# Module Proforma

**Approved, 2022.02**

## Summary Information

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|---|---|
| **Module Code** | 6331BEUG |
| **Formal Module Title** | Environmental Analysis |
| **Owning School** | Civil Engineering and Built Environment |
| **Career** | Undergraduate |
| **Credits** | 20 |
| **Academic level** | FHEQ Level 6 |
| **Grading Schema** | 40 |

## Module Contacts

### Module Leader

| Contact Name | Applies to all offerings | Offerings |
|---|---|---|
| Saiful Bhuiyan | Yes | N/A |

### Module Team Member

| Contact Name | Applies to all offerings | Offerings |
|---|---|---|
| Hu Du | Yes | N/A |

### Partner Module Team

| Contact Name | Applies to all offerings | Offerings |
|---|---|---|

## Teaching Responsibility

| LJMU Schools involved in Delivery |
|---|
| Civil Engineering and Built Environment |

## Learning Methods

| Learning Method Type | Hours |
|---|---|
| Lecture | 20 |
| Online | 10 |
| Tutorial | 20 |

## Module Offering(s)

| Offering Code | Location | Start Month | Duration |
|---|---|---|---|
| SEP-CTY | CTY | September | 12 Weeks |

## Aims and Outcomes

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|---|---|
| **Aims** | To develop an understanding of the theory, principles and practices of building energy systems modelling and simulation techniques and to use analytical approaches to the appraisal of environments and design proposals. |

## Learning Outcomes

**After completing the module the student should be able to:**

| Code | Description |
|---|---|
| MLO1 | Critically analyse the various complex heat and mass transfer processes occurring in buildings and associated practical engineering applications. |
| MLO2 | Critically analyse air flow processes typically taking place in buildings to produce practical natural ventilation solutions. |
| MLO3 | Critically analyse the aural environment in buildings with particular regard to noise and vibration caused by building engineering plant and systems. |
| MLO4 | Utilise industry standard modelling and simulation software to analyse complex buildings. |
| MLO5 | Demonstrate an understanding of the entrepreneurial process to establish innovative solutions to industry problems. |

## Module Content

### Outline Syllabus

Thermal Analysis: Building energy flowpaths, Overview of heat transfer at surfaces; Transient heat transfer, thermal storage effects, passive solar buildings, Principles of Energy modelling techniques, Steady state, dynamic (admittance) and numerical analysis (finite temperature difference). Air Flow Analysis: Heat and mass transfer by convection; fundamental concepts convective heat transfer, flow of working fluids, driving forces for air flow. Ventilation & Air Flow prediction; use of empirical and simplified approaches to determining building air change rate for plant sizing, principles of single and multi- zonal approaches to predicting air movements within buildings, application of Acoustics and noise control; measurement of sound levels, insulation, absorption, attenuation, acoustic characteristics of building materials and systems, noise control in buildings. Vibration; simple harmonic motion, modes of vibration, characteristics of springs, static and dynamic modulus of materials and natural frequency, vibration isolation and control in buildings. Computational Fluid Dynamics (CFD) to predicting the air flow, temperature and pollutant distribution, air velocities, fire and smoke movement in and around buildings. Building Simulation: use of modelling and simulation software to investigate and analyse buildings.

### Module Overview

This module develops an understanding of the theory, principles and practices of building energy systems modelling and simulation techniques and helps students to use analytical approaches to the appraisal of environments and design proposals.

### Additional Information

This module is designed to contrast the traditional longhand calculation and estimation methods of analysing building internal environments and engineering processes with modern innovations in building thermal and energy modelling, and building information modelling.

## Assessments

| Assignment Category | Assessment Name | Weight | Exam/Test Length (hours) | Learning Outcome Mapping |
|---|---|---|---|---|
| Portfolio | BUILDING SIMULATION REPORT | 40 | 0 | MLO2, MLO1, MLO4, MLO3, MLO5 |
| Centralised Exam | Exam | 60 | 2 | MLO2, MLO1, MLO4, MLO3, MLO5 |