MODULE SPECIFICATION PROFORMA

Module Code:	ENG736

Module Title:	Analysis of Renewable & Sustainable Systems

Level:	7	**Credit Value:**	20

Cost Centre(s):	GSAC	JACS3 **code**:	H220

School:	Applied Science, Computing & Engineering	**Module Leader:**	David Sprake

Scheduled learning and teaching hours	40 hrs
Guided independent study	160 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered (not including exit awards)	Core	Option
MSc Engineering (Renewable & Sustainable Energy)	✓	☐

Pre-requisites
N/A

Office use only
Initial approval: 19/06/2018 Version no:1
With effect from: 01/09/2018
Date and details of revision: Version no:

Module Aims

- Provide an up to date critical analysis of a variety of renewable sources and the engineering skills associated with modelling, selecting, designing and installing the apparatus to capture its energy and convert it into useful forms.
- Analyse sustainable energy reduction systems in terms of economics, engineering and social issues.
- Critically analyse the long-term environmental, socio-economic and political issues surrounding renewable energy supply and demand.
- Develop initiative, creativity and entrepreneurship to encourage students to solve complex problems and become successful future contributors to the industry.

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	Critically analyse ways in which renewable sources can be analysed and modelled to predict energy production in a variety of situations.	KS5	KS7
		KS10	
2	Critically model the economic and environmental systems of renewable energy exploitation in comparison to fossil fuel and nuclear energy production.	KS5	KS3
		KS7	
3	Apply knowledge to select optimum engineering solutions for different situations.	KS3	KS6
		KS7	
4	Report clearly, critically, and comprehensively on current research into renewable or sustainable systems and their problems in real world scenarios.	KS1	KS6
		KS4	KS7
5	Research and analyse a sustainable or renewable energy system to produce a complex solution for a real world problem.	KS1	KS2
		KS3	KS6
		KS8	

Transferable skills and other attributes

1. Communication
2. ICT Technologies
3. Time management and organisation
4. Interpersonal skills
5. Problem solving
6. Information handling including numeracy

Derogations

Credits shall be awarded by an assessment board for those Level 7 modules in which an overall mark of at least 50% has been achieved with a minimum mark of 40% in each assessment element.

Assessment:

Indicative Assessment Tasks:

Examination (50%)
Coursework (50%) Students will be asked to analyse a renewable and/or sustainability problem and produce a solution.

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

Learning and Teaching Strategies:

A series of workshop style lectures with student-led seminars and small group activities. Directed learning using library and internet resources will be facilitated using Moodle.

Syllabus outline:

- Why renewable energy and sustainability?
- Energy resources overview: Comparative evaluation of present UK/ worldwide energy mix and sustainability. Energy security. Primary energy, fossil fuels, renewables, nuclear power. Supply and demand issues. The effects of the variability of power from renewable energy sources.
- Resource understanding: Relative abundance of natural energy and its sources. Renewable energy supply vs. demand modelling and the importance of storage.
- Prediction of potential energy. Types. Environmental considerations. Theoretical and practical design considerations. Planning. Selection. Real world case studies with associated problems and solutions. To cover:
    - Wind Energy.
    - Hydro power.

- Wave energy.
- Tidal power.
- Solar Thermal.
- Solar Photovoltaic.

- The economic value of renewable energy: Modelling economic systems for sustainability and renewable energy and the factors effecting its sale.
- Environment. Critical evaluation of environmental factors and issues surrounding fossil fuel, nuclear and renewable energy production.
- Future Scenarios: Mapping energy futures: Energy scenarios, scenarios as policy tools.

Indicative Bibliography:

Essential reading

Everett, B. (2012), Energy Systems and Sustainability: Power for a Sustainable Future. 2nd ed . Oxford: Oxford University Press.

Other indicative reading

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

Boyle, G. (2012) Renewable Energy: Power for a Sustainable Future. Oxford University Press

Sorensen, B. (2017), Renewable Energy: Physics, Engineering, Use, Environmental Impacts, Economy and Planning Aspects. 5th ed. Burlington, MA: Elsevier.

Murray, B. (2009) Power Markets and Economics: Energy Costs, Trading, Emissions: Structure, Costs, Operation(John Wiley & Sons Ltd)

Internet sources and government documents:

http://2050-calculator-tool.decc.gov.uk/pathways//primary_energy_chartglobalcalculator.org
http://www.decc.gov.uk/
www.ipcc.ch/
http://www.tyndall.ac.uk
http://www.ofgem.gov.uk
http://www.energyinst.org.uk/
http://www.iea.org/
http://www.worldenergy.org/