

## Liverpool John Moores University

Title: SUSTAINABLE ENERGY GENERATION  
Status: Definitive  
Code: **7082BEPG** (119553)  
Version Start Date: 01-08-2013

Owning School/Faculty: Built Environment  
Teaching School/Faculty: Built Environment

Team	Leader
Alex Mason	Y
Olga Korostynska	
Eduardo Cordova-Lopez	

**Academic Level:** FHEQ7      **Credit Value:** 20.00      **Total Delivered Hours:** 53.00  
**Total Learning Hours:** 200      **Private Study:** 147

### Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	48.000
Workshop	2.000

**Grading Basis:** 50 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	UNSEEN EXAM	60.0	3.00
Report	AS2	DESIGN TASK	40.0	

### Aims

*To provide the knowledge and understanding for the selection and effective management of sustainable energy sources in the construction and property industries.*

## Learning Outcomes

After completing the module the student should be able to:

- 1 Critically appraise the traditional methods of energy generation and have an understanding of the current legislative frameworks driving change in the energy sector
- 2 Suggest improvements to the current methods of energy supply and distribution, focusing on future needs.
- 3 Critically evaluate the existing financial framework for energy systems.
- 4 Design and critically evaluate a sustainable energy system.

## Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

EXAM	1	2
REPORT	3	4

## Outline Syllabus

*Description and discussion of a range of conventional energy generation sources including their operation, cost and parameters such as their efficiency.*

*Design and critical evaluation with regard to methods of pollution control from energy supply sources, particularly fossil fuels, and environmental impact assessment for common types of conventional and renewable energy systems.*

*Discussion of the renewable energy agenda, including current global legislation and incentives for the uptake of such energy generation means. In addition a discussion of renewable energy generation systems will be included such as: solar; hydro; tidal; wind; geothermal; energy from waste, etc.*

*Energy distribution, smart grids and transmission losses.*

*Building energy management systems, energy tariff selection and metering, plant control and optimisation, in addition to carbon neutral and sustainable construction/property.*

*Calculation of life cycle costs and energy payback period.*

*How pollution control, energy generation and building energy management systems (BEMS) fit into the future cities concept.*

## Learning Activities

Lectures, interactive workshop, virtual laboratory tour.

## References

<b>Course Material</b>	Book
<b>Author</b>	Nicola Armaroli, Vincenzo Balzani
<b>Publishing Year</b>	2011
<b>Title</b>	Energy for a sustainable world: from the oil age to a sun-powered future
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	John Wiley & Sons Inc
<b>ISBN</b>	9783527633609

<b>Course Material</b>	Book
<b>Author</b>	Egbert Boeker and Rienk van Grondelle
<b>Publishing Year</b>	2011
<b>Title</b>	Environmental physics sustainable energy and climate change
<b>Subtitle</b>	
<b>Edition</b>	3rd Edition
<b>Publisher</b>	Chichester: Wiley-Blackwell
<b>ISBN</b>	9781119974185

<b>Course Material</b>	Book
<b>Author</b>	Godfrey Boyle
<b>Publishing Year</b>	2004
<b>Title</b>	Renewable energy: power for a sustainable future
<b>Subtitle</b>	
<b>Edition</b>	2nd Edition
<b>Publisher</b>	Oxford: Oxford University Press in association with the Open University
<b>ISBN</b>	9780199261789

<b>Course Material</b>	Book
<b>Author</b>	Dusastre, Vincent
<b>Publishing Year</b>	2010
<b>Title</b>	Materials for sustainable energy: a collection of peer-reviewed research and review articles from Nature Publishing Group
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Singapore; London; World Scientific
<b>ISBN</b>	9814317667

<b>Course Material</b>	Book
<b>Author</b>	Evans, Robert L.
<b>Publishing Year</b>	2007
<b>Title</b>	Fuelling our future: an introduction to sustainable energy

<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Cambridge ; New York : Cambridge University Press
<b>ISBN</b>	9780521865630

<b>Course Material</b>	Book
<b>Author</b>	Kruger, Paul
<b>Publishing Year</b>	2006
<b>Title</b>	Alternative energy resources: the quest for sustainable energy
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Hoboken, NJ: Wiley
<b>ISBN</b>	9780471772088

<b>Course Material</b>	Book
<b>Author</b>	Dejan Mumovic and Mat Santamouris
<b>Publishing Year</b>	2009
<b>Title</b>	A handbook of sustainable building design and engineering: an integrated approach to energy, health and operational performance
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	London: Earthscan
<b>ISBN</b>	1844075966

<b>Course Material</b>	Book
<b>Author</b>	Hermann Scheer
<b>Publishing Year</b>	2002
<b>Title</b>	The solar economy: renewable energy for a sustainable global future
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	London: Earthscan
<b>ISBN</b>	9781853838354

<b>Course Material</b>	Book
<b>Author</b>	Gonzalo Abad
<b>Publishing Year</b>	2011
<b>Title</b>	Doubly fed induction machine: modeling and control for wind energy generation
<b>Subtitle</b>	IEEE Press series on power engineering
<b>Edition</b>	
<b>Publisher</b>	Oxford: Wiley-Blackwell
<b>ISBN</b>	9781118104941

<b>Course Material</b>	Book
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<b>Author</b>	Olimpo Anaya-Lara
<b>Publishing Year</b>	2009
<b>Title</b>	Wind energy generation: modelling and control
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Oxford: Wiley
<b>ISBN</b>	0470748230

<b>Course Material</b>	Book
<b>Author</b>	Jeff W. Eerkens
<b>Publishing Year</b>	2010
<b>Title</b>	The nuclear imperative: a critical look at the approaching energy crisis (more physics for presidents)
<b>Subtitle</b>	
<b>Edition</b>	2nd Edition
<b>Publisher</b>	Dordrecht: Springer
<b>ISBN</b>	9048186676

<b>Course Material</b>	Book
<b>Author</b>	Steven B. Krivit, Jay H. Lehr, Thomas B. Kingery
<b>Publishing Year</b>	2011
<b>Title</b>	Nuclear energy encyclopedia: science, technology, and applications
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Oxford : Wiley-Blackwell
<b>ISBN</b>	9781118043479

<b>Course Material</b>	Book
<b>Author</b>	Fereidoon P. Sioshansi
<b>Publishing Year</b>	2012
<b>Title</b>	Smart grid: integrating renewable, distributed & efficient energy
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Amsterdam; Boston: Elsevier/Academic Press
<b>ISBN</b>	6613299014

<b>Course Material</b>	Book
<b>Author</b>	William Shepherd, Li Zhang
<b>Publishing Year</b>	2011
<b>Title</b>	Electricity generation using wind power
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Singapore; London: World Scientific
<b>ISBN</b>	981430414x

<b>Course Material</b>	Book
<b>Author</b>	Remus Teodorescu, Marco Liserre, Pedro Rodriguez
<b>Publishing Year</b>	2011
<b>Title</b>	Grid converters for photovoltaic and wind power systems
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Chichester: Wiley
<b>ISBN</b>	9780470667040

<b>Course Material</b>	Book
<b>Author</b>	Tom Markvart and Luis Castaner
<b>Publishing Year</b>	2005
<b>Title</b>	Solar cells: materials, manufacture and operation
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Oxford: Elsevier Advanced Technology
<b>ISBN</b>	9781856174572

<b>Course Material</b>	Book
<b>Author</b>	Ronald DiPippo
<b>Publishing Year</b>	2005
<b>Title</b>	Geothermal power plants: principles, applications and case studies
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Oxford: Elsevier
<b>ISBN</b>	9781856174749

<b>Course Material</b>	Book
<b>Author</b>	Keith Moss
<b>Publishing Year</b>	2005
<b>Title</b>	Energy management in buildings
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	London: E. & F. N. Spon
<b>ISBN</b>	9780203349021

<b>Course Material</b>	Book
<b>Author</b>	Suzy Edwards, Ed Bartlett and Ian Dickie
<b>Publishing Year</b>	2000
<b>Title</b>	Whole life costing and life-cycle assessment for sustainable building design
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Watford: CRC
<b>ISBN</b>	9781860814419

<b>Course Material</b>	Book
<b>Author</b>	E. Bjordal
<b>Publishing Year</b>	2010
<b>Title</b>	Energy, natural resources and environmental economics
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Berlin; London: Springer
<b>ISBN</b>	9783642120671

<b>Course Material</b>	Book
<b>Author</b>	Gill Seyfang
<b>Publishing Year</b>	2011
<b>Title</b>	The new economics of sustainable consumption : seeds of change
<b>Subtitle</b>	
<b>Edition</b>	2nd Edition
<b>Publisher</b>	Basingstoke: Palgrave Macmillan
<b>ISBN</b>	9780230321755

<b>Course Material</b>	Book
<b>Author</b>	Bent Srenson
<b>Publishing Year</b>	2011
<b>Title</b>	Renewable energy [electronic resource] : physics, engineering, environmental impacts, economics & planning
<b>Subtitle</b>	
<b>Edition</b>	4th Edition
<b>Publisher</b>	London: Academic
<b>ISBN</b>	9780080890661

<b>Course Material</b>	Book
<b>Author</b>	Barbara Carroll and Trevor Turpin
<b>Publishing Year</b>	2009
<b>Title</b>	Environmental impact assessment handbook : a practical guide for planners, developers and communities
<b>Subtitle</b>	
<b>Edition</b>	2nd Edition
<b>Publisher</b>	London: Thomas Telford
<b>ISBN</b>	9780727735096

<b>Course Material</b>	Book
<b>Author</b>	Charles H. Eccleston
<b>Publishing Year</b>	2011
<b>Title</b>	Environmental impact assessment [electronic resource] : a guide to best professional practices
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Boca Raton, Fla. ; London : CRC

<b>ISBN</b>	9781439828748
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<b>Course Material</b>	Book
<b>Author</b>	Michael Greenberg
<b>Publishing Year</b>	2012
<b>Title</b>	The environmental impact statement after two generations: managing environmental power
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	London: Routledge
<b>ISBN</b>	9780203803837

<b>Course Material</b>	Book
<b>Author</b>	Peter Morris and Riki Therivel
<b>Publishing Year</b>	2009
<b>Title</b>	Methods of environmental impact assessment
<b>Subtitle</b>	
<b>Edition</b>	3rd Edition
<b>Publisher</b>	London: Routledge
<b>ISBN</b>	0203892909

<b>Course Material</b>	Book
<b>Author</b>	Regulations
<b>Publishing Year</b>	2006
<b>Title</b>	The Building Regulations 2000
<b>Subtitle</b>	Low or zero carbon energy sources: strategic guide
<b>Edition</b>	
<b>Publisher</b>	London: TSO
<b>ISBN</b>	9780117036383

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## Notes

Considers the technological and economic aspects of energy generation, critically comparing traditional and renewable energy generation mechanisms and their ability to deliver sustainable energy. Current and emerging technologies will be discussed in depth, considering their operation, key parameters (e.g. efficiency, cost, etc.) and application in the built environment context. These include energy generation from coal, gas, oil, wind, tide, thermal, solar and nuclear energy. The economic aspects of energy generation will be covered, including energy payback, life cycle costing and consideration of incentive schemes such as the renewable heating incentive and feed in tariffs, in addition to larger incentive mechanisms. Support of energy through technology will be discussed via topics such as smart grids and smart metering.