Module Specification

Building Services Innovations

Version: 2028-29, v1.0, 19 Mar 2025

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Part 1: Information

Module title: Building Services Innovations

Module code: UBLL7X-30-3

Level: Level 6

For implementation from: 2028-29

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

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: Yes

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module explores advanced concepts in building services engineering, focusing on innovative heating, cooling, and refrigeration systems, as well as their design, performance, and sustainability. It covers system characteristics, psychrometric performance, heat recovery applications, and energy-efficient technologies. Students will also delve into rotodynamic machines, refrigeration cycles, and capacity control mechanisms. Laboratory work develops practical skills in commissioning and flow balancing, reviewing the application of

theoretical analysis within a laboratory condition, whilst taking into consideration real world applications.
Additionally, the module integrates advanced mathematical techniques, such as complex and linear algebra, Fourier series, and differential equations, to solve engineering problems.

Features: Not applicable

Educational aims: The aim of this module is to develop students' expertise in analysing and solving complex problems in building services engineering, integrating advanced mathematics, physics, and experimental techniques. Students will gain skills in designing, commissioning, and managing energy-efficient systems, critically evaluating their performance and effectively communicating results. Additionally, the module fosters an understanding of current research and innovation in the field, enabling students to apply cutting-edge practices in building services design and management.

Outline syllabus: Module will cover areas such as:

Advanced comfort cooling and air-conditioning systems
Advanced heating systems
Applications of heat transfer and heat recovery
Rotodynamic machines
Refrigeration
Commissioning and ‘soft-landings’ strategies
Codes of Practice.

Maths - Complex algebra, Linear algebra, Fourier series and convergence of Fourier series, Differential equations, 1st and 2nd order partial derivatives.

In this module the following competencies are met and assessed to passing standard appropriate to this level of study:
The principles of building construction, services, structure, materials use, assembly and manufacture.
Understand the consequences of design decision making on value to clients and communities over the life-cycle of built projects and the costs to the environment.

Propose design solutions that achieve or exceed relevant performance standards and requirements.
Locate, evaluate and apply relevant legislation, regulations, standards, codes of practice and policies related to the development of the built environment.

Part 3: Teaching and learning methods

Teaching and learning methods: Teaching Strategy for the Module

The subject is taught through a structured and diverse set of activities designed to enhance student understanding and engagement. The strategy includes the following components:

Introductory Lectures - A comprehensive set of lectures provides a foundational overview of the subject, establishing key concepts and objectives. These session serves as a starting point for deeper exploration through subsequent activities.

Interactive Tutorial - Tutorials are designed to foster engagement by encouraging questions, discussions, and problem-solving. These sessions allow students to clarify concepts and apply their knowledge in a collaborative setting.

Laboratory Experimentation - Hands-on learning is facilitated through laboratory-based experiments, where students utilise specialised lab facilities to test and analyse the physical parameters of the subject. This practical approach reinforces theoretical knowledge and develops technical skills.

Online Learning Resources - A rich suite of online learning materials supports students in their independent study. These resources include multimedia content, readings, interactive tools, and self-assessment opportunities, enabling students to learn at their own pace and in the manner that suits their individual preferences.

This multi-faceted teaching strategy ensures a well-rounded learning experience,

combining theoretical understanding, practical application, and independent exploration to meet diverse learning needs.

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

MO1 Analyse complex engineering plant and systems to solve problems relating to engineering specifications and performance indices.

MO2 Develop, implement, and critically evaluate procedures for designing, commissioning, and managing building services technologies, with a focus on achieving energy-efficient control through experimental performance analysis and effectively communicating findings in appropriate formats.

MO3 Select and apply advanced techniques, physics laws, from engineering mathematics to the solution of a given engineering problem, communicated in a written form, with reference to the assumption and limitation of the model.

MO4 Critically review current research and innovation in the application of building services in buildings.

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/1507C960-5C8C-5895-7628-C3E7362CE565.html?lang=en-GB&login=1

Part 4: Assessment

Assessment strategy: Assessment Strategy

The assessment strategy for this module is designed to assess students' proficiency in advanced building services engineering concepts and mathematical techniques. It ensures students develop both technical expertise and the ability to apply mathematics to solve complex engineering problems.

First Attempt Assessment

Task 1 – Portfolio: Engineering Analysis of Building Services

Students will prepare a comprehensive portfolio demonstrating the application of engineering principles to analyse advanced building services systems, including heating, cooling, refrigeration, ventilation and heat recovery. The portfolio will integrate system design, performance evaluation, and commissioning strategies. Students are expected to perform calculations, critically assess system efficiencies, and propose sustainable improvements.

Task 2 – Exam: Mathematical Analysis

A timed written exam will evaluate students' mastery of the mathematical principles introduced in the module. Topics include complex algebra, linear algebra, Fourier series, and differential equations, applied to engineering scenarios such as system dynamics and heat transfer.

This is the final significant time limited written assessment in the programme, with similar assessments in earlier years being used to scaffold academic writing skills, as part of an inclusive assessment strategy.

Second Attempt Assessment

Task 1 – Portfolio

Students will revise their original portfolio, addressing the same module outcomes with an emphasis on improving analysis, accuracy, and system integration.

Task 2 – Exam

The second attempt at the exam will follow the same format but feature new questions on the same topics.

Feedback Strategy

Formative feedback will be provided during portfolio development, focusing on design strategies, technical accuracy, and clarity of communication. Detailed written feedback will accompany the final portfolio submission, offering specific suggestions for improvement in technical analysis and academic writing.

Assessment tasks:

Portfolio (First Sit)
Description: Engineering Portfolio (3,000 words)
Weighting: 75 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO4

Examination (First Sit)
Description: Exam (3 hours)
Weighting: 25 %
Final assessment: No
Group work: No
Learning outcomes tested: MO3

Portfolio (Resit)
Description: Engineering Portfolio (3,000 words)
Weighting: 75 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO4

Examination (Resit)
Description: Exam (3 hours)
Weighting: 25 %
Final assessment: No
Group work: No
Learning outcomes tested: MO3

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Architecture and Environmental Engineering [Frenchay] BEng (Hons) 2025-26