Module Specification

Zero Carbon Buildings (Technology and Modelling)

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Contents

Part 1: Information

Module title: Zero Carbon Buildings (Technology and Modelling)

Module code: UBLML1-30-2

Level: Level 5

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

College: College of Arts, Technology and Environment

School: CATE School of Architecture and Environment

Partner institutions: None

Field: Architecture and the Built Environment, LLE

Module type: Module

Pre-requisites: Zero Carbon Buildings (Environments and Materials) 2023-24

Excluded combinations: Energy Transformations 2023-24, Low Carbon Building Services 2023-24, Sustainability and Energy Simulations 2023-24

Co-requisites: None

Continuing professional development: Yes

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: BEFORE: Learners joining this level 5 course are expected to have fundamental knowledge of building physics (such as the heat-balance equation), as covered in the level 4 course Zero Carbon Building (Environments and Materials). DURING: Learners will gain technical knowledge on the application of principles relating to zero carbon dwellings (such as Passivehaus), including site analysis, fabric evaluation, services selection and renewable energy options.

AFTER: Upon completion of the course, learners shall have the skills to engage with the design and specification of zero carbon dwellings, and undertake energy performance calculations. They will also have the knowledge and skills to undertake the level 6 course Zero Carbon Buildings (Energy Management and Performance).

Features: This module has been designed to be delivered as a stand-alone credit-bearing short course, meeting the criteria for Lifelong Loan Entitlement funding through the Student Loan Company.

This course maps directly to existing UWE modules, which form part of our BEng (Hons) Building Services Engineering programme, and so learners who progress to the full programme can use the short course to offset these credits. The syllabus is also very close to a level 6 module which forms part of the BEng (Hons) Architecture and Environmental Engineering programme. So these modules are listed as excluded combination of the short course.

As this module can be taken as a stand-alone short course, and these learners may lack the peer support and institutional knowledge of students on full degree programmes. Hence the course has been designed to meet the highest standard of inclusive design, including:
-A primary in-person teaching environment, that represent at least 72 contact hours out of a total 300 hours of learning (25%).
-A secondary online learning environment where material is available in digital formats, including recordings of in-person delivery.
-Learning material and online reading publications in formats more accessible to neurodiverse learners.
-Each element of learning shall be divided into short presentations on theory, followed by interactive learning activities, using technology enhanced learning, detailed session plans and related reading lists.
-Where possible the use of hands-on learning equipment and real-world case studies, will be used to give the learning a professional focus.

Educational aims: See learning outcomes

Outline syllabus: Students will learn about the relationship between buildings and energy supply systems, including the electrical grid, gas systems, liquid and solid

fuels. They shall compare and contrast fossil fuel to those derived from carbon neutral processes.

Students will learn how to apply the principles of passive design of buildings, using computer aided design systems to help evaluate the impact of design on energy performance.

Students shall evaluate and apply heat generation, storage and recovery systems. These will include boilers, heat pumps, district systems, solar thermal systems, ventilation heat recovery systems and thermal stores. Case study of a commercial boiler house shall be used to understand heat flows at a large scale.

Students will learn to evaluate and apply a range on-site electricity generation and storage: Solar PV generators; battery systems; uninterruptable power supplies; combined heat and power; trigeneration; fuel cells and hydrogen cycles

Energy Modelling: Energy benchmarking; CO2 emissions; compliance software.

Part 3: Teaching and learning methods

Teaching and learning methods: Regular online (flipped) lectures are to introduce topics, define the scope of learning required and provide initial conceptual development.
Lectures are followed by supervised face-to-face tutorial/seminar sessions to reinforce cognitive development and provide feedback. Supervised tutorials provide guidance in applying quantitative methods required for solving problems, and provide feedback on independent learning and activities undertaken in support of the planned site visits. Software workshops are used to support student learning simulation software.

Directed independent learning in this module includes time engaged with essential reading, completion of tutorial exercise drills, preparation for, and completion of, summative assignment.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 For a given case study site, develop the conceptual design of a residential dwelling using zero carbon principles, including the evaluation of the site's microclimate opportunities and constraints, a comparison of different environmental strategies, and the identification of potential design risks.

MO2 Evaluate, contrast and select appropriate construction technology relating to a zero carbon dwelling for a given site, supporting choices with quantitative data relating to predicted performance of operational energy use and related carbon emissions, and identifying potential risks to actual post-occupation performance.

MO3 Present a design proposal appropriate for a professional audience, demonstrating an ability to articulate the process of how zero carbon theory was applied and answer questions relating to how key design issues could be resolved.

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

E-learning/online learning = 24 hours

Total = 300

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/ublml1-30-2.html

Part 4: Assessment

Assessment strategy: The Strategy:
Considering the syllabus of this module, the level of study and the number expected study hours, it has been determined that an appropriate and engaging form of assessment would be a portfolio of design work and related presentation. These

demonstrate clearly the level of which the students have achieved the learning outcomes and also are authentic to the world of work where design calculation / specifications and presentation skills are much in demand.

The Assessment:

Presentation (15 minutes) Poster - learners shall present their final design of a zero carbon building using a poster as a visual aid.

Portfolio (3000 words) - Specify a zero carbon building design for a given site. Submit a portfolio of work to support the design.

Resit Presentation - a similar brief to that described above, which may include some topic changes.
Resit Portfolio - a similar brief to that described above, which may include a summary of any changes from any previously submitted portfolio.

Assessment tasks:

Portfolio (First Sit)
Description: Portfolio (3,000 words)
Weighting: 75 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2

Presentation (First Sit)
Description: Presentation (15 mins)
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO3

Presentation (Resit)

Description: Presentation (15 mins)
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO3

Portfolio (Resit)
Description: Portfolio (3,000 words).
Weighting: 75 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2

Part 5: Contributes towards

This module contributes towards the following programmes of study: