

Module Title:	Science and Materials	Level:	5	Credit Value:	20
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Module code:	AUR527	Is this a new module?	Yes	Code of module being replaced:	AUR506
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Cost Centre(s):	GABE	JACS3 code:	
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With effect from:	September 17
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School:	Applied Science, Computing & Engineering	Module Leader:	Gareth Carr
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Scheduled learning and teaching hours	48 hrs
Guided independent study	152 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
BSc (Hons) Construction Management	x	<input type="checkbox"/>
BSc (Hons) Architectural Design Technology	x	<input type="checkbox"/>
BSc Civil Engineering Studies	x	<input type="checkbox"/>

Pre-requisites
none

Office use only

Initial approval: April 17

APSC approval of modification: August 17

Version: 2

Have any derogations received LTQC approval?

Yes No N/A

If new module, remove previous module spec from directory?

Yes No

Module Aims

The Science and Materials module will provide opportunities for students to evaluate the characteristic properties of construction materials and components, their manufacture, handling, storage, use and redundancy.

The Module will investigate economic, environmental and life-cycle considerations in the selection, specification and use of construction materials through case-study detailing of contemporary building and civil engineering projects.

Performance requirements of structural materials will be determined through case-study analyses and the application of underpinning scientific principles in the context of typical constructional arrangements. The module will investigate changes in the physical properties of structural materials as they approach and succumb to failure.

External and internal environments will be considered in terms of the components of human comfort and the requirements of functional convenience. Prevailing natural conditions and artificial interventions in the design of such environments will be investigated through measurement and analysis.

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

At the end of this module, students will be able to		Key Skills	
1	Evaluate the characteristic properties and applications of metals, polymers, ceramics, natural and composite materials used in the construction industry.	KS1	KS2
		KS5	KS6
		KS7	
2	Investigate the manufacture, handling, storage and use of construction materials and components, with particular emphasis upon the health, safety and welfare of those involved in such processes.	KS1	KS5
		KS6	
3	Evaluate the environmental impact of construction materials through their manufacture, use and redundancy.	KS1	KS5
		KS7	
4	Determine by mathematical means, solutions to given structural design scenarios.	KS1	KS3
		KS10	

5	Determine by mathematical means, solutions to given environmental design scenarios.	KS1	KS3
		KS10	

Transferable skills and other attributes

This module will complement the content of contemporaneous and subsequent technology modules in providing detailed analysis of the materials and components used in the design and specification of buildings and civil infrastructure.

Structural and environmental consequences of the selection, specification and performance of materials will inform associated modules that require design development and practicable construction detailing.

Derogations

None

Assessment:

1. An illustrated written essay that investigates inherent material properties with regard to typology, manufacture and use, including associated implications for health, safety, welfare and environmental sustainability.
2. An 'open-book' in-class test requiring structural and environmental solutions to be determined through mathematical analysis.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1,2,3	Essay	50	N/A	2000
2	4,5	In-class test	50	2 hrs	N/A

Learning and Teaching Strategies:

This module will provide opportunities for didactic delivery of technical content in the categorisation, analysis and application of material technologies in the design and execution of building and civil engineering projects.

Laboratory-based activities will provide students with experiential learning in the preparation and testing of a variety of materials, and will provide data for the subsequent analysis of material performance and industrial application.

Contemporary case-study projects should be incorporated within the delivery as far as possible, to ensure that students are given opportunities to appreciate material performance in use. Site visits should also form part of the student experience in this regard, should such opportunities present themselves as part of the general delivery of the curriculum.

Module content will be underpinned by selection, measurement and computation to ensure that students become familiar with established methods of structural and environmental mathematical analysis.

Syllabus outline:**Materials Classification:**

Metals
Polymers
Ceramics
Natural materials, and
Composites

Materials handling, storage and use

Health, safety and welfare

Environmental sustainability:

Lifecycle assessments.
Embodied energy.
Waste management
renewable and non-renewable materials.

Material testing:

Testing methods, interpreting test data.

Structural behaviours

strength, elasticity, toughness, hardness, creep, fatigue, porosity, brittleness, density, durability.
bending,
shear:
deflection
frameworks
columns

Human comfort and functional convenience

thermodynamics,
fluid mechanics
natural and artificial illumination,
acoustics,
ventilation.
passive design solutions

Bibliography:**Essential reading**

CLAISSE, P, A. (2015) *Civil Engineering Materials*. Kidlington: ButterworthHeinemann.

Domone, P, Illston, J. (2011) *Construction Materials, their nature and behaviour 4th Edn*. Oxon: Spon Press.

EVERETT, A. (1994) *Materials*. (Mitchells Building Series). 5th Ed. Abingdon: Routledge

Lyons, A. (2010) *Materials for Architects and Builders*. Oxford: Butterworth-Heinemann

THOMAS, R. (ed.) (2006) *Environmental design: An introduction for architects and engineers*. Third Edition edn. London: Taylor & Francis.

Other indicative reading

DEAN, Y. (1996) *Materials Technology*. (Mitchells Building Series). Abingdon: Routledge.

DORAN, D. and Cather, B. (2013) *Construction Materials Reference Book*. Abingdon, Routledge.

BRE Digests

Papers from Cement and Concrete Association

Papers from TRADA

Papers from Steel Construction Institute