UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Fundamentals of Nano and Supramolecular Materials
Module Code	CFS7014-B
Academic Year	2020/1
Credits	20
School	School of Chemistry and Biosciences
Subject Area	Chemistry
FHEQ Level	FHEQ Level 7
Pre-requisites	N/A
Co-requisites	N/A

Contact Hours	
Type	Hours
Learning Objects Interaction	14
Online Tutorials (Synchronous)	2
Directed Study	170
Practical Classes or Workshops	14 (online workshop)

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 1

Module Aims

Nanoscience and nanotechnology have revolutionised various techniques in a broad range of fields. This course aims to enable students to develop a fundamental understanding of the field of nanoscience and nanotechnology and train students to apply this knowledge to solve practical problems. This course also aims to introduce the students to different applications of supramolecular chemistry in designing new materials and the presence of different kinds of supramolecular interactions in nature (photosynthesis, membrane proteins etc).

Outline Syllabus
1. Different types of nanomaterials including semiconductor quantum dots, metal nanoparticles, polymer nanoparticles, carbon based nanomaterials, inorganic nanomaterials, organic nanomaterials, 0D, 1D, 2D, and 3D nanomaterials. 2. Characterisation techniques for the morphology, structure and property analysis of nanomaterials. 3. The applications of different nanomaterials in diverse fields such as electronics, energy, environment, and healthcare. 4. Key supramolecular interactions based on intermolecular interactions: Cation binding: The crown ethers; The Lariat ethers and podands; The cryptands; The spherands; Selectivity in cation complexation; The template effect and high dilution; The calixarenes; The siderophores. 5. Supramolecular chemistry of life: Membrane potentials; Membrane transport 6. Molecular devices: Introduction; Supramolecular photochemistry; Molecule based electronics; sensors; nonlinear optical materials.

Learning Outcomes	
Outcome Number	Description
01	Discuss the concepts of nanomaterials and nanotechnology.
10	Appraise the use of supramolecular self-assembly in designing and interpreting molecular devices.
11	Analyse the morphology, structure and properties of nanomaterials using a wide variety of experimental techniques.
12	Apply nanomaterials and nanotechnology to solve problems and perform applications.
13	Apply the knowledge in designing molecular machines for electronics, sensors, etc
14	Be competent at self-study, data mining, and be able to quickly assimilate information.
15	Be able to think across your own discipline and explore other fields.
16	Write scientific reports and use references properly.
02	Identify the physical & chemical properties of nanomaterials as compared to their bulk counterparts.
03	Know different types of nanomaterials including semiconductor quantum dots, metal nanoparticles, polymer nanoparticles, carbon based nanomaterials, inorganic nanomaterials, organic nanomaterials, 0D, 1D, 2D, & 3D nanomaterials.
04	Describe the synthesis and processing of a diversity of nanomaterials & their mechanisms.
05	Explain the applications of different nanomaterials in diverse fields such as electronics, energy, environment, and healthcare.
06	Describe underlying principles of supramolecular chemistry.
07	Identify supramolecular chemistry in natural processes.
08	Describe the principle of cation and anion binding by supramolecular hosts with examples.
09	Describe solid-state inclusion compounds and give examples.

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 discissions etc.) that 'scaffold' the learning, and a range of formative tasks that generate feedback on progress. Online workshops and tutorials will also be used to support learning and monitor progress as students move through the curriculum.

Directed study provides you with the opportunity to undertake guided reading and to develop your own portfolio of learning to enhance transferable skills and knowledge relating to evaluation of own role and subject provision.

The VLE will be used to provide access to online resources, lecture notes and external links to websites of interest.

Assessment 1: An assessed proactive team based learning workshop based on material delivered in semester 1. Group of students will be given contemporary research topics to prepare a short report (term paper) and give a poster presentation.
Assessment 2: Summative open book examination to cover the whole module.

Mode of Assessment

Type	Method	Description	Length	Weighting
Summative	Examination - Open Book	Summative assessment: open book exam	2 hour	60%
Summative	Coursework	Term paper and virtual poster (2000 words)	N/A	40%

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.

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