



Title:	Engineering Chemistry	APPROVED
Long Title:	Engineering Chemistry	
Module Code:	CHEM6001	Duration: 1 Semester
Credits:	5	
NFQ Level:	Fundamental	
Field of Study:	Chemistry	
Valid From:	Semester 1 - 2019/20 (September 2019)	
Module Delivered in	9 programme(s)	
Next Review Date:	September 2023	
Module Coordinator:	Donagh OMahony	
Module Author:	Elaine OKeeffe	
Module Description:	This module introduces the fundamentals of atomic theory and chemical bonding, along with concepts in inorganic and physical chemistry relevant to students of engineering.	
Learning Outcomes		
<i>On successful completion of this module the learner will be able to:</i>		
LO1	Describe the fundamental principles of atomic theory, chemical bonding, the physical states of matter and the main features of the periodic table.	
LO2	Perform calculations regarding molar quantities, solutions, stoichiometry, reaction rates, and the equilibrium state.	
LO3	Link fundamental concepts in chemistry with applications in the engineering sphere.	
LO4	Carry out a range of selected laboratory experiments for measurement of physical parameters using correct laboratory practice.	
Pre-requisite learning		
Incompatible Modules <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.</i>		
General and Inorganic Chemistry; Physical Chemistry; Physical and Organic Chemistry		
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. You may not enrol on this module if you have not acquired the learning specified in this section.</i>		
No requirements listed		
Co-requisites		
No Co Requisites listed		

Module Content & Assessment
Indicative Content
Chemistry Fundamentals

Foundations of modern atomic theory, periodic classification of the elements, trends in properties, covalent and ionic bonding, bonding in metals and semiconductors, intermolecular forces, including hydrogen bonding and Van der Waals forces, properties resulting from bond formation.

Quantifying Chemical Interactions

Stoichiometry, thermochemistry, factors affecting reaction rates, role of catalysts, reaction order and its determination from reaction rate, equilibrium expressions, factors affecting equilibrium, Le Chatelier's Principle; examples of important industrial equilibria, theories of acids and bases, pH and related calculations, buffer solutions and their applications, Henderson-Hasselbach equation, oxidation and reduction reactions.

Engineering Applications

Electrolytic cells and standard electrode potentials; electrolysis; Nernst equation; corrosion; fuel cells; voltaic cells, buffers, corrosion, combustion reactions, some aspects of industrial chemistry.

Laboratory Practicals

Sample experiments; Determination of the % water present in crystalline copper sulphate, determination of % ethanoic acid in vinegar, analysis of manganese (vii) solution by colourimetry, determination of % iron in an iron salt, determination of enthalpy of neutralisation.

Assessment Breakdown

	%
Course Work	100.00%

Course Work

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Multiple Choice Questions	Theory assessment. Typical content examined: atomic theory, periodic table, chemical bonding and stoichiometry	1,2	25.0	Week 7
Practical/Skills Evaluation	Performance of practicals with associated reports and calculations	2,4	25.0	Every Second Week
Short Answer Questions	Theory assessment. Typical content examined: atomic theory, periodic table, chemical bonding, stoichiometry, chemical equilibrium, acid-base theory, kinetics, thermochemistry and electrochemistry	1,2,3	50.0	Week 13

No End of Module Formal Examination

Reassessment Requirement
Repeat examination

Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

The institute reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time				
<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Delivery of course material and problem solving	3.0	Every Week	3.00
Lab	Practical skills development	2.0	Every Second Week	1.00
Independent & Directed Learning (Non-contact)	Review of course material and completion of laboratory practical reports	3.0	Every Week	3.00
Total Hours				8.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				4.00

Workload: Part Time				
<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Delivery of course material and problem solving	3.0	Every Week	3.00
Lab	Practical skills development	2.0	Every Second Week	1.00
Independent & Directed Learning (Non-contact)	Review of course material and completion of laboratory practical reports	3.0	Every Week	3.00
Total Hours				8.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				4.00

Module Resources

Recommended Book Resources

- Burns R. A. 2002, *Fundamentals of Chemistry*, 4th Ed., Prentice Hall [ISBN: 0130337196]
- Blackman A., Bottle S., Schmid S., Mocerino M. 2015, *Chemistry*, John Wiley & Sons [ISBN: 0730311058]
- CIT, *Manual of Practical Chemistry for First Year Courses*

Supplementary Book Resources

- Kennedy D. 2014, *Chemistry Live*, Folens [ISBN: 9781780904672]
- Brown T. E., May H. E. Jr., Bursten B. E., Murphy C., Woodward P., Stoltzfus M. E. 2001, *Chemistry: The Central Science*, 14th Ed., Pearson [ISBN: 0134414233]

This module does not have any article/paper resources

Other Resources

- Website: *Companion website for recommended textbook*
http://wps.prenhall.com/esm_burns_chemistry_4/
- Website: Khan Academy 2017, *Khan Academy Chemistry*
<https://www.khanacademy.org/science/chemistry>

Module Delivered in

Programme Code	Programme	Semester	Delivery
CR_EBIOM_8	<u>Bachelor of Engineering (Honours) in Biomedical Engineering</u>	2	Mandatory
CR_ECPEN_8	<u>Bachelor of Engineering (Honours) in Chemical and Biopharmaceutical Engineering</u>	1	Mandatory
CR_EMECH_8	<u>Bachelor of Engineering (Honours) in Mechanical Engineering</u>	2	Mandatory
CR_CSTRU_8	<u>Bachelor of Engineering (Honours) in Structural Engineering</u>	1	Mandatory
CR_ESENT_8	<u>Bachelor of Engineering (Honours) in Sustainable Energy Engineering</u>	2	Mandatory
CR_ECBPO_6	<u>Certificate in Chemical and Biopharmaceutical Process Operations</u>	1	Mandatory
CR_EOMNI_8	<u>Engineering Common Entry (Level 8)</u>	1	Mandatory
CR_CCEEE_9	<u>Master of Engineering in Civil Engineering (Environment and Energy)</u>	1	Mandatory
CR_CSTEN_9	<u>Master of Engineering in Structural Engineering</u>	1	Mandatory