

# ES4E0-15 Renewable Energy

**23/24**

**Department**

School of Engineering

**Level**

Undergraduate Level 4

**Module leader**

Stan Shire

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

100% exam

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

ES4E0-15 Renewable Energy

[Module web page](#)

### Module aims

The module is intended to present and assess some of the important renewable energy technologies and give some sense of the engineering design and development of some of these technologies. Starting with a brief outline of existing and proposed renewable energy systems, the course adopts an active solution-seeking approach, assessing these technologies against economic, engineering and other criteria.

Two of the most promising technologies, wind power, and solar energy are treated in some depth as an example of optimisation in mechanical and electrical engineering design. Other technologies studied include geothermal, biomass, ocean and hydro power.

### 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.

Overview of renewable energy:

Resource scale and availability.

Available technologies and challenges.

Technical and economical assessment of renewable technologies.

Detailed technical study of two major renewable energy technologies:

Solar energy: solar thermal & solar PV, current technology and future potential.

Wind energy: wind turbine configurations and power generating technologies.

Broad study of technologies with less potential:

Hydro power energy: Principles of hydro power technology.

Ocean current, tidal & wave energy: technology, economics, challenges and R&D.

Ground source and geothermal energy: principles, operation, future scope.

Biomass and Bioenergy: resources, sustainability, processing, combustion, scope.

## Learning outcomes

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

- Interpret, apply and resolve the scientific concepts and principles underpinning renewable energy technologies.
- Evaluate design processes and methodologies for renewable energy systems and apply them to new situations.
- Autonomously apply mathematical models for solving problems in renewable energy systems, critique these methods and advance independent hypotheses for the scope of their applicability and the limitations of these models for practical application.
- Discuss current practice and its limitations as well as likely new and advanced developments at the forefront of renewable energy technology

## Indicative reading list

1. Solar Energy Engineering, Kalogirou, S.A., 2nd Edition, Academic Press, 2013. E-book ISBN 9780123972569.
2. Solar Engineering of Thermal Processes, Duffie JA and Beckman WA, John Wiley & Sons. 2013. ISBN: 978-0-470-87366-3
3. Understanding renewable Energy Systems. Quashning V. Earthcan. 2005. ISBN 978-1-84407-128-9
4. Renewable Electricity and the Grid. Boyle G (ed). Earthscan. 2007. ISBN 978-1-84407-418-1.
5. Freris L, Principles of Wind Energy Conversion, Prentice Hall, 1990. ISBN: 9780139605277.
6. The Design and Sizing of Active Solar Thermal Systems. Reddy TA. Oxford University Press. 1987. ISBN 978-0198590163
7. Wind Turbine Technology. Spera A (ed). ASME Press. 2009. ISBN: 0-7918-0260-4 .

## Subject specific skills

TBC

## Transferable skills

TBC

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## Study

### Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Seminars	2 sessions of 1 hour (1%)
Online learning (independent)	30 sessions of 30 minutes (10%)
Private study	113 hours (75%)
Total	150 hours

### Private study description

Guided Independent Learning 113 hrs.

## Costs

No further costs have been identified for this module.

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## Assessment

You must pass all assessment components to pass the module.

### Assessment group BA

	Weighting	Study time
In-person Examination 3 hours written exam (closed book)	100%	

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- Graph paper
- Answerbook Gold (24 page)
- Students may use a calculator
- Engineering Data Book 8th Edition

## Feedback on assessment

Numerical scoring for each individual student's exam script.  
Cohort level feedback on examinations.

[Past exam papers for ES4E0](#)

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## Availability

### Courses

This module is Core for:

- Year 4 of UESA-H311 MEng Mechanical Engineering

This module is Core optional for:

- Year 4 of UESA-H219 MEng Civil Engineering with Exchange Year

This module is Optional for:

- Year 4 of UESA-H116 MEng Engineering with Exchange Year
- Year 5 of UESA-H115 MEng Engineering with Intercalated Year
- RESA-H6P9 Postgraduate Research Wide Bandgap Power Electronics
  - Year 1 of H6P9 Wide Bandgap Power Electronics (EngD)
  - Year 2 of H6P9 Wide Bandgap Power Electronics (EngD)
- Year 1 of TESA-H341 Postgraduate Taught Advanced Mechanical Engineering

This module is Option list A for:

- Year 4 of UESA-H336 MEng Automotive Engineering
- Year 5 of UESA-H337 MEng Automotive Engineering with Intercalated Year
- Year 4 of UESA-H217 MEng Civil Engineering
- Year 5 of UESA-H218 MEng Civil Engineering with Intercalated Year
- Year 4 of UESA-H114 MEng Engineering
- Year 4 of UESA-HH76 MEng Manufacturing and Mechanical Engineering
- Year 5 of UESA-HH38 MEng Manufacturing and Mechanical Engineering with Intercalated Year
- Year 5 of UESA-HH77 MEng Manufacturing and Mechanical Engineering with Intercalated Year
- UESA-H311 MEng Mechanical Engineering
  - Year 4 of H311 Mechanical Engineering
  - Year 4 of H30G Mechanical Engineering with Business Management
  - Year 4 of H30P Mechanical Engineering with Fluid Dynamics
  - Year 4 of H30K Mechanical Engineering with Instrumentation
- Year 4 of UESA-H316 MEng Mechanical Engineering

- Year 4 of UESA-H318 MEng Mechanical Engineering with Exchange Year
- Year 5 of UESA-H317 MEng Mechanical Engineering with Intercalated Year
- Year 1 of TESA-H643 Postgraduate Taught Electrical Power Engineering
- Year 1 of TESA-H642 Postgraduate Taught Energy and Power Engineering

This module is Option list B for:

- Year 4 of UESA-H336 MEng Automotive Engineering
- Year 5 of UESA-H337 MEng Automotive Engineering with Intercalated Year
- Year 4 of UESA-H311 MEng Mechanical Engineering
- Year 4 of UESA-HH31 MEng Systems Engineering
- Year 4 of UESA-HH33 MEng Systems Engineering with Exchange Year
- Year 5 of UESA-HH32 MEng Systems Engineering with Intercalated Year

This module is Option list C for:

- UESA-H311 MEng Mechanical Engineering
  - Year 4 of H30L Mechanical Engineering with Automotive Engineering
  - Year 4 of H30M Mechanical Engineering with Robotics