Liverpool John Moores University

Title:	MECHANICAL ENGINEERING FOR BUILDINGS
Status:	Definitive
Code:	**5216BEUG** (122818)
Version Start Date:	01-08-2021
Owning School/Faculty:	Civil Engineering and Built Environment
Teaching School/Faculty:	Civil Engineering and Built Environment

Team	Leader
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Academic Level:	FHEQ5	**Credit Value:**	20	**Total Delivered Hours:**	50
Total Learning Hours:	200	**Private Study:**	150		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	20
Tutorial	30

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Test	AS1	TIME CONTROLLED OPEN BOOK TEST	50	
Report	AS2	BUILDING THERMAL ANALYSIS REPORT	50	

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:

1	Apply the principles of heat transfer, thermodynamics and general engineering to control of the internal environment.
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.
3	Analyse moderately complex buildings using longhand calculation and estimation methods to evaluate heating loads, cooling loads and energy requirements.
4	Analyse moderately complex buildings using industry standard software packages to evaluate heating loads, cooling loads and energy requirements.
5	Utilise appropriate mathematical methods to solve practical mechanical engineering problems.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

TIME CONTROLLED OPEN BOOK TEST	1	2	3	5
BUILDING THERMAL ANALYSIS	3	4		

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, pyschrometric 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.

Learning Activities

Lectures, tutorials, workshops, occasional labs, occasional site visits.

Notes

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.