

## Liverpool John Moores University

Title: SCIENCE AND MATERIALS  
Status: Definitive  
Code: **4538BEKL** (123366)  
Version Start Date: 01-08-2021

Owning School/Faculty: Civil Engineering and Built Environment  
Teaching School/Faculty: Imperia College

Team	Leader
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**Academic Level:** FHEQ4      **Credit Value:** 20      **Total Delivered Hours:** 72  
**Total Learning Hours:** 200      **Private Study:** 128

### Delivery Options

Course typically offered: Runs Twice - S1 & S2

Component	Contact Hours
Lecture	42
Practical	18
Tutorial	10

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	REPORT	50	
Exam	AS2	EXAMINATION	50	2

### Aims

*To provide students with an appreciation of the common scientific principles associated with environmental conditions inside buildings, and the properties and behaviour of common building materials.*

*To enable students to apply appropriate scientific and analytical methods to*

*investigate the internal environment in buildings and the performance and behaviour of common building materials.*

## **Learning Outcomes**

After completing the module the student should be able to:

- 1 Apply appropriate scientific and analytical methods to investigate scientific problems related to the environmental conditions and processes in buildings.
- 2 Describe and evaluate factors which influence human comfort juxtaposed with the utility, sustainability and energy efficiency of buildings, with respect to temperature, humidity, air movement, lighting and noise levels.
- 3 Identify the properties of common building materials and classify their performance characteristics, with due regard to the natural environment and potential environmental impacts.
- 4 Describe the thermal properties of common building structures and evaluate heat losses from simple buildings.

## **Learning Outcomes of Assessments**

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

REPORT	2	3	4
EXAMINATION	1	3	4

## **Outline Syllabus**

*Environmental Science:*

- *Light; scientific properties of light, units and measurement of light, lighting levels for buildings.*

*Artificial lighting systems and equipment; lamps & luminaires, Lumen system of lighting design, colour rendering.*

*Use of natural light; daylight factors.*

- *Acoustics; nature of sound, nature of hearing, properties of sound (frequency, pitch, amplitude etc), measurement of sound levels, logarithms to base 10 and the decibel system.*

*Noise in buildings; measurement of noise, noise transfer, noise control, sound insulation & absorption, attenuation.*

*Room acoustics; reflection, absorption, reverberation.*

- *Heat and heat transfer; radiation, conduction & convection.*

*Thermal properties in buildings; thermal insulation, thermal capacity, thermal resistance of building components, thermal bridging.*

*Energy use in buildings; thermal comfort, heat losses and gains, energy balance, energy regulations.*

- *Properties of air, moisture in air, vapour, humidity and condensation. Condensation in buildings, interstitial condensation.*

*Materials:*

- *Properties, design criteria and specification of a range of materials including bricks and brickwork, cement, mortar, concrete, plaster, metals, alloys, timber (including engineered timbers), clay products, insulation materials and polymers including vapour and damp-proofing barriers.*
- *Thermal properties of common materials and structures, thermal conductivities and U values*
- *Use of protective coatings including paints, stains and renders.*
- *Maintenance and replacement of building components,*
- *Sustainability and environmental issues relating to procurement of materials and construction methods.*

*Analytical methods (integrated within above):*

- *Geometry: Calculation of areas and volumes of common shapes.*
- *Algebra: linear, simultaneous and quadratic equations, laws of indices, manipulation of formulae.*
- *Basic statistics and graphical representation: data collection methods, interpretation of data and constructing cumulative frequency tables, line graphs, histograms and bar charts.*
- *Trigonometry: basic trigonometric ratios and their inverses, trigonometric ratios for the four quadrants, solution of triangles.*

## **Learning Activities**

The module is based on a lecture and tutorial programme including video and presentations together with a number of practical laboratory sessions. Students are encouraged to develop competence using scientific equipment in an active learning approach.

Laboratory work will have an emphasis on the manipulation, interpretation and analysis of the data, which should allow reasoned conclusions and recommendations to be made.

Certain key mathematical skills will be integrated within the laboratory activities.

## **Notes**

The module is designed to provide students on a range of Built Environment study programmes with a sound basic understanding of the principal materials used in construction and the scientific principles related to environmental services within buildings. Alongside this the student will be encouraged to apply appropriate analytical methods.