

Fundamentals of Nano and Supramolecular Materials

Module Code:	CFS7014-B
Academic Year:	2018-19
Credit Rating:	20
School:	School of Chemistry and Biosciences
Subject Area:	Chemistry and Forensic Science (ceases 2016)
FHEQ Level:	FHEQ Level 7 (Masters)

Pre-requisites:

Co-requisites:

Contact Hours

Type	Hours
Lectures	28
Tutorials	2
Directed Study	170

Availability Periods

Occurrence	Location/Period
BDA	University of Bradford / Semester 1 (Sep - Jan)

Module Aims

Nanoscience and nanotechnology has 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

Module Learning Outcomes

On successful completion of this module, students will be able to...

- 1 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.
- 2 Identify the physical & chemical properties of nanomaterials as compared to their bulk counterparts.
- 3 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.
- 4 Describe the synthesis and processing of a diversity of nanomaterials & their mechanisms.
- 5 Explain the applications of different nanomaterials in diverse fields such as electronics, energy, environment, and healthcare.
- 6 Describe underlying principles of supramolecular chemistry.
- 7 Identify supramolecular chemistry in natural processes

- 8 Describe the principle of cation and anion binding by supramolecular hosts with examples.
- 9 Describe solid-state inclusion compounds and give examples.

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 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 examination to cover the whole module.

Mode of Assessment

Type	Method	Description	Length	Weighting	Final Assess'
Summative	Examination - closed book	Closed book exam	2 hours	60%	Yes
Summative	Coursework	Term paper and poster	-2000 words	40%	No

Legacy Code (if applicable)

CT-4021D

Reading List

To view Reading List, please go to [rebus:list](#).