Module Code | CHU11E05
---|---
Module Name | Chemistry
ECTS Weighting | 5 ECTS
Semester taught | Semester 1
Module Coordinator/s | Assist. Prof. Richard Hobbs
| Assist. Prof. Niall Mc Evoy

**Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline**

On successful completion of this module, students should be able to:

LO1. Explain chemical equations, balance them, and make calculations based on them relating to stoichiometry and molarity;

LO2. Relate trends in the periodic table (in both elements and their compounds) with the underlying trends in electronic and atomic structure;

LO3. Perform calculations on the rates of reaction and to relate reaction kinetics to the details of the reaction mechanism;

LO4. Perform calculations on chemical equilibria of different nature (acid-base, complexation, gas reactions, solubility, etc.);

LO5. Be able to read and interpret basic phase diagrams of pure substances and binary mixtures;

LO6. Explain the properties of ideal and near-ideal solutions and carry out calculations using colligative properties;

LO7. Perform calculations of electrochemical potentials and relate them to thermodynamic quantities;

LO8. Explain chemical reactivity (thermodynamic and kinetic) in terms of valency, electronegativity and electronic structure;

LO9. Relate some of the macroscopic properties of materials to the nature of the electronic structure and bonding at the molecular/atomic level;

LO10. Carry out basic experimental procedures on aspects of chemical reactions and to appreciate the need for safety and safety procedures in the laboratory.

**Graduate Attributes: levels of attainment**

To act responsibly - Introduced

To think independently - Introduced

To develop continuously - Introduced

To communicate effectively - Introduced
Module Content

**Introduction and General Chemistry**

- Chemical change; elements, compounds and mixtures; atomic theory; stoichiometry and chemical equations; atomic structure; electronic structure and the periodic table; bonding; elementary structural chemistry; metals, semiconductors and insulators.

**Physical Chemistry I**

- Thermodynamics: First law, internal energy, enthalpy; introduction to entropy, 2nd and 3rd Laws; criterion for chemical change; equilibrium constant for a chemical reaction, Gibbs free energy.

**Physical Chemistry II**

- States of matter: Gibbs phase rule, ideal solutions, colligative properties
- Chemical Equilibrium: Law of mass action; factors that influence the position of equilibrium. Ionic equilibria: ionic equilibria in aqueous solutions; strong and weak acids and bases; buffer solutions and indicators;
- Electrochemistry; molar conductivity and electrolyte solutions; electrode potentials; cells; electrolysis; emf and chemical equilibrium; and introduction to analytical chemistry;
- Chemical Kinetics: rates of reactions; order and molecularity; activation energy; kinetics and mechanisms; catalysis.

Teaching and Learning Methods

This module is taught using a combination of lectures, tutorials and laboratory-based experiments.
## Assessment Details

Please include the following:

- Assessment Component
- Assessment Description
- Learning Outcome(s) addressed
- % of total
- Assessment due date

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<tr>
<th>Assessment Component</th>
<th>Assessment Description</th>
<th>LO Addressed</th>
<th>% of total</th>
<th>Week due</th>
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<tbody>
<tr>
<td>End of semester examination</td>
<td>Written/Multiple Choice Examination</td>
<td>1-9 above</td>
<td>80</td>
<td>16</td>
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<tr>
<td>Laboratory sessions</td>
<td>Students attend 4 laboratory practicals (3 hours per experiment). Lab reports are assessed.</td>
<td>1-10 above</td>
<td>20</td>
<td>Reports due 1 week after each experiment undertaken</td>
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## Reassessment Requirements

## Contact Hours and Indicative Student Workload

Contact hours: 48 hours

Independent Study (preparation for course and review of materials): 40 hours  
(approximately 30 hours reviewing lecture material and references to textbook, 10 hours answering tutorial questions)

Independent Study (preparation for assessment, incl. completion of assessment): 32 hours (12 hours preparing for labs and completing lab reports, 20 hours preparation for final exam)

## Recommended Reading List

Main text for the course:

Required textbook The recommended text for this module is:


The material is also covered in: Chemistry: Molecules, Matter and Change, P Atkins and L Jones, 4th edition, Freeman  
Chemistry for Engineering Students, Brown and Holme, 1st edition, Thompson
There is also a more detailed and advanced text by Atkins and Jones: *Chemical Principles – the Quest for Insight*, Freeman, 2nd edition. This will also cover the material presented in lectures, and may suit students who already have a strong background in Chemistry.

Some students who have not done Chemistry at school find that they benefit from access to a text that starts at a more elementary level. Two such texts that JF Engineering students have found valuable in recent years are: *Chemistry*, R Lewis and W Evans, MacMillan Foundations *Fundamentals of Chemistry*, DE Goldberg, McGraw-Hill

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<td>Module Co-requisite</td>
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<tr>
<td>Module Website</td>
<td><a href="http://www.tcd.ie/Engineering/Courses/BAI/JF_Subjects/1E5/">http://www.tcd.ie/Engineering/Courses/BAI/JF_Subjects/1E5/</a></td>
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<tr>
<td>Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.</td>
<td>School of Chemistry</td>
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<td>Module Approval Date</td>
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<td>Academic Start Year</td>
<td>September 9\textsuperscript{th} 2019</td>
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<td>Academic Year of Date</td>
<td>2019/2020</td>
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