Liverpool John Moores University

Title:	MATHEMATICS FOR BUILDING SERVICES APPLICATIONS AND DIGITAL DESIGN FOR BUILDING SERVICES ENGINEERING
Status:	Definitive
Code:	**4601BEFDL** (123832)
Version Start Date:	01-08-2016
Owning School/Faculty:	Built Environment
Teaching School/Faculty:	City of Liverpool College

Team	Leader
Alfred Leung	Y

Academic Level:	FHEQ4	**Credit Value:**	20	**Total Delivered Hours:**	91
Total Learning Hours:	200	**Private Study:**	109		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	46
Tutorial	32
Workshop	10

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	FORMAL EXAMINATION	50	3
Portfolio	AS2	PORTFOLIO	50	

Aims

To provide the students with an understanding of the fundamental principles and concepts used in a wide range building services applications and the range of mathematical techniques needed to solve related problems. The module aims to provide a fundamental understanding of both the mathematical techniques essential

to allow the various Building Services specialists to integrate and communicate effectively and a basis from which the more specialised services applications can be developed and to enable identify the concept of digital design on the building services project.

Learning Outcomes

After completing the module the student should be able to:

1	Solve indicial equations by the using the laws of indices and logarithms.
2	Apply the techniques of differential and integral calculus to building services engineering problems.
3	Apply and use mathematical & computational techniques to compare statistical data associated with to building services engineering problems.
4	Identify the digital design trend and implications of a building services engineering project.
5	Produce and evaluate the documentation how the building services engineering projects are complied with the current Building Regulation.

Learning Outcomes of Assessments

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

FORMAL EXAMINATION	1	2	3
PORTFOLIO	4	5	

Outline Syllabus

Laws of Indices and Logarithms:

Indices: Recall the laws of indices and use these to simplify algebraic expressions.

Exponential functions: The nature and value of e. Calculations involving ex and e-x.

Graphs of exponential growth and decay. The gradient of an exponential curve. Logarithms: Definition of a logarithm. Conversion between index and log form. The laws of logarithms. Common & Napierian logarithms. Indicial equations.

Differential Calculus:
Basic principles: Gradients of straight lines and curves. The differential coefficient. Differentiating algebraic, trigonometrical, exponential and logarithmic expressions. The second derivative. Velocity and acceleration.
Maxima & minima: Identification and location of turning points. Practical applications involving maximum and minimum values.

Method of least squares: Determining the line of best fit for graphs drawn from experimental data.

Integral Calculus:
Basic principles: Integration as the reverse of differentiation. Integrating algebraic and trigonometrical functions.

The definite integral: Calculating areas under graph curves. Practical applications, such as the calculation of work done during thermodynamic processes.

Numerical integration: Use of Simpson's rule as an alternative method for calculating areas under graph curves and performing definite integration.

Simple Building Energy Model (SBEM) – National Calculation Method

BIM related to Building services design process.

The compliancy of Building Regulation Part L.

Take-off procedures for simple construction elements: general overview of take-off procedures for standard simple construction elements and components including foundations and substructures, superstructure, including external and internal walls, flat and pitched roof construction and coverings, internal and external finishes, internal components such as doors, windows and staircases and floors.

Building up an estimate: prime costs, labour and plant rates, materials costs, terms of supply, material handling costs, allowance for wastage and conversion, method statements and their effect on estimating, use of standard reference documents, use of company data, documentation, software or procedures, examination of rules within methods of measurement appropriate to Building Services Engineering.

Learning Activities

Lectures, tutorials, workshop and seminars

Notes

In common with other disciplines within engineering and construction, mathematics is crucial to all aspects of Building Services Engineering. Understanding key mathematical concepts and applying them successfully to solve problems are vital skills every building services engineering student must acquire. This module teaches, applies and nurtures those skills. The ethos of the module is to deliver these skills in an accessible and practically oriented manner so students build up their knowledge and understanding gradually so as to encourage students to engage fully in the problem-solving process.

This module brings together the students' learning throughout their study and further develops the knowledge for the level 5. The module requires the students to demonstrate the understanding of the process of digital design package.