MODULE SPECIFICATION

Module Title:	**Energy Systems & Sustainability**	**Level**:	4	**Credit Value**:	20

Module code:	ENG493	**Is this a new module?**	YES	**Code of module being replaced**:	ENG483

Cost Centre:	GAME	JACS3 **code**: HECoS **code:**	H221/100175

Trimester(s) in which to be offered:	1, 2	**With effect from:**	September 18

School:	Faculty of Arts, Science and Technology	**Module Leader:**	David Sprake

Scheduled learning and teaching hours	60 hrs
Guided independent study	140 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
BEng (Hons) Renewable and Sustainable Engineering	✓	☐
BEng (Hons) Electrical & Electronic Engineering	✓	☐
BEng (Hons) Automation Engineering	✓	☐
BEng (Hons) Low Carbon Energy, Efficiency and Sustainability	✓	☐

Pre-requisites
None

Office use only

Initial approval February 17

APSC approval of modification Sept 18
Approved on 21/09/20 for addition of BEng Low Carbon Energy, Efficiency and Sustainability

Version 2

Have any derogations received Academic Board approval? Yes ✓ No ☐

Module Aims
This module aims to give the student an understanding of: i. How a range energy technologies operate (fossil fuel, nuclear and renewable) ii. An overview of modern energy generation, transmission and distribution systems and their sustainability. iii. The future innovations needed in the energy field. iv. Climate change, its consequences and drivers. v. Technical approaches to the minimization of environmental problems involved in the deployment of energy technologies. vi. Future energy demand, supply and its security including UK legislation and route maps available for implementation of energy decarbonisation targets for 2050. vii. Awareness of quality issues and their application to continuous improvement in the sustainability arena.

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

At the end of this module, students will be able to		Key Skills	
1	Have a basic understanding of modern energy systems and its link with climate change, perform simple energy-related calculations and undertake elementary economic analyses.	KS10	KS9
		KS6	
2	Assess the case for or against different energy technologies in terms of their sustainability, environmental impacts and financial viability.	KS7	KS5
3	Identify appropriate technical approaches to the minimization of environmental problems involved in the deployment of energy technologies.	KS3	KS6
		KS1	KS2
4	Discuss policy and legislation drivers relating to climate change, renewable energy and sustainability	KS4	KS8
5	Awareness of quality issues and their application to continuous improvement	KS4	

Derogations

A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Assessment:

Assessment One: is by means of an Exam covering outcomes 1 and 2.

Assessment Two: is by means of a coursework (50%) covering outcomes 3 and 4.
A typical coursework may be to devise a challenging academic and vocationally relevant scenario requiring students to engage in solutions to energy systems that are suitable to meet 2050 carbon reduction targets.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1,2	Examination	50	2 hours	
2	3,4,5	Portfolio	50		2000

Learning and Teaching Strategies:

Lectures - presentation of theory, facts and concepts, relating to energy, in order to convey critical information. Interaction or active learning should be implemented to develop an understanding of principles and concepts and stimulate discussion.

Tutorials – Close interaction with students ensuring that the work presented during lectures has been understood, with specific help being given in order to overcome any learning problems, should they occur.

Guest lecturers, filed visits and discussion/ debate sessions.

Syllabus outline:

Forms of energy, primary energy, laws of thermodynamics,
Energy conversion technologies.
Overview of fossil, nuclear and renewable energy production.
Climate change and its link with carbon dioxide.
Magnitudes of energy use: Buildings, Industry, Heat, Electricity, and Transport and how it is supplied
Energy efficiency.

The consequences of cuts in supply.
Electricity generation, transmission and distribution,
Smart grids, smart meters,
Basic energy storage: grid and demand side.
Environmental impacts of energy use,
The energy market and how it works. Economic payback modelling.
The price of oil and other fossil fuels, the factors that affect it.
Government decarbonisation targets and how they might be achieved.

Bibliography:

Essential reading

Everett, B. (2012) Energy Systems and Sustainability, 2nd Edn., Oxford: Oxford University Press.

Shepherd D. W. and Shepherd W (2014) Energy Studies, 3rd Edn., London: Imperial College Press.

Other indicative reading

Boyle, G. et al. (2012) Renewable Energy: Power for a Sustainable Future, 3rd Edn., Oxford: Oxford University Press.

David J.C. MacKay (2008)Sustainable Energy - Without the Hot Air (Download free at http://www.withouthotair.com/)