

Module Title:	Material Science
Language of Instruction:	English
Credits:	5
NFQ Level:	6
Module Delivered In	1 programme(s)
Teaching & Learning Strategies:	Lectures Laboratory Practice & reports Project Private study
Module Aim:	The aims of this module are: (1) to prepare students for participation in the quality control of materials used in the construction of civil engineering projects; (2) to give students a basis for further study of materials.
Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	describe & examine the: - (a) source and origin of various engineering materials including aggregates, timber, metals and cement; (b) physical properties associated with aggregates, cement, timber, metals and fresh and hardened concrete; (c) principles of sustainability; (d) impact that sustainability, carbon footprint and circular economy has on our choice of materials;
LO2	demonstrate an awareness of: - (a) manufacturing technologies associated with aggregates, cement, concrete, timber and metals; (b) various engineering products available including admixtures etc.
LO3	demonstrate a knowledge of quality assurance of materials.
LO4	demonstrate the skills developed in: - (a) taking and preparation of laboratory samples; (b) laboratory analysis for engineering properties of materials in accordance with codes of practice including the use of specifically designed engineering testing apparatus; (c) analysing laboratory data in accordance with codes of practice and checking conformity of laboratory results with specifications; (d) understanding the significance of accurate sampling and testing and its relevance to the overall performance of materials in construction; (e) the preparation of laboratory reports.
LO5	illustrate the importance of Health and Safety in a laboratory environment.
Pre-requisite learning	
Module Recommendations	
<i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>	
No recommendations listed	
Incompatible Modules	
<i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>	
No incompatible modules listed	
Co-requisite Modules	
No Co-requisite modules listed	
Requirements	
<i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>	
No requirements listed	

Module Content & Assessment

Indicative Content

(1) Sustainability

(a) Principles of Sustainability (b) Carbon Footprint, CO2 emissions, Kyoto Protocol, embodied carbon (c) Life Cycle/Circular Economy, Construction Waste

(2) Aggregates

(a) Origin and geological classification of rock. (b) Sources of aggregates. (c) Sampling of aggregates. (i) Sampling (ii) Riffing (iii) Quartering (d) Physical properties and classification of aggregates. (i) Particle size analysis (ii) Fines Content (iii) Flakiness Index Test (iv) Moisture Content (e) Typical Laboratory Experiments Aggregates (i) Sampling (ii) Quartering & Riffing (iii) Particle size analysis (iv) Fines Content Test (v) Flakiness Index Test (vi) Moisture Content

(3) Cement

(a) Composition, types and manufacturing process (b) Setting times (c) Soundness (d) Strength

(4) Concrete

(a) Constituents and mix design (b) Basic Properties of fresh concrete (c) Basic Properties of hardened concrete (d) Typical Laboratory Experiments Concrete (i) Workability – Slump Test (ii) Making Cubes (iii) Curing Cubes (iv) Demoulding Cubes (v) Measuring Cubes (vi) Crushing Cubes

(5) Timber

(a) Growth and structure of trees (b) Classification of wood (c) Moisture content and seasoning (d) Natural and handling defects (e) Insect and fungal attack (f) Preservation (g) Stress grading (h) Timber products (i) Typical Laboratory Experiments Timber (i) Physical identification and examination of natural wood samples (ii) Physical identification and examination of manufactured board samples (iii) Microscopic examination of hardwood and softwood (slides) structure that is radial, tangential and longitudinal sawn cuts (iv) Moisture content measurement by both Oven and Meter testing (v) Physical examination of defects and deterioration in timber samples (vi) Physical examination and measurement of Knot / Area ratio on timber samples (vii) Physical examination of both Pressure and Brush applied preservative treatments to timber samples

(6) Metals

(a) Ferrous/non-ferrous (b) Processes, treatments (c) Properties and use (d) Typical Laboratory Experiments (i) Physical identification and examination of various metal samples (ii) Microscopic examination of structure of various metal samples (iii) Metals material testing for Stress and Strain and Hardness tests

Assessment Breakdown	%
Continuous Assessment	100.00%

Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Other	n/a	1,2,3,4,5	100.00	n/a

No Project

No Practical

No End of Module Formal Examination

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	12 Weeks per Stage	2.00
Laboratory	12 Weeks per Stage	2.00
Estimated Learner Hours	12 Weeks per Stage	6.50
Total Hours		126.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_CMCIV_D	Bachelor of Engineering in Civil Engineering	1	Mandatory