

## Liverpool John Moores University

Title: SCIENCE AND MATERIALS  
Status: Definitive  
Code: **4001BEHN** (102268)  
Version Start Date: 01-08-2011

Owning School/Faculty: Built Environment  
Teaching School/Faculty: Built Environment

Team	Leader
Derek King	Y

**Academic Level:** FHEQ4  
**Credit Value:** 12.00  
**Total Delivered Hours:** 76.00  
**Total Learning Hours:** 120  
**Private Study:** 44

### Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	36.000
Online	4.000
Practical	24.000
Tutorial	12.000

**Grading Basis:** BTEC

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Minimum 2 Environmental Science assignments	50.0	
Report	AS2	Minimum 2 Materials Science assignments	50.0	

### Aims

*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 provide a basic knowledge of the scientific principles that underpins the structure and properties of materials used in the construction industry.*

*To develop an understanding of the principle characteristics and properties of construction materials.*

*To analyse, apply, investigate and evaluate scientific principles relating to the behaviour of materials in construction related situations.*

*To examine those factors which affect a materials performance leading to their deterioration.*

*To examine how materials may be modified to change their properties and performance.*

## **Learning Outcomes**

After completing the module the student should be able to:

- 1 Explain the properties of materials justifying the reason for their selection and their effect on the design of buildings and installations.
- 2 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.
- 3 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.
- 4 Perform a range of 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:

ENVIRONMENTAL	1	2	3	4
SCIENCE REPORT				
MATERIALS REPORT	1	2	3	4

## **Outline Syllabus**

*Considers the important properties, design criteria and the specification of materials and uses of concrete, metals and alloys (including amongst others, iron, steel, zinc, copper, brass, aluminium and lead), timber and timber products, clay products (bricks and tiles), plastics and other man-made materials, coatings and finishes (including paints and renders), 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**

The module is based on a lecture programme, supported by films, videos, slides and visits to laboratories will be used in support of this programme.

Work should be practically applied, relevant to the work technologists in the construction and property sector, and teaching strategy should not be too theoretical. The module contains some laboratory, experimental and practical work and students should develop a competence in using scientific equipment, recording and analysing results. An active learning approach is preferable to the traditional approach.

Performance grading and assessment will depend on how well the student applies the knowledge and techniques developed in their studies and not on the recollection of facts and figures. This is particularly the case in the laboratory work where the emphasis will be on the manipulation, interpretation and analysis of the data and not on its simple recording and reporting.

Exercises can be used in the early part of the module as a diagnostic device but should not contribute to the grading performance.

In-course assignments may be used in this module, but where possible, should be linked to development of the module or other modules in the programme.

## **References**

<b>Course Material</b>	Book
<b>Author</b>	Taylor, G.D.
<b>Publishing Year</b>	2000
<b>Title</b>	Materials in Construction, An Introduction
<b>Subtitle</b>	

<b>Edition</b>	3rd Edition
<b>Publisher</b>	Longman
<b>ISBN</b>	0582368898

<b>Course Material</b>	Book
<b>Author</b>	McMullan, R.
<b>Publishing Year</b>	2003
<b>Title</b>	Environmental Science
<b>Subtitle</b>	
<b>Edition</b>	5th
<b>Publisher</b>	Macmillan Press Ltd
<b>ISBN</b>	0333732014

<b>Course Material</b>	Book
<b>Author</b>	BS/EN and DD/ENV's
<b>Publishing Year</b>	0
<b>Title</b>	
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	British Standards Institution
<b>ISBN</b>	

<b>Course Material</b>	Book
<b>Author</b>	ASHRAE Guide
<b>Publishing Year</b>	0
<b>Title</b>	
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.
<b>ISBN</b>	

<b>Course Material</b>	Book
<b>Author</b>	CIBSE Guide, Codes of Practice and Publications
<b>Publishing Year</b>	0
<b>Title</b>	
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Chartered Institute of Building Services Engineers
<b>ISBN</b>	

<b>Course Material</b>	Book
<b>Author</b>	BRE Digests and Information Papers
<b>Publishing Year</b>	0
<b>Title</b>	
<b>Subtitle</b>	
<b>Edition</b>	

<b>Publisher</b>	Building Research Establishment
<b>ISBN</b>	

<b>Course Material</b>	Book
<b>Author</b>	TRADA Papers
<b>Publishing Year</b>	0
<b>Title</b>	
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Timber Research and Development Association
<b>ISBN</b>	

<b>Course Material</b>	Book
<b>Author</b>	Cement and Concrete Association
<b>Publishing Year</b>	0
<b>Title</b>	
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	
<b>ISBN</b>	

<b>Course Material</b>	Book
<b>Author</b>	Lead Development Association Papers
<b>Publishing Year</b>	0
<b>Title</b>	
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	
<b>ISBN</b>	

<b>Course Material</b>	Book
<b>Author</b>	Copper Development Association papers
<b>Publishing Year</b>	0
<b>Title</b>	
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	
<b>ISBN</b>	

<b>Course Material</b>	Book
<b>Author</b>	British Refrigeration Association Papers
<b>Publishing Year</b>	0
<b>Title</b>	
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	
<b>ISBN</b>	

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

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### **Notes**

The module is designed to provide the student with a sound basic understanding of the characterisation and behaviour of the principal materials used in construction and also the application of scientific principles to environmental issues within construction. The module explains the principles on that the properties of all materials are founded, and the factors that affect their behaviour and selection for use in construction. The module includes the basic tests that are required to assess the most important properties and qualities of the principal materials used in construction. Consideration is given to the environmental, health and safety issues relating to the use and selection of materials used in the construction and services provision of buildings.