MODULE DESCRIPTOR

Module Code:	ENGM058
Module Title:	Life Cycle Thinking and the Circular Economy
FHEQ Level:	7
Module Co-ordinator:	Prof. Angela Druckman
Other contributors:	Prof. Richard Murphy, Dr Jaquetta Lee, Dr Jonathan Chenoweth
Number of credits:	15 credits
Number of ECTS credits:	7.5
Module Availability:	Semester 1
Overall student workload:	150 hours overall student workload. 30 scheduled contact hours (e.g. lectures, discussions and exercises), 120 hours independent study
Last updated:	28.04.17

Assessment Pattern

Units of Assessment	**Weighting towards Module Mark (%)**
In-class Group Work Report	20%
Individual Post Module Report	80%
Alternative Assessments (in case of failed assessment)	
For In-class Group Work Report: an individual report using different case study example(s).	
For Post Module Report: repeat assignment using different case study example(s).	
Qualifying Condition(s) A weighted aggregate mark of 50% is required to pass the module	

Pre-requisite/Co-requisites

None

Module Overview

When considering how to reduce the environmental impacts of a product, a service, an organisation, a household or even a nation, it is vital to take a life cycle approach. In this module we introduce participants to life cycle thinking, the concept of the circular economy, life cycle management and related environmental systems analysis approaches. We consider how such approaches can guard against trade-offs in sustainability, thus leading to better-informed decisions.

Module Aims

This module aims to:

- introduce participants to life cycle thinking, the concept of the circular economy, life cycle management and related environmental systems analysis approaches.

Learning Outcomes

On successful completion of this module, students will be able to:

- Explain the concept of life cycle thinking (LCT) and describe the benefits and challenges of its application in practice in industry and for policy making. (K, T, P)
- To appreciate and be able to discuss the strengths and weaknesses of the circular economy concept (K, T, P)
- Describe the goal, key methodologies, challenges and role of systems analysis approaches such as Life Cycle Assessment (LCA) and Input-Output Analysis. (K)
- Appreciate different types of footprints, appropriate methodologies, and to be aware of current protocols and standards used for carbon footprinting of products, services and organisations. (K, P)
- Apply the principles and tools of Design for Sustainability to consumer products. (C, P)

Key: C-Cognitive/Analytical; K-Subject Knowledge; T-Transferable Skills; P- Professional/ Practical skills

Module Content

Indicative content includes:

- Introduction to life cycle thinking, the circular economy, and life cycle management
- Concepts, policy and organisational drivers, and application in practice;
- Introduction to Life Cycle Assessment methodology, simplified life cycle studies; and case studies (from academia and industry);
- Overview of Input-Output Analysis: principles and application;
- Principles and practice of Design for Sustainability.

Methods of Teaching/Learning

The learning and teaching strategy is designed to take an active learning approach, in which the students are engaged in class exercises and discussions. The schedule includes guest expert speakers from industry with whom students are encouraged to engage.

The learning and teaching methods include:

- Preparatory reading (~10 hours);
- Lectures (~18 hours)
- In-class exercises and group discussions (~12 hours)
- Post course study and assignment (~110 hours)

Assessment Strategy

The assessment strategy is designed to provide students with the opportunity to demonstrate that they understand the concepts of life cycle thinking (LCT) and the circular economy, and are able to discuss the benefits and challenges of its application in practice in industry and for policy making. In the individual assignment students are asked to demonstrate their understanding by applying what they have learnt to case studies. In the group assignment they are asked to apply the principles of Design for Sustainability to a specific consumer good or service.

Thus, the summative assessment for this module consists of:

- An Individual Post Module Report in which students are instructed to utilise case studies to critically explore how life cycle thinking can be applied to improve sustainability outcomes.
  Assignment length: 3,200 words maximum (excluding reference list).
  Deadline: ~ 3 weeks after the end of the module.
- An In-class Group Work Report in which students apply the principles and tools of Design for Sustainability to a selected consumer product.
  Deadline: close of play on the day of the exercise.

  In cases where the In-class Group Work Report is failed, the alternative assignment will be an individual report, 800 words maximum.

Formative assessment and feedback

Students receive formative feedback during in-class group exercises and discussions. Groups are generally around 6-7 students.

Reading List

Essential Reading

Cowell SJ, Nebel, B and Clift R, (2002; edited 2012). "*Introduction to Life Cycle Assessment"*, Centre for Environmental Strategy, University of Surrey, Guildford, UK

Nature: Special Edition on the Circular Economy. March 2016

Pearce, F. (2015). How you can make the greenest life choices. New Scientist 12.12.15. https://www.newscientist.com/article/mg22830510-800-how-you-can-make-the-greenest-life-choices/

United Nations Environmental Programme (2009). "*Design for Sustainability. A Step by Step Approach*". UNEP, Sustainable Consumption and Production Branch, Paris, France. http://www.d4s-sbs.org/

Recommended Reading

Clift, R. and Druckman, A. (2016) Taking Stock of Industrial Ecology. Springer. Free e-book available at http://www.springer.com/us/book/9783319205700

Various chapters, including, for example:

- Bailey, M and Gadd, A. Quantifying the potential of Industrial Symbiosis - the LOCIMAP project, with Applications in the Humber Region.
- Chertow, M. and Park, J. Scholarship and Practice in Industrial Symbiosis: 1989-2014.
- Druckman, A. and Jackson, T. Understanding households as drivers of carbon emissions.
- Guinée, J. Life Cycle Sustainability Assessment: what is it and what are its challenges?
- Hill, J. Circular Economy and the Policy Landscape in the UK.
- Moriguchi, Y. and Hashimoto, S. Material Flow Analysis and Waste Management.
- Sim, S, King, H and Price, E. The role of science in shaping sustainable business: Unilever case study.
- Stahel, W. and Clift, R. Stocks and Flows in the Performance Economy.
- Wiedmann, T. Impacts embodied in global trade flows.

EEA (2014). Environmental Indicator Report. http://www.eea.europa.eu/publications/environmental-indicator-report-2014

Jackson, T. (1996) Material Concerns, Routledge, London. See pages 8-14 for a description of the second law of thermodynamics.

Peters, G. (2010). "*Carbon footprints and embodied carbon at multiple scales*." Current Opinion in Environmental Sustainability 2(4): 245-250.

Plassmann, K., A. Norton, N. Attarzadeh, M. P. Jensen, P. Brenton and G. Edwards-Jones (2010). "Methodological complexities of product carbon footprinting: a sensitivity analysis of key variables in a developing country context." Environmental Science and Policy 13(5): 393-404.

Sim, S., M. Barry, R. Clift and S. J. Cowell (2007). "The relative importance of transport in determining an appropriate sustainability strategy for food sourcing." International Journal of LCA 12(6): 422-431.

Wijkman, A. and Skånberg, K. (2015). The Circular Economy and Benefits for Society. Club of Rome. Available from http://www.clubofrome.org/cms/wp-content/uploads/2015/10/The-Circular-Economy-and-Benefits-for-Society.pdf

Background Reading

Allwood, J. M. and J. M. Cullen (2012). "*Sustainable Materials With Both Eyes Open*", Uit Cambridge Limited. http://withbotheyesopen.com/