able to:

### Technical Outcomes

- Comprehend the laws governing conservation of energy and thermodynamics.
- Investigate different energy sectors and technologies, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards.
- Determine methods for energy transfer to generate power.

### Non-Technical Outcomes

- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline or line of work.
- Understanding of, and the ability to apply, an integrated or systems approach to solving energy-related engineering problems.

## Course Programme

- Introduction
- Fundamentals of Energy
- Energy production, storage and usage
- Power Generation
- Energy Trilemma
- Non-renewable energy
- Renewable energy
- Transport
- Storage
- New materials
- Efficiency
- Implications for Materials Research
- Challenges
- Future Considerations
- Carbon Capture
- Targets and Regulations

## Course Delivery

The course is conveniently delivered through Swansea University's Learning Management System, Canvas, providing a seamless online learning experience. Students are granted a generous three-month period to complete the course, allowing for personalised learning at their own preferred pace.

Throughout the course, participants will engage in three progressive assessment quizzes, complemented by a comprehensive final written assessment that culminates

their learning journey. All assessments are conveniently submitted through the secure and user-friendly platform, Canvas.

To ensure a supportive and enriching learning environment, expert guidance and assistance are readily available from our project lecturers and dedicated learning technologists. These experienced professionals can be easily reached through Canvas or via email.

**Website: [www.now-switch.wales/netzeroskills](http://www.now-switch.wales/netzeroskills)**

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