Module Code	CHU11E05
Module Name	Chemistry
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 1
Module Coordinator/s	Asst. Prof. Richard Hobbs
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; L08. Explain chemical reactivity (thermodynamic and kinetic) in terms of valency, electronegativity and electronic structure; L09. Relate some of the macroscopic properties of materials to the nature of the electronic structure and bonding at the molecular/atomic level; L010. 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

[1] TEP Glossary

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; Gibbs free energy. **Physical Chemistry II** • States of matter: Gibbs phase rule, ideal solutions, colligative properties • Chemical Equilibrium: Law of mass action; equilibrium constant for a chemical reaction; 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[2]
Please include the following:

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

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
End of semester examination	Written/Multiple Choice Examination	1-9 above	80	20
Laboratory sessions	Students attend 3 laboratory practicals (2 experiments online/at home, 1 experiment on site in laboratory setting, 3 hours per experiment). Lab reports are assessed.	1-10 above	20	Reports due **1 week** after each scheduled in-person experiment, **2 weeks** after each scheduled online/at home experiment

Reassessment Requirements

Contact Hours and Indicative Student Workload[2]

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): 26 hours (6 hours preparing for labs and completing lab reports, 20 hours preparation for final exam)

Recommended Reading List

Main text for the course:

The recommended text for this module is:

Chemistry – The Molecular Nature of Matter and Change, Silberberg and Amateis, 9th edition, McGraw-Hill

The material is also covered in: Chemistry, Chang and Overby, 13th edition, McGraw-Hill; Chemistry: Molecules, Matter and Change,

[2] TEP Guidelines on Workload and Assessment

	Atkins and 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 studied Chemistry previously may 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 A valuable online resource is available via openstax at the following link. https://openstax.org/details/books/chemistry-2e/
Module Pre-requisite	
Module Co-requisite	
Module Website	https://www.tcd.ie/engineering/current-students/undergraduate/engineering/year-one/
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	School of Chemistry
Module Approval Date	
Approved by	
Academic Start Year	September 23rd 2024
Academic Year of Date	2024/2025