ES4E0-15 Renewable Energy

20/21

Department
School of Engineering
Level
Undergraduate Level 4
Module leader
Stan Shire
Credit value
15
Module duration
10 weeks
Assessment
30% coursework, 70% exam
Study location
University of Warwick main campus, Coventry

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.
- Apply concepts from a range of areas such as business, economics, legislation (H&S, environmental and social impacts) for assessment of renewable energy technologies and systems in order to evaluate their suitability and efficacy.
- Autonomously apply mathematical and computer based 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

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (10%)
Seminars	2 sessions of 1 hour (1%)
Other activity	2 hours (1%)
Private study	116 hours (39%)
Assessment	150 hours (50%)
Total	300 hours

Private study description

Guided Independent Learning 116 hrs.

Other activity description

Coursework Feedback Classes 2 x 1 hrs

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group DA

	Weighting	Study time
Renewable Energy Assignment Online test. Poster/ presentation or equivalent.	30%	45 hours
Online Examination	70%	105 hours

	Weighting	Study time
2 X 1 HR QMP TO BE RUN IN SAME TIME SLOT WITH SHORT BREAK INBEWTWEEN		
~Platforms - QMP		

- Online examination: No Answerbook required
- Students may use a calculator
- Engineering Data Book 8th Edition

Feedback on assessment

For each piece of assessed coursework, feedback will be provided using the following methods:
DIscussion of a suitable approach to the assignment during a time-tabled class-based feedback session.
Verbally answering questions that arise in the time-tabled feedback session.
Written comments on each piece of work submitted for assessment.
Numerical scoring for each individual student's work submitted for assessment.
Model solutions to past examination papers.
Cohort level feedback on examinations.

Past exam papers for ES4E0

Availability

Courses

This module is Core for:

- Year 4 of UESA-H311 MEng Mechanical Engineering
- Year 1 of TESA-H1A0 Postgraduate Taught Sustainable Energy Technologies

This module is Optional for:

- 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-H217 MEng Civil Engineering
- 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
- 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 4 of UESA-H311 MEng Mechanical Engineering
- Year 4 of UESA-HH31 MEng Systems Engineering

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