

ES2G6-15 Materials & Technologies for Sustainable Energy

26/27

Department

School of Engineering

Level

Undergraduate Level 2

Module leader

Jisun Im

Credit value

15

Module duration

10 weeks

Assessment

100% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

Energy efficiency is becoming ever more important as we seek to mitigate the effects and extent of global warming. While solar and wind generation are obvious replacements to traditional fossil fuel energy sources, there are a wealth of materials and technologies that can offer substantial advantages in terms of energy management. In this module we will explore the critical role that materials and technologies play in shaping a sustainable energy future. This module covers topics and concepts that will allow us to utilise materials and technologies for future energy generation and storage applications, such as traditional (e.g. silicon/perovskite photovoltaics, lithium/sodium ion batteries) to emerging (e.g. hydrogen production, piezoelectric, thermoelectric) technologies.

Module aims

The principle aims of the module are to develop an understanding of sustainable materials and technologies, and how they can be used collectively to solve real world problems.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

The following outlines a brief overview of the syllabus.

1. Introduction and energy past & present

[Energy generation technologies]

2. PV (silicon)
3. PV (other materials)
4. Kinetic energy harvesting
5. Thermoelectric energy harvesting

[Energy storage technologies]

6. Electrical energy storages
7. Thermal and mechanical energy storage

[Sustainable fuels]

8. Hydrogen production, part 1
9. Hydrogen production, part 2
10. Recycling and reuse of materials in energy system

Learning outcomes

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

- Apply engineering principles, which include mathematics, statistics and natural science knowledge, to complex problems involving sustainable materials for energy generation and storage. [C1, M1]
- Analyse and evaluate the performance of materials for sustainable energy applications, and thus apply engineering principles and judgment to discuss limitations of the technology in the context of efficiency and sustainability. [C2, M2]
- Be able to evaluate the environment and societal impacts for new materials technology. [C7, M7]
- Be able to select and apply appropriate materials, equipment, engineering technologies and processes to solve energy generation and storage problems for any given location, while considering their limitations. [C13, M13]

Indicative reading list

[Reading lists can be found in Talis](#)

Subject specific skills

TBC

Transferable skills

1. Numeracy: apply mathematical and computational methods to communicate parameters, model and optimize solutions
 2. Apply problem solving skills, information retrieval, and the effective use of general IT facilities
 3. Communicate (written and oral; to technical and non-technical audiences) and work with others
 4. Plan self-learning and improve performance, as the foundation for lifelong learning/CPD
 5. Exercise initiative and personal responsibility, including time management, which may be as a team member or leader
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Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Seminars	10 sessions of 1 hour (7%)
Other activity	2 hours (1%)
Private study	118 hours (79%)
Total	150 hours

Private study description

118 hours private study

Other activity description

2 x 1 hour Examples/revision/Examination Advice classes

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group B

Assessment component	Weighting	Study time	Eligible for self-certification
Centrally-timetabled examination (On-campus) 3 hour written examination to be done on campus.	100%		No

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- Students may use a calculator
 - Answerbook Gold (24 page)

Reassessment component is the same

Feedback on assessment

Exam advice class. • Support through advice and feedback hours. • Examples lectures. • Cohort feedback on examinations.

[Past exam papers for ES2G6](#)

Availability

Courses

This module is Core for:

- Year 2 of UESA-H315 BEng Mechanical Engineering
- UESA-H316 MEng Mechanical Engineering
 - Year 2 of H315 Mechanical Engineering BEng
 - Year 2 of H316 Mechanical Engineering MEng

This module is Optional for:

- Year 2 of UESA-H113 BEng Engineering
- UESA-H112 BSc Engineering
 - Year 2 of H112 Engineering
 - Year 2 of H112 Engineering
- Year 2 of UESA-H114 MEng Engineering

This module is Core option list A for:

- Year 2 of UESA-HN15 BEng Engineering Business Management