UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Chemistry For Engineers
Module Code	CHE5001-B
Academic Year	2024/5
Credits	20
School	School of Chemistry and Biosciences
FHEQ Level	FHEQ Level 5

Contact Hours	
Type	Hours
Interactive Learning Objects	20
Practical Classes or Workshops	4
Laboratories	12
Directed Study	134
Lectures	20
Practical Classes or Workshops	10

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year

Module Aims

To introduce models describing bond formation between atoms and relate these to the physical chemical properties of simple molecules. To provide experience of laboratory techniques through examples of organic separations and introduce common methods for characterisation of organic chemicals. To design synthetic chemistry experiments, using greener and sustainable approaches, and specialist chemistry search engines. To carry those experiments out and then test the results using modern analytical equipment. To train students in the preparation of laboratory reports and introduce the standard formats used by professional chemists

Outline Syllabus

In Semester 1:
- The language of organic Chemistry: Drawing organic compounds, functional groups and nomenclature.
- Isomerism: Conformation and configuration, enantiomers and diastereoisomers.
- Mechanisms: Orbitals and hybridisation, curly arrows, electrophiles, radicals and nucleophiles, reactive intermediates and transition states, inductive, mesomeric and hypercojugation effects, strength of nucleophiles and electrophiles, carbocation stabilities, rearrangements, pKa.
- Analytical tools for organic Chemistry: IR spectra of functional group containing compounds. Introduction to mass spectrometry. Origins and applications of proton and carbon NMR spectra. Elucidating structures from spectra.

In Semester 2:
- Specialist Chemistry search engines: SciFinder, PubChem, ChemSpider.
- Introductory to the chemistry laboratory: health and safety, standard glassware, design of experiments using Chemistry search engines and green and sustainable Chemistry approaches.
- Environmental Chemistry and use of Analytical tools to identify and quantify contaminants in the environment.
- Experiments: Extractions, recrystallisations and distillations, bio-synthesis, organic synthesis, drug delivery composites for sustained drug release, use of analytical equipment for characterisation and identification of various compounds.

Learning Outcomes

Outcome Number	Description
01	Explain how types of chemical bonding in organic molecules influence structure and reactivity of molecules.
02	Name organic molecules and describe the stereochemistry of simple molecules.
03	.Use chemical search engines to identify suitable chemical reactions, that are based on green and sustainable Chemistry approaches, and take into consideration the environmental impact. Those reactions can be used in the Chemistry laboratory or at an industrial scale
04	Conduct simple experiments in the chemistry lab
05	Present chemical information and interpret its meaning.
06	Demonstrate contribution to a team.

Learning, Teaching and Assessment Strategy

The module uses a blended approach to support learning and achievement. Students will engage with a series of weekly online learning packages. These will include short videos that address key concepts, a set of structured activities (reading, online discussions etc.) that scaffold the learning, and a range of formative tasks that generate feedback on progress. Students will also engage in a series of on-campus tutorials. Online seminars (tutorials/discussions) will also be used to support learning and monitor progress as student move through the curriculum.

Laboratory-based work, both on campus and online will include staff-led demonstration of practical and manipulative skills at the bench and supervision of students experimental work. Chemical search skills will be taught through on campus and online hands-on sessions.

The Learning strategy is to develop skills and knowledge through active learning activities. In line with CDIO principles. The learning strategy harnesses active learning and experiential learning is key driver. The module will finish with a design and build challenge supported by targeted interactive workshops, in which students will design and then 'build' a synthetic route to an organic molecule, after consideration of greener and sustainable Chemistry approaches and the environmental impact of contaminants.

The first part of the modules is knowledge-rich and will be assessed using an in-class assessment, to cover LOs 1 and 2.

The second half of the module will be group based, and the assessment will be linked to the CDIO project, to cover LOs 3, 4, 5 and 6. Each group will be assessed based on the effectiveness of the project to meet the project brief, design quality and build - as measured by physical and spectroscopic data of the synthetic product, with a detailed justification of design, materials, and synthetic methodologies taking into account sustainability and environmental implications of the project. Students will need to demonstrate lessons learned in all aspects of the work during the poster preparation and presentation stage.

Group demonstration/Presentation of the deliverable (the experimental outcome as part of a multidisciplinary project) will be achieved through the online submission of a poster

Mode of Assessment

Type	Method	Description	Weighting
Summative	Online MCQ Examination	Online Mid term assessment (MCQ) (1 Hr)	50%
Summative	Presentation	Online poster submission and online presentation (15 Mins)	50%

Reading List

To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html

Please note:
This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.
