Module Proforma

Approved, 2022.02

Summary Information

Module Code	5333BEUG
Formal Module Title	Mechanical Engineering for Buildings
Owning School	Civil Engineering and Built Environment
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 5
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
Laurence Brady	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
Tutorial	30

Module Offering(s)

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

Aims and Outcomes

Aims	To develop the student's understanding of the principles of heat transfer, thermodynamics and general engineering and the application of these principles to sustainable and energy efficient design and operation of building engineering systems, plant and equipment.To enable students to utilise appropriate mathematical methods to solve mechanical engineering problems.

Learning Outcomes

After completing the module the student should be able to:

Code	Description
MLO1	Apply the principles of heat transfer, thermodynamics and general engineering to control of the internal environment.
MLO2	Apply the principles of heat transfer, thermodynamics and general engineering to the selection of sustainable and energy efficient building engineering systems, plant and equipment.
MLO3	Analyse moderately complex buildings using longhand calculation and estimation methods to evaluate heating loads, cooling loads and energy requirements.
MLO4	Analyse moderately complex buildings using industry standard software packages to evaluate heating loads, cooling loads and energy requirements.
MLO5	Utilise appropriate mathematical methods to solve practical mechanical engineering problems.

Module Content

Outline Syllabus

Convection: mathematical analysis of heat transfer taking place in free and forced convection processes. Use of dimensional analysis techniques and dimensionless groups, Grashof, Nusselt, Reynolds, Prandtl numbers. Heat exchangers: Identification of modes of heat transfer within building services equipment and applications; heat exchanger construction, characteristics, fluid flow paths, pressure drop, design, types and classification. Radiation: Reflectivity, transmissivity, absorptivity, emissivity for different surfaces. Wave characteristics and parameters associated with electromagnetic radiation. Asymmetric radiation and discomfort asymmetry. Heating and cooling loads: Analysis and longhand calculation of building heating and cooling loads, compliance with legislation and energy efficiency standards. Use of thermal analysis software to determine heating and cooling loads. Psychrometrics: psychrometric properties of air, psychrometric cycles for heating and cooling processes, evaluation of cooling and heating plant duties. Thermodynamic properties of fluids; application of the first law of thermodynamics to steady flow and non-flow processes for gases, vapours and liquids. Thermodynamic cycles: use of T-S and p-H diagrams to show commonly encountered thermodynamic cycles. Performance analysis of practical thermodynamic cycles, comparison with the Carnot cycle. Thermodynamic processes in refrigeration cycles, heat pumps and heat engines. Refrigeration: vapour compression and absorption refrigeration cycles, refrigerants, compressors, condensers, evaporators.

Module Overview

This module develops the student's understanding of the principles of heat transfer, thermodynamics and general engineering and the application of these principles to sustainable and energy efficient design and operation of building engineering systems, plant and equipment. By the end of the module students you should be able to utilise appropriate mathematical methods to solve mechanical engineering problems.

Additional Information

This module is designed to run in semester 1 alongside the complementary Electrical Engineering for Buildings module to provide students with the necessary grounding in the underpinning principles of mechanical engineering, heat transfer, thermodynamics and fluid mechanics, so that they may undertake the appropriate Design Project module in semester 2. On the Building Services Engineering Degree Apprenticeship programme, the knowledge learning outcomes are K1, K2, K3, K4, K5, K7, the skills learning outcomes are S1, S2, S3, S7 and S8 and the behaviours learning outcomes are B1, B6, B7.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Learning Outcome Mapping
Centralised Exam	Exam	50	2	MLO3, MLO5, MLO1, MLO2
Report	BUILDING THERMAL ANALYSIS	50	0	MLO3, MLO4