Module Descriptor Form

Civil and Environmental Engineering

CL218 - Chemistry And Materials Science

Module Code	CL218	**Module Title**	Chemistry And Materials Science				
Module Registrar	Phoenix, Prof Vernon						
Other Staff Involved	Dr Andrea Hamilton (Lecturer)						
Credit Weighting	20	**Semester**	1/2	**Elective**	No	**Academic Level**	2
Pre-requisites							
Required for							

Module Format and Delivery (hours):

Lectures	Tutorials	Assignments	Labs	Private Study	Total
22	22	46	10	100	200

Educational Aim

This module aims to:

This class aims to provide practical insights to fundamental chemistry and materials science and their roles in a wide range of civil and environmental engineering applications.

Syllabus

This module will teach the following:

Chemistry material properties, use of the periodic table; chemical formulas, chemical reaction equations; bonding; equilibrium chemistry and the concept of pH; electronegativity and redox chemistry; free radical chemistry

Chemical Thermodynamics laws of thermodynamics (first principles); chemical equilibrium; gas behaviour (ideal gas law); effects of temperature and pressure; phase changes; reactivity and activation energy

Materials Science mineralogy; crystallinity, defects, and impacts on material properties; structural materials (e.g. steel, concrete, glass, polymers, etc); geological materials (e.g. rocks, soils and its constituent, etc);

Integration Applications cement; corrosion; chemistry of the environment (pollution-environment interactions and remediation) and specific cycles/systems; pollution and its impacts on development; public health issues, material and component manufacturing techniques including historic and artisanal methods, sustainability issues in the construction industry, a net zero approach to construction (guest lecture from Zero Waste Scotland).

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Learning Outcomes

On Completion of the module, the student is expected to be able to:

LO: 1	demonstrate a working knowledge of fundamental principles of chemistry and materials science.
LO: 2	identify aspects of chemistry and materials science that link to the engineering properties and behaviour of materials.
LO: 3	apply fundamentals of chemistry and materials science to solve engineering problems.

(UK SPEC suggests no more than 4 learning outcomes per module. Statements must be broad and be syllabus free and link in with the intended learning outcomes on the programme specifications.)

Assessment of Learning Outcomes - Criteria

Learning Outcome: **1**

	Criteria
1	understand concepts from chemistry and materials science relevant to civil and environmental engineering
2	link fundamental phenomena of chemistry and materials science to complex phenomena.
3	apply theoretical principles of chemistry and materials science to complex, open-ended problems in civil and environmental engineering

Learning Outcome: **2**

	Criteria
1	develop a working knowledge of how basic principles affect complex engineering phenomena
2	link complex engineering behaviour to fundamental science
3	demonstrate this knowledge in the application of appropriate tests to engineering materials

Learning Outcome: **3**

	Criteria
1	identify materials of interest to civil and environmental engineering and their fundamental physical properties
2	determine the key aspects of fundamental chemistry and materials science that affect these materials
3	apply this knowledge to explain how these materials are manufactured (including historic and artisanal technologies) and manipulated by their environment.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

To Pass the module, students need to gain a summative mark of: 40%

Description	Semester	Start Week	Duration	Weight	Submission Week	Linked Criteria
S1 Week 2 miniquiz	1	2		2%	2	LO 1: C1, C2, C3 LO 2: C1, C2, C3
S1 Week 3 miniquiz	1	3		2%	3	LO 1: C1, C2, C3 LO 2: C1, C2, C3
S1 Week 4 miniquiz	1	4		2%	4	LO 1: C1, C2, C3 LO 2: C1, C2, C3
S1 Week 5 miniquiz	1	5		2%	5	LO 1: C1, C2, C3 LO 2: C1, C2, C3
S1 week 6 miniquiz	1	6		2%	6	LO 1: C1, C2, C3 LO 2: C1, C2, C3
S1 Week 7 miniquiz	1	7		2%	7	LO 1: C1, C2, C3 LO 2: C1, C2, C3
S1 Week 8 miniquiz	1	8		2%	8	LO 1: C1, C2, C3 LO 2: C1, C2, C3
S1 Week 9 miniquiz	1	9		2%	9	LO 1: C1, C2, C3 LO 2: C1, C2, C3
Semester 1 exam. Closed Book	1		2.00	34%	E	LO 1: C1, C2, C3 LO 2: C2
S2 Week 1 online quizzes	2	1		1%	2	LO 1: C1, C2, C3 LO 3: C1, C2, C3
S2 Week 2 online quizzes	2	2		1%	3	LO 2: C1, C2, C3 LO 3: C1, C2, C3
S2 Week 3 and 4 online quizzes	2	3		3%	5	LO 2: C1, C2, C3 LO 3: C1, C2, C3
S2 Week 5 online quizzes	2	5		1%	6	LO 3: C1, C2, C3
S2 Week 6 online quizzes	2	6		1%	7	LO 3: C1, C2, C3
S2 week 7 online quizzes	2	7		1%	8	LO 2: C1, C2, C3 LO 3: C1, C2, C3
Lab with group lab report hand-in.	2	7		7%	9	LO 1: C1 LO 2: C2, C3 LO 3: C3
S2 Weeks 8 and 9 online quizzes	2	8		1%	10	LO 2: C1, C2, C3 LO 3: C1, C2, C3
Semester 2 exam. Closed Book	2		2.00	34%	E	LO 2: C1, C3 LO 3: C1, C2, C3

Principles of Assessment Feedback

1. A range of assessment activities are used including tutorial work, quizzes, laboratory testing and reporting. Expectations in terms of time and effort are outlined clearly in the presentation of each assignment.
2. All assessments are clearly related to the learning outcomes and assessment feedback is provided against clearly stated criteria.?
3. Assessments and methods are clearly explained to students at the start of the course.?
4. The effectiveness of the assessment and feedback methods are reviewed at the end of the course and any recommended changes are implemented in the next academic year.

Additional Information

Students must gain a summative mark of 40% for BOTH semesters to pass the module. Attendance at the end of semester exam is a requirement of this module. Absence from the final exam will result in an 'absent' mark being returned. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist of an exam for the semester(s) failed. No marks from any previous attempts will be transferred to a new resit attempt.

Resit Procedure

Exam in the August resit exam diet.

Recommended Reading

***Purchase recommended **Highly recommended reading *For reference

*Dean, John R., Alan M. Jones, David Holmes, Rob Reed, Jonathan Weyers, and Allan Jones (2011) Practical Skills in Chemistry, Second Edition [online] Available at http://www.dawsonera.com/depp/reader/protected/external/AbstractView/S9780273731191 [free access via Suprimo]

**Moore, John T. (2004) Chemistry Made Simple. New York: Broadway Books.

*Roussak, O.V. and H. D. Gesser (2013) Applied Chemistry: A Textbook for Engineers and Technologists [online] Available at http://link.springer.com/book/10.1007/978-1-4614-4262-2/page/1 [free access via Suprimo]

*Sawyer, Clair N., Perry L. McCarty, and Gene F. Parkin (2002) Chemistry for Environmental Engineering and Science, Fifth Edition. London: McGraw-Hill Inc.

**Callister, W. D. and David G. Rethwisch (2009) Materials Science and Engineering: An Introduction, 10th edition. Wiley.

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Module Timetable

Week	Semester 1	Semester 2
0		
1		
2	Continuous 2%	Continuous 1%
3	Continuous 2%	Continuous 1%
4	Continuous 2%	
5	Continuous 2%	Continuous 3%
6	Continuous 2%	Continuous 1%
7	Continuous 2%	Continuous 1%
8	Continuous 2%	Continuous 1%
9	Continuous 2%	Lab 7%
10		Continuous 1%
11		
E	Examination 34%	Examination 34%

Date of Last Modification

08-09-2025