Liverpool John Moores University

Title:	MATERIALS
Status:	Definitive
Code:	**5200CIV** (122921)
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:**	67
Total Learning Hours:	200	**Private Study:**	133		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	33
Practical	10
Tutorial	11
Workshop	11

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	JOURNAL-STYLE REPORT ON LABORATORY EXPERIENCE	25	
Exam	AS2	EXAMINATION	75	2

Aims

To introduce the students to a range of advanced materials, and to a more fundamental understanding of how their micro- and mesoscale structures determine

their macroscale properties.
To explore how effects such as electrical, thermal and acoustic conduction are mediated through a range of materials, and how careful selection of such materials can control and guide these effects.
To understand how and why the treatment and environment to which a material is exposed can alter its properties and working life, e.g. fire, salt water, thermal cycling.
To understand how photovoltaic and solar thermal power are generated and why combining the two is a challenge; to understand suitable locations for photovoltaic panels in buildings.

Learning Outcomes

After completing the module the student should be able to:

1	Evaluate how a material's manufacture, growth or downstream treatment alters its microscale and macroscale properties, and be able to broadly predict a material's behaviour from microscale inspection and a history of its manufacture and treatment.
2	Explain conduction and insulation of temperature, sound, light and electricity, and be able to predict whether a material will conduct, insulate or semi-conduct based upon its properties.
3	Describe and explain the function and principles of photovoltaic electricity production, and design structures using photovoltaics in order to achieve the optimum conditions for their function and usage.
4	Demonstrate an understanding of novel and innovative construction materials and their applications.
5	Demonstrate hands-on skills in a variety of physical and electrochemical measurement techniques in a laboratory environment.

Learning Outcomes of Assessments

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

JOURNAL STYLE LAB REPORT	1	2	3	4	5
EXAMINATION	1	2	3	4	

Outline Syllabus

The Advanced Materials syllabus will cover the properties of a broad range of specialised and functional materials in a course designed to build upon the structural materials elements of the course taught in level 4. The mechanism(s) behind each material's function will be explored in detail, taking in elements of the chemistry and physics underpinning each. Insulation and high strength-to-weight materials will be explored in detail, incorporating pervasive foams, honeycomb and cellular structures. A range of material treatments and finishes will also be explored, incorporating paints, varnishes, and glass treatments such as tempering, alongside thin-layer and/or surface functionalisations such as silicon solar cells and self-cleaning coatings.
The properties, and potential applications of, novel and innovative materials will be

considered.
Students will consider the practical application of solar panels, strength-to-weight ratios of various materials, acoustic properties of materials, different polymerisation processes and polymer formation, thermoplastics and Thermoset plastics and crystal grain boundaries.

Learning Activities

Lectures will be delivered throughout a semester-long programme, incorporating slides, videos and in-lecture quizzes. These theory sessions will be provided alongside extensive hands-on laboratory sessions to both demonstrate the phenomena described but also to extend student experience of a range of analytical techniques and physical principles.

Notes

This module develops techniques for evaluating and understanding the mechanisms and behaviour of engineering materials. Students will develop an understanding of novel and innovative materials.