Module Specification

Building Services Applications

Version: 2026-27, v1.0, 19 Mar 2025

Contents

Part 1: Information

Module title: Building Services Applications

Module code: UBLL7E-30-2

Level: Level 5

For implementation from: 2026-27

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 the design, analysis, and sizing of mechanical and electrical building services, integrating engineering principles, mathematics, and physical system understanding to meet environmental performance requirements. Topics include heating, ventilation, air conditioning (HVAC), water and wastewater systems, electrical power distribution, lighting, and emergency lighting. Students will study linear algebra and basic calculus, applying these techniques directly to solve building services problems from first principles. Learning is delivered through

lectures, tutorials, and lab-based practicals, emphasising hands-on experience. By completing this module, students will gain the skills to design and specify building services systems for commercial, industrial, and public-sector buildings.

Features: Not applicable

Educational aims: To equip students with the knowledge and skills to design, analyse, and size mechanical and electrical building services, integrating engineering principles, mathematical techniques, and an understanding of physical systems to meet specific environmental performance requirements.

Outline syllabus: The module covers a range of topics essential to understanding building services systems and the design process, including; developing design criteria, taking into account weather, climate, and user requirements, developing layouts and schematics of the systems to support the completion of detailed calculations, to enable the sizing and selection of equipment, creating energy efficient and performance relating to health and comfort, with an understanding of the wider implications of design decisions.

Covers the following systems:
Heating and cooling: Closed loop water systems, heat gains and losses, emitters and generators, pressure drop calculations, pump curves.

Mechanical Ventilation: Psychrometrics, jets and plumes, duct sizing, pressure loss calculations, fan curves.

Natural Ventilation: Introduction to natural ventilation, mixed mode ventilation, single sided, cross and stack ventilation calculations.

Domestic Hot and Cold Water: mains and boosted systems, pipe sizing and pressure drop, local and central hot water systems.

Waste and Rainwater Drainage: pressures through pipework, seals, sizing of pipework.

Lighting Services: Lamp and luminaire technologies, lux level calculations, design

integration.

Electrical Power Distribution: Estimating maximum loads, cable distribution strategies, cable calculations, motors and the distinction between real and apparent power.

The module contains a dedicated taught section focusing on mathematical theory and its engineering applications.
This section shall cover key mathematical concepts for engineering, including algebraic manipulation (polynomials, rational functions, exponential, logarithmic, trigonometric, and hyperbolic functions), matrix and vector algebra and differential and integral calculus, focusing on limits, differentiation (including product and chain rules), integration, and first-order differential equations using separation of variables. These mathematical techniques are fundamental for solving engineering problems from first principles and understanding the maths that underpin analysing physical systems.

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:

1. 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.

2. 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.

3. 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.

4. 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 Describe the engineering design principles of building services engineering, with reference to their underlying physical properties.

MO2 Identify, size and evaluate the suitability of building services technologies to meet specific environmental performance requirements.

MO3 Utilise techniques from linear algebra and basic calculus to solve defined engineering problems.

MO4 Analyse a mathematical model of a building service, interpreting its relevance to the physical system while considering the assumptions and limitations of the model.

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/2D8CD0BA-8682-3418-D942-553D85E399DC.html?lang=en-GB&login=1

Part 4: Assessment

Assessment strategy: Assessment Strategy

The assessment strategy for this module is designed to evaluate students' understanding of both engineering concepts in building services and mathematical techniques, fostering both technical and academic development. The approach focuses on ensuring that students build confidence and competence in applying theory to practical problems, while also improving their mathematical problem-solving skills.

First Attempt Assessment

Task 1 – Portfolio: Engineering Analysis of Building Services

Students will submit a detailed technical portfolio analysing a building's mechanical and electrical services, focusing on HVAC, electrical power distribution, and passive thermal systems. This portfolio will require students to demonstrate their ability to apply engineering design principles, size appropriate services for given conditions, and analyse the systems' performance. The portfolio will be an integration of all module topics and will include calculations and recommendations for improving system efficiency.

Task 2 – Exam: Mathematical Application in Building Services

A timed exam will assess students' understanding of the mathematical techniques covered in the module, including algebra, and calculus. The exam will require students to solve engineering problems using these mathematical tools, with specific problems related to building services systems.

Preparation for this assessment will include enhanced study skills support as part of the scaffolding for inclusive assessment, helping students to gain confidence with time limited assessments, which will also feature in future modules. Alternative assessment types for students with approved reasonable adjustments may be considered, but shall retain an element of time limitation.

Second Attempt Assessment

Task 1 – Portfolio

Students will revise their initial portfolio, with variations to the criteria and potentially spatial variations.

Task 2 – Exam

The second attempt at the exam will cover the same topics as the first attempt but using different questions.

Feedback Strategy

Formative feedback will be provided on the initial portfolio draft prior to the first submission opportunity, focusing on the application of engineering principles, accuracy of calculations, and the quality of the analysis. Students will receive detailed, written feedback on their final submissions, with specific guidance on improving technical writing, mathematical techniques, and overall academic skills.

Assessment tasks:

Portfolio (First Sit)

Description: Engineering Portfolio (3000 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 (3000 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

Building Services Engineering {Apprenticeship-UWE} [Frenchay] BEng (Hons) 2024-25