Module Title: **Introduction to Sustainability in Energy Provision and Demand Management**	**Module Code: EV7115** **Level: 7** **Credit: 30** **ECTS credit: 15**	**Module Leader**: Frances Hill **Additional tutors:** Alan Owen Tim Coleridge Bryce Gilroy-Scott Jane Fisher Louise Halestrap Ruth Stevenson Siobhan Maderson

Pre-requisite: None	**Pre-cursor:** None
Co-requisite: None	**Excluded combinations:** None

Location of delivery: CAT, DL

The main aims of the module are to enable the student to:

Be introduced to the programme, teaching and learning resources and study skills.

Contextualize sustainability and energy generation supply and demand in view of current environmental changes.

Appreciate the interconnectedness of the factors involved.

Discern the wider implications of environmental change and the need for a sustainable approach to energy use, demand, supply and management and its influence on social structures, environment, economics, resource management and governance through a critical analysis. This will introduce the students to the broad concept of sustainability and its implications for subject areas covered in subsequent modules of the programme.

The second half of the module provides an overview of national and international energy markets, legislation, social and behavioural approaches to energy, and training in data collection and analysis e.g. using hydro-power and/or solar thermal as an example technology.

Main topics of study:

- Environmental change, IPCC processes, and analysis of Mitigation challenges in energy generation and use in buildings, appliances and equipment, transport etc
- International and national approaches to energy provision and demand management
- UK and international markets, policy and support for renewable energy
- Introduction to policy and programme evaluation
- Stock level analysis of buildings and equipment, Potential studies and scenario analysis (building on and supporting Zero Carbon Britain)
- AC and DC electrical theory, grid connection issues for renewables
- Energy storage, smart grids and meters
- Ecosystem services, biodiversity, landuse and water security
- Atmospheric carbon reduction
- Mechanisms of environmental change
- Health and well-being implications of environmental change
- Economic fundamentals and non growth economic systems
- Transportation
- Adaptations needed for climatic changes and weather extremes

Learning Outcomes for the module

At the end of this module, students will be able to:

Knowledge

1. Distinguish the urgency, timeframe, scale and causes of environmental change;

2. Form a synthesis of knowledge related to the role of energy, vulnerability, adaptive capacity, and resilience-building in relation to current environmental change;

3. Gain an overview of the role of energy issues including national and international energy policies, markets, available sustainable energy technologies, societal and behavioural aspects and trends in energy generation and use over time.

Thinking skills

4. Conceive the nature of the interconnectedness of the numerous interactions related to sustainability and environmental change and the central role of energy;

5. Critically analyse the role of renewable and low carbon energy generation in the wider context of sustainability.

Subject-based practical skills

6. collect and analyse energy-related data using appropriate equipment and software.

Skills for life and work

7. Effectively communicate (in written and oral forms) to both peers and a wider audience;

8. Show the ability to use IT and computer skills to gather and use evidence and data to find, retrieve, sort and exchange new information.

Teaching/ learning methods/strategies used to enable the achievement of learning outcomes:

The factual content of the module is taught through lectures, seminars, practical workshops, presentations and tutorials,

Both theoretical and practical aspects are covered.

There is a formative learning element to the module to allow students to receive critical feedback on their work without the pressure of marked assessment.

For distance learning (DL) students, learning will be supported through Internet-based lectures (of the on-site lectures), practical exercises, seminars and tutorials.

All students will have access to Moodle discussion boards and regular Skype surgeries, where they can meet with peers and a tutor to discuss any academic issue.

Lectures on-site and through DL highlight key concepts, models and frameworks, and integrate additional resources (such as journal articles). They encourage deep learning through the use of self-assessment questions which encourage students to engage with the topic, which assists understanding of new topics and skills.

Assessment methods which enable students to demonstrate the learning outcomes for the module:	Weighting:	Learning Outcomes demonstrated
1. Critique Review (2,500 words max)	**(45%)**	**1,2,4,5,7**
2. Essay (2500 words max)	**(40%)**	**2,3,4,5,7**
3. Numerical assignment (1000 words equivalent)	**(15%)**	**6,7,8**

Reading and resources for the module:

Core

Boyle, G. (ed.) (2012) Renewable energy: power for a sustainable future. 3rd edn. Oxford: Oxford University Press.

IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp Online at ***http://ipcc.ch/report/ar5/syr/***. Accessed 11/12/16

Pears, R. and Shields, G. (2013) Cite them right: the essential referencing guide. 10th edn. Basingstoke: Palgrave Macmillan.

Pelling M. (2011) *Adaptation to Climate Change, From resilience to transformation*; Routledge, Abingdon. (*)

Twidell, J. and Weir, T. (2015) Renewable energy resources. 3rd edn. Abingdon: Routledge

Recommended

Adger, W.N., Lorenzoni I., and O'Brien K.L., (2010) *Adapting to Climate Change, Thresholds, Values, Governance*, Cambridge University Press, Cambridge.

Beggs, C. (2009) *Energy: management, supply and conservation*. 2nd edn. Abingdon: Routledge.

Centre for Alternative Technology (2013) *ZCB: rethinking the future*. Machynlleth: CAT Publications.

Czisch, D. G. (2011) *Scenarios for a future electricity supply: cost-optimized variations on supplying Europe and its neighbours with electricity from renewable energies*. Stevenage: IET.

Ensor J. and Berger R. (2009), *Understanding Climate Change Adaptation, Lessons from community-based approaches*, Practical Action Publishing, Rugby.

Everett, B., Boyle, G., Peake, S. and Ramage, J. (eds.) (2011) *Energy systems and sustainability: power for a sustainable future*. 2nd edn. Oxford: Oxford University Press.

Harvey, L. D. D. (2010) *Energy and the new reality 1: energy efficiency and the demand for energy services.* Abingdon: Routledge.

Harvey, L. D. D. (2010) *Energy and the new reality 2. carbon-free energy supply*. Abingdon: Routledge.

IPCC (2013) *Climate change 2013: the physical science basis*. Available at: http://www.ipcc.ch/report/ar5/index.shtml (Accessed: December 2016).

MacKay, D. J. C., (2008) *Sustainable energy - without the hot air*. Cambridge: UIT.

Oughton, D. R. and Wilson, A. (2015) *Faber & Kells heating and air-conditioning of buildings*. 11th edn. Abingdon: Routledge.

Roaf, S. (2009) *Adapting buildings and cities for climate change : a 21st century survival guide.* 2nd ed. Oxford: Elsevier. (*)

Schipper E.L.F., and Burton I., editors. (2008), *The Earthscan Reader on Adaptation to Climate Change*, Earthscan, London.

Further relevant journals, websites and other relevant resources will be provided within reading materials that are made available for the module.

(*) Available as an e-book

Indicative learning and teaching time **(10 hrs per credit):**	**Activity**
1. Student/tutor interaction, some of which may be online:	Activity Lectures, seminars, tutorials, presentations, practicals 65 hours
2. Student learning time:	Activity Seminar reading and preparation, assignment preparation, background reading, on-line research activities. 235 hours
Total hours (1 and 2):	300 hours