

New Course Code and Title	MS742M: Biomaterials	
Course Coordinator	Luciana Lisa Lao	
Details of Course	<p>Summary of course content</p> <p>This course is about materials used to construct medical implants and other devices used to repair, replace or regenerate tissues and organs. It provides an introduction to specific materials commonly used in medical devices, as well as general structure and properties of the main material classes used, namely metals, ceramics, polymers and hydrogels. The course covers the mechanisms by which the human body reacts to such implanted materials and how biocompatibility of devices and their materials needs to be tested for and proven by device manufacturers in order to market the device. Special handling, performance requirements, degradation and ethical aspects relevant specifically to biomaterials and medical devices are covered. Finally, specific application areas of materials in medicine, namely tissue engineering and drug delivery, are elaborated on.</p>	
	<p>Rationale for introducing this course</p> <p>This new course is being developed to teach the subject of Biomaterials as a Materials Specialization course for the new MSE online Masters program.</p>	
	<p>Aims and objectives</p> <p>This course introduces and exposes students to different classes of biomaterials and their applications.</p> <p>The aims of this course is for students to</p> <ul style="list-style-type: none"> • Learn the mechanisms by which the human body reacts to a foreign material • Classify materials into three main classes and describe their structure-property relationships for use in medical applications • Have knowledge of what to consider when selecting a material for an implant and their implications. • Understand the role of biomaterials in tissue engineering and drug delivery. 	
	<p>Course Syllabus (Refer to page 3)</p> <ol style="list-style-type: none"> 1. Introduction to Biomaterials 2. Tissue-Material Interactions 3. Metals and Ceramics in Medicine 4. Polymers in Medicine 5. Applications in Tissue Engineering and Drug Delivery 	
Assessment	Continuous Assessment – Quiz 1 (Individual)	20%

(Individual Assessment)	Continuous Assessment – Quiz 2 (Individual)	25%
	Continuous Assessment – Quiz 3 (Individual)	15%
	Project Work (Individual)	40%
	Total:	100 %
To be offered with effect from (state Academic Year and Semester)	AY2017/18 Semester 2	
Cross Listing (if applicable)	N/A	
Prerequisites (if applicable)	N/A	
Preclusions (if applicable)	N/A	
Mode of Teaching & Learning (Lectures, regular tests, Q&A, problem-based learning)	<i>Lectures, assessments, project</i>	
Basic Reading List	<i>Biomaterials -- An Introduction. 3rd ed., Joon B. Park and Roderic S. Lakes, Springer 2007</i>	
• Compulsory Reading		
• Supplementary Reading	<i>Biomaterials Science -- An Introduction to Materials in Medicine. 3rd ed., B.D. Ratner, A.S. Hoffman, F.J. Schoen and J.E. Lemons, Editors, Academic Press 2013.</i>	
Maximum Class Size	30	
Hours of Contact/Academic Units	39 hours / 3 AU	
Workload Per Week (The workload for a 3-AU course must add up to 39 hours of contact hours)	Lecture hours per week	3 hours
	Tutorial hours per week	
	Total hours	39 hours

Course Syllabus

The following topics will be covered:

Module 1: Introduction to Biomaterials

- Key concepts and evolution of biomaterials
- Ethical issues of biomaterials

Module 2: Tissue – Material Interactions

- Tissue – biomaterial interface
- Blood – biomaterial interaction
- Wound healing and immune response
- Determination of biocompatibility

Module 3: Metals and Ceramics in Medicine

- Structure and properties of metals and ceramics
- Applications of metals and ceramics in medicine

Module 4: Polymers in Medicine

- Structure and properties of polymers and hydrogels
- Degradable and natural polymers
- Applications of polymers and hydrogels in medicine

Module 5: Applications in Tissue Engineering and Drug Delivery

- Tissue engineering

- Drug delivery