Liverpool John Moores University

Title:	SCIENCE, MATERIALS AND MATHEMATICS
Status:	Definitive
Code:	**4107BEHN** (118178)
Version Start Date:	01-08-2012
Owning School/Faculty:	Built Environment
Teaching School/Faculty:	Built Environment

Team	Leader
Derek King	Y
Jeff Cullen	
Alex Mason	

Academic Level:	FHEQ4	**Credit Value:**	24.00	**Total Delivered Hours:**	98.00
Total Learning Hours:	240	**Private Study:**	142		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	48.000
Practical	24.000
Tutorial	24.000

Grading Basis: BTEC

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1		60.0	2.00
Test	AS2		20.0	
Presentation	AS3		20.0	

Aims

To enable students to use fundamental mathematical processes in the solution of Construction problems.
To enable students studying construction related programmes to analyse, apply, investigate and evaluate scientific principles and the properties and behaviour of

materials in construction related situations.
To develop an understanding of the principle characteristics and properties of construction materials.
To analyse, apply, investigate and evaluate scientific principles relating to the environmental behaviour of buildings.

Learning Outcomes

After completing the module the student should be able to:

1 Apply analytical methods to the management and production of construction processes and operations.
2 Apply analytical methods to surveying, testing and control problems in construction.
3 Analyze and model construction situations using statistics and probability.
4 Apply analytical methods to analyze structural and building engineering systems and supply appropriate design solutions.
5 Explain the properties of materials justifying the reason for their selection and their effect on the design of buildings and installations.
6 Investigate and apply scientific principles as they apply to construction, structural, environmental and services operations and determine comfort levels in the design and use of buildings.
7 Apply standard methods to predict the structural behaviour of materials and summarise how the basic principles of structural mechanics and fluid mechanics affect the design of structural members and services installations.
8 Perform a range of materials experiments associated with the above scientific principles and services, recording, treating and analysing results.
9 Perform a range of environmental science experiments associated with the above scientific principles and services, recording, treating and analysing results.

Learning Outcomes of Assessments

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

EXAMINATION	1	2	3	4	5	7
TEST	5	6				
PRESENTATION	8	9				

Outline Syllabus

Analytical methods - management and production:
Algebra: linear, simultaneous and quadratic equations, laws of indices and logarithms, common and Napierian logarithms, indicial equations, direct and inverse proportion, inequalities, functional notation and manipulation of algebraic problems.
Graphical representation: functions, points of intersection between two graphs, graph sketching (straight line, polynomial, exponential and logarithmic), fit lines to experimental data using least squares method.
Space, time and motion: plot space/time and velocity/time diagrams, determine displacement, velocity and acceleration. Laws of motion, momentum, impulse and

projectiles.
Analytical methods - surveying,testing and control
Trigonometry: basic trigonometric ratios and their inverses, trigonometric ratios for the four quadrants, solution of triangles, calculusation of areas and volumes of solids Determination of co-ordinates in 2-d and 3-d geometry.
Trapezoidal and Simpson's rule

Statistics and probability:
Tabular and graphical form: data collection methods, histograms, bar charts, line diagrams, cumulative frequency diagrams, scatter plots.
Central tendency and dispersion: introduction to the concept of central tendency and variance measurement, mean, median, mode, standard deviation, variance and inter-quartile range, application to construction.
Analytical methods- analysis of structural and building engineering systems; trigonometric methods: to solve problems such as static forces, relative motion, frameworks.
Calculus: to differentiate and integrate simple equations and demonstrate applications of calculus.

Important properties, design criteria and the specification of materials and uses of concrete, metals and alloys, timber and timber products, clay products, plastics and other synthetic materials, coatings and finishes, insulation materials, vapour and damp-proofing barriers.

The application of scientific principles relation to thermal properties of materials, heat losses and heat gains, heating and ventilating, illumination (natural and artificial), sound transmission, refrigeration and air conditioning, fluid flow (hydrostatics and fluid dynamics) in determining comfort levels.

The application of the basic scientific principles underpinning the provision of services to a building or engineering project in terms of, water supply and distribution, gas supply and distribution, electrical supply and distribution, chemicals, fluids and oil distribution and the safe and effective disposal of waste products.

Consideration of the structural behaviour of construction components and the way in which materials behave in structural terms depending on, how they are used, how they are loaded and the inherent properties of the material. A good working knowledge of how materials are used is needed in terms of how they behave when used as: beams, columns, structural frames, pads and machinery bases, floors, timber, steel and concrete, bridging brackets, supports to equipment tanking and pressure vessels.

Modelling of scientific problems will be covered through a range of experiments associated with scientific principles and services. This will require the necessary calculations associated with these experiments and drawing of conclusions about the results.
In considering the above includes the need for maintenance and eventual replacement in terms of energy efficiency, environmental issues such as renewable resources and sustainable construction, and environmental issues relating to all of the above. Appropriate attention should be given to health, safety and welfare

arrangements throughout the delivery of this module.

Learning Activities

Lectures, tutorials and problem-solving sessions.
The module contains some laboratory, experimental and practical work and students should develop a competence in using scientific equipment, recording and analysing results.

References

Course Material	Book
Author	Taylor, G.D.
Publishing Year	2000
Title	'Materials in Construction, An Introduction'
Subtitle	
Edition	3rd
Publisher	Longman
ISBN	0582368898

Course Material	Book
Author	McMullan, R.
Publishing Year	2003
Title	'Environmental Science'
Subtitle	
Edition	
Publisher	Macmillan Press Ltd
ISBN	0333732014

Course Material	British Standards
Author	British Standards Institution
Publishing Year	
Title	BS/EN and DD/ENV's
Subtitle	
Edition	
Publisher	British Standards Institution
ISBN	

Course Material	Book
Author	American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.
Publishing Year	
Title	ASHRAE Guide
Subtitle	
Edition	

Publisher	American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.
ISBN	

Course Material	Book
Author	Chartered Institute of Building Services Engineers
Publishing Year	
Title	CIBSE Guide, Codes of Practice and Publications
Subtitle	
Edition	
Publisher	Chartered Institute of Building Services Engineers
ISBN	

Course Material	Book
Author	Watson, K.L.
Publishing Year	1998
Title	'Foundation Science for Engineers'
Subtitle	
Edition	2nd
Publisher	Palgrave Macmillan
ISBN	033372545X

Course Material	Book
Author	Croft, A. & Davison, R.
Publishing Year	2003
Title	'Foundation Mathematics'
Subtitle	
Edition	
Publisher	Prentice Hall
ISBN	0130454265

Notes

The module is designed to provide a sound basic understanding of the characteristics and behaviour of the principal materials used in construction, and also the application of scientific principles to environmental services within construction. Alongside this the student will be encouraged to apply appropriate analytical methods to the solution of related construction based problems.