

Mechanical Engineering for Buildings

Module Information

2022.01, Approved

Summary Information

Module Code	5216BEUG
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

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)

Display Name	Location	Start Month	Duration Number Duration Unit
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.
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After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Apply the principles of heat transfer, thermodynamics and general engineering to control of the internal environment.
MLO2	2	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	3	Analyse moderately complex buildings using longhand calculation and estimation methods to evaluate heating loads, cooling loads and energy requirements.
MLO4	4	Analyse moderately complex buildings using industry standard software packages to evaluate heating loads, cooling loads and energy requirements.
MLO5	5	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 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.Refrigeration: vapour compression and absorption refrigeration cycles, refrigerants, compressors, condensers, evaporators.Appropriate engineering mathematics associated with the solution of problems in electrical engineering.
Module Overview	The aim of this module is to develop your 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. The module will enable you 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.In this module, the knowledge learning outcomes are K1, K2, K3, K4, K5, K7, the behaviours learning outcomes are B1, B6, B7 and the skills learning outcomes are S1, S2, S3, S7, S8.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Portfolio	TIME CONTROLLED OPEN BOOK TEST	50	0	MLO1, MLO2, MLO3, MLO5

Report	BUILDING THERMAL ANALYSIS	50	0	MLO3, MLO4
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Module Contacts

Module Leader

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

Partner Module Team

Contact Name	Applies to all offerings	Offerings
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