UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Fundamentals of Nano and Supramolecular Materials
Module Code	CFS7014-B
Academic Year	2023/4
Credits	20
School	School of Chemistry and Biosciences
FHEQ Level	FHEQ Level 7

Contact Hours	
Type	Hours
Lectures	28
Tutorials	2
Directed Study	168
Practical Classes or Workshops	2

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.
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 and 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	Describe the principle of cation and anion binding by supramolecular hosts with examples.
08	Describe solid-state inclusion compounds and give examples.
09	Appraise the use of supramolecular self-assembly in designing and interpreting molecular devices.
10	Analyse the morphology, structure and properties of nanomaterials using a wide variety of experimental techniques.
11	Apply nanomaterials and nanotechnology to solve problems and perform applications.
12	Apply the knowledge in designing molecular machines for electronics, sensors, etc
13	Be competent at self-study, able to think across your own discipline, explore other fields and be able to quickly assimilate information.
14	Write scientific reports and use references properly.

Learning, Teaching and Assessment Strategy

Lectures will deliver core content; providing you with the opportunity to acquire the information to enhance your knowledge and understanding of the basic concepts of nanoscience and nanotechnology. This will be complemented by seminars, group discussions and tutorials to allow you to apply the grasped knowledge to specific exemplar problems. 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 report based on a recent published scientific article and material covered throughout the semester. Students will be provided with a contemporary research article to prepare a short report (2000 words).

Assessment 2: Summative closed book examination to cover the whole module.

Mode of Assessment

Type	Method	Description	Weighting
Summative	Examination - Closed Book	Summative assessment: closed book exam (2 Hrs)	60%
Summative	Coursework - Written	Report on contemporary research	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.
