EV7139 Module Specification

Module Title: Sustainable heating and cooling	**Module Code: EV7139** **Level: 7** **Credit: 15** **ECTS credit: 7.5**	**Module Leader**: Alan Owen **Additional tutors:** Frances Hill
Pre-requisite: none	**Pre-cursor: none**	
Co-requisite: none	**Excluded combinations: none**	**Suitable for incoming study abroad?** N
Location of delivery: CAT and online – blended delivery		

Summary of module for applicants:

This module considers how the sustainable heating and cooling in buildings will need to adapt to meet the needs of a changing environment. It aims to enable students to:

Analyse the advantages and limitations of existing thermal provision systems in a local, national and global context

Synthesise and develop scenarios of future thermal energy provision and demand in short, medium and long-term contexts

Main topics of study:

- Existing thermal systems functions, benefits, and limitations (oil, gas, biomass, air-conditioning etc)
- Emerging thermal systems functions and limitations (e.g. Heat pumps, hydrogen, geothermal, district heating, thermal storage etc)
- Futuring of thermal energy provision

This module will be able to demonstrate at least one of the following examples/ exposures

Live, applied project ☒
Company/engagement visits ☒
Company/industry sector endorsement/badging/sponsorship/award ☐

Learning Outcomes for the module

- *Digital Proficiency - Code = (DP)*
- *Industry Connections - Code = (IC)*
- *Social & Emotional Intelligence - Code = (SEI)*
- *Physical Intelligence - Code = (PI)*
- *Cultural Intelligence - Code = (CI)*
- *Community Connections & UEL Give Back - Code = (CC)*
- *Cognitive Intelligence – Code = (COI)*
- *Enterprise and Entrepreneurship (EE)*

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

Knowledge

1. Demonstrate a critical understanding of the principles of thermal provision in buildings including the benefits and limitations (e.g. supply & demand) of transforming thermal energy provision systems;*(COI)*

Thinking skills

2. Critically appraise the technological challenges of future thermal energy provision and demand management *(COI)*

3. Critically appraise the wider resource impacts and emissions implications of installation, use and end of life outcome of thermal energy provision and demand management *(COI)*

Subject-based practical skills

4. Systematically analyse and synthesise the relationships between thermal energy provision and demand, in the context of future benefits and impacts *(COI)*
5. Derive and use data to support a thermal energy futuring argument *(SEI) (PI) (DP)*

Skills for life and work

6. Demonstrate the ability to work effectively as part of a team delivering a group project (SEI) (CI)
7. Communicate effectively (written and visually) to a team, peer or a wider audience (DP) *(SEI)*

Teaching/ learning methods/strategies used to enable the achievement of learning outcomes:
For students studying onsite and by distance (blended) learning:

The factual content of the module is taught through lectures, seminars, practical workshops, presentations, demonstrations and tutorials, and throughout this process an active exchange of views and opinions is encouraged. Students have access to MS Teams where they can access recorded and written support material, meet with their peers and a tutor to discuss any academic issue. Both theoretical and practical aspects are covered both onsite and through interactive sessions on Teams.

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

For distance learning (DL) students, learning will be supported through streamed and recorded Internet-based lectures (of the onsite lectures), situation related practical exercises, seminars and tutorials.

Lectures onsite and through MS Teams 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, to help students understand new topics and skills.

Assessment methods which enable students to demonstrate the learning outcomes for the module:	**Weighting:**	**Learning Outcomes demonstrated:**
1. Report (2400 words)	80%	1,2,3,4,5,7
2. Poster presentation (600 words equivalent)	20%	6, 7

Reading and resources for the module:
These must be up to date and presented in correct Harvard format unless a Professional Body specifically requires a different format

Core
A Handbook on Low-Energy Buildings and District-Energy Systems: Fundamentals, Techniques and Examples, Danny Harvey L.D., 2012, Routledge, ISBN-13: 978-1138965508

Recommended

Athienitis,A., O'Brien,W., 2015 Modeling, Design, and Optimization of Net-Zero Energy Buildings, Ernst & Sohn**,** ISBN-13: 978-3433030837

Cantor, J, Heat Pumps for the Home, 2020. 2nd ed The Crowood Press Ltd; ISBN-10:1785007793

Chartered Institution of Building Services Engineers, 2020, Heat networks: code of practice for the UK. Raising standards for heat supply

Chartered Institution of Building Services Engineers, 2019

Open-loop groundwater source heat pumps: code of practice for the UK. Harnessing energy for heating and cooling from water in the ground : CP3

DBEIS UK Gov.2021, Combined Heat and Power– Technologies, , Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/961492/Part_2_CHP_Technologies_BEIS_v03.pdf (Accessed 14th Dec 2021)

DBEIS UK Gov.2021, Biomass Policy Statement, Available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1031057/biomass-policy-statement.pdf (Accessed 14th Dec 2021)

Laughton, C.,2021, Solar domestic water heating, Routledge, ISBN-10 ： 0367787512

Sørensen, B. (2017) *Renewable Energy: Physics, Engineering, Environmental Impacts, Economics and Planning*. 5th edition. London, United Kingdom: Academic Press.

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

Provide evidence of how this module will be able to demonstrate at least one of the following examples/ exposures

Live, applied project
…group project – District Heating with range of inputs

Company/engagement visits
We expect to call in industry practitioners as external lecturers

Company/industry sector endorsement/badging/sponsorship/award *N/A*

Indicative learning and teaching time **(10 hrs per credit):**	**Activity**
1. Student/tutor interaction:	Lectures, seminars, tutorials, presentations, practicals / demonstrations **30 hours**
2. Student self learning and research time:	Seminar reading and preparation, assignment preparation, background reading, and research activities. **120 hours**
Total hours:	**150 hours**

For office use only. (Not required for Programme Handbook)

Assessment Pattern for Unistats KIS (Key Information Sets)	**Weighting:**
Coursework *(written assignment, dissertation, portfolio, project output)*	
Practical Exam *(oral assessment, presentation, practical skills assessment)*	
Written Exam	

HECoS Code:	
UEL Department:	