Liverpool John Moores University

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Title:	MODERN MATERIALS
Status:	Definitive
Code:	**6001APCHEM** (121135)
Version Start Date:	01-08-2020
Owning School/Faculty:	Pharmacy & Biomolecular Sciences
Teaching School/Faculty:	Pharmacy & Biomolecular Sciences

Team	Leader
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Academic Level:	FHEQ6	**Credit Value:**	20	**Total Delivered Hours:**	40
Total Learning Hours:	200	**Private Study:**	160		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	17
Seminar	3
Workshop	17

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	Examination	70	3
Report	Report	Report	30	

Aims

The course aims at covering the modern aspects of materials chemistry. Emphasis

will be placed on stimuli-responsive materials, on nanoscale technology, and on the approaches used in the manufacture of modern materials. Applications of modern materials in different fields will also be discussed.

Learning Outcomes

After completing the module the student should be able to:

1	Discriminate between different chemical classes of smart materials and their syntheses.
2	Define and demonstrate the processes of manufacturing advanced materials.
3	Evaluate critically the technological applications of advanced materials.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Examination	1	2	3
Report	3		

Outline Syllabus

Smart materials
Stimuli-responsive materials. External stimuli and properties changes (piezoelectric, electrostrictive, magnetostrictive, thermoelectric, shape memory alloys, photochromic, thermocromic)
Advanced polymer chemistry and materials
RAFT-polymerisation. Block copolymers. Living polymerisation. Polymer electrolytes and charged polymers. Dielectric, piezoelectric, conducting, semiconducting, light emitting polymers. Self-healing polymers. Dendrimers. Biodegradable polymers. Micro- and nano-dispersed systems.
Coatings and layers
Surfaces and surface analysis. Anti-fouling. Modification of surfaces. Monolayers and multilayer. Self-assembled layers. Thin films.
Supramolecular materials and soft matter
Definition of the field. Characterisation of soft matter. Liquid crystals, gels, hydrogels. Self-assembly and supramolecular material. Bottom-up approach. Recognition and templation.
Nanotechnology
Scale and properties. Nanotubes, fullerenes, nanoparticles. Application of nanotechnology in medicine, engineering, electronic. Nanosensors. Implication of nanotechnology.
Making modern materials
Top-down and bottom-up approaches. Self-assembly, 3D printing, soft lithography, micro-patterning, electrodeposition.
Applications of modern materials
- optics/photonics (functional paints, energy harvesting, liquid crystals)
- electronics (solar cells)

- medicine (healthcare, regenerative medicine, tissue engineering)
- environment (energy saving, remediation, catalysts)

Learning Activities

Lectures, workshops, seminars.

Notes

Modern materials chemistry covers a wide range of topics, including synthetic compounds and polymers which are electrically conductive or semiconductive, or which can convert light into electricity or vice versa. Such materials are key to the rapid development of mobile devices. Stimuli-responsive or 'smart' materials, nanoscale technology, and materials utilised in healthcare will also be covered, both from a chemical and macroscale approach.