MS4013 – Biomaterials

Course Code	MS4013					
Course Title	Biomaterials					
Pre-requisites	MS2013	Polymers and Composites				
	MS3011	Metallic & Ceramic Materials				
Pre-requisite for	MS4610	Advanced Biomaterials				
	MS4611	Biomedical Devices				
	MS4612	Drug Delivery and Tissue Engineering				
No of AUs	3					
Contact Hours	LECTURES	26	Tutorial	13		

Course Aims

This course will introduce you to the types of biomaterials used in health care applications. In particular, host reactions to biomaterials and biological testing of metallic, ceramic and polymeric biomaterials will be discussed. In vitro and in vivo biocompatibility of materials will be discussed in relation to the actual applications. Some key applications (case studies) of each type of biomaterial will be covered, along with a discussion of the failure of biomedical devices caused by biocompatibility problems.

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) would be able to:

1. Predict the role of biomaterials in medicine
2. Define biomaterials & biocompatibility
3. Explain the different role of biomaterials – Temporary, Degradable, Permanent
4. Describe and identify application of the different classes of Biomaterials – Metals, Ceramics, Polymers, hydrogels
5. Explain the implant Failure – Infection, Loosening, Fracture & Wear
6. Describe the effect of implant on body – toxic, bioinert, bioactive
7. Explain the effect of body on implant – environmental effect: corrosion, degradation
8. Explain the history of Biomaterials – Why some implants work, why some don't, evolution of role of biomaterials – from passive (bioinert) to interactive & integrative bioactive) to instructive (regenerative medicine)

Course Content

Introduction to Biomaterials; Biology and Medicine; Biocompatibility; Biological Testing of Materials; Classes of Materials used in Medicine; Applications

Reading and References

Suggested reading:

1. Biomaterials Science, An introduction to materials in medicine, 2nd edition, Buddy Ratner, Allan Hoffman, Frederick Schoen, Jack Lemons, 2004.
2. Biomaterials, An introduction, 3rd edition, Joon Park, R. S. Lakes, Springer, 2007.
3. Biomaterials, A basic introduction, 1st edition, Qizhi Chen, George Thouas, CRC Press, 2018.

Additional reading:

1. Materials science and engineering: an introduction, Willian D Callister, Wiley.
2. M.F. Ashby and D.R.H. Jones, Engineering Materials (vol 1), Published by Butterworth Heinemann.

Course Policies and Student Responsibilities

(1) CA

Absentees must be supported by a medical certificate or other valid official documents.

Academic Integrity

Good academic work depends on honesty and ethical behavior. Quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honor Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student of NTU, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at the University. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, and collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.