Course BMEN 4630.002: Biomaterials and Medical Devices

Professor Taylor H. Ware
Term Fall 2016
Meetings Tuesday, Thursday 8:30-9:45am CB3 1.312

Instructor: **Taylor H. Ware**
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Office Hours **Monday 8-10 am, by appointment, meet in BSB lobby; Immediately following all lectures**

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Office Hours **TBA**

General Course Information

Pre-& Co-requisites; Other restrictions	BMEN 2320, CHEM 1312
Course Description	Introduction to the field of biomaterials used in the design of medical devices and to augment/replace soft and hard tissues. Discussion of bulk properties, clinical applications and *in vivo* behavior of different classes of natural and synthetic materials. Analysis of biological response and biocompatibility, degradation and failure processes of implantable biomaterials/devices. Overview of regulatory compliance and performance requirements for commercialization of medical devices. Students will become familiar with several classes of biomaterials and their bulk and surface properties. Lectures will discuss design and performance requirements of implants, structure-property relationships for synthetic and biological materials, and static and dynamics properties of biomaterials.
ABET CLOs (Course-learning Objectives)	CLO1: Use knowledge of biomaterials and medical devices to solve problems at the interface of engineering, biology, and physiology (SO: a) CLO 2: Report contemporary challenges related to the design and development of artificial implants using current literature (SO: j) CLO 3: Assess the performance of biomaterials and their interactions with the biological environment (SO: e) CLO 4: Understand the regulatory environment governing development, performance and commercialization of medical devices (SO: h) CLO 5: Research standard testing procedures and their relationships to US and European regulations (SO: i) CLO 6: Recognition of professional responsibility through evaluation of clinical cases (SO: f)
Texts & Materials	Text Book Required: None Text book suggested: Biomaterials: A Basic Introduction. Qizhi Chen, George Thouas. ISBN 9781482227697 Select journal articles that can be accessed through the UT Dallas Library. A hand-held calculator will be needed for all quizzes, problem sets and exams. Use of programmable calculators or calculator programs on smart phones or similar devices is not permitted.

Assignments & Academic Calendar

Date	Topics
T 8/23	Course introduction- Intro to biomaterials science
R 8/25	History of biomaterials & Intro to regulation
T 8/30	Overview of clinical applications & Intro to biocompatibility
R 9/1	Basic Properties of biomaterials- bonding
T 9/6	Crystal structure
R 9/8	From structure to bulk properties- electrical, thermal, optical
T 9/13	Bulk properties continued: mechanical properties
R 9/15	Metallic Biomaterials – Example alloys and properties
T 9/20	Metallic biomaterials microstructure, processing
R 9/22	Introduction to surfaces and Corrosion- oxide layers, galvanic cells
T 9/27	Corrosion continued – predicting and observing types of corrosion
R 9/29	Exam No. 1 Review or Additional Lecture Material
T 10/4	**Exam No. 1 (covers material from 8/23 - 9/29)**
R 10/6	Ceramic biomaterials: materials and applications
T 10/11	Properties and processing of ceramics – stable ceramics
R 10/13	Resorbable ceramics
T 10/18	Polymeric biomaterials: types, molecular structure and bonding
R 10/20	Physical properties of structural polymer biomaterials
T 10/25	Degradable and chemically active polymers
R 10/27	Hydrogels, drug delivery, tissue scaffolds
T 11/1	Biocompatibility of synthetic materials
R 11/3	Exam No. 2 Review or Additional Lecture Materials
T 11/8	**Exam No. 2 (covers material from 10/6 - 11/3)**
R 11/10	Natural materials: soft tissues
T 11/15	Natural materials: hard tissues
R 11/17	Special considerations - Sterility & patient safety, Risk analysis
	Fall Break and Thanksgiving
T 11/29	Regulatory Compliance & Legal aspects of biomaterials
R 12/1	In class presentations- Case study of a device
T 12/6	Final Exam Review or Additional Lecture Material
TBA	**Final Exam (comprehensive)**

Exam Dates and Times

10/4	**Exam No. 1, in class**
11/8	**Exam No. 2, in class**
TBA	**Final Exam, Time and Location TBD**

Course Policies

Grading (credit)	**Homework (20%); project (10%); in-class exams (20% each); final exam (cumulative 30%)**
Grading policy	**A minimum grade is guaranteed based on the table below. The professor reserves the right to assign a higher grade than the indicated table provides.**

%	100-93.0%	92.9%-90.0%	89.9%-87.0%	86.9%-83.0%	82.9%-80.0%	79.9%-77.0%	76.9%-73.0%	72.9%-70.0%	69.9%-67.0%	66.9%-63.0%	62.9%-60.0%	≤59.9
Letter Grade	**A**	**A-**	**B+**	**B**	**B-**	**C+**	**C**	**C-**	**D+**	**D**	**D-**	**F**

Make-up Exams	**There will be no make-up in-class exams except for circumstances explicitly described in university policy. A single in-class exam absence. when approved by the instructor. will result in that exam being removed from grade calculation.**
Late Work	**Homework assignments will not be accepted after the stated due date. The lowest 2 homework assignments will be removed from the grade calculation. No credit will be given after the answers to the assignment are posted or discussed in class.**
Special Assignments	**A final project will consist of 10% of the grade. It will consist of a written assignment and an in-class oral presentation.**
Class Attendance	**Class attendance is not specifically graded. However, any material discussed in class can be included on the exams. As such, attendance is strongly encouraged.**
Classroom Citizenship	***Cell-phone use*: Laptops, cellular telephones, and other electronic devices must be turned off and put away during lectures and exams.**
Field Trip Policies	**N/A**

Further information can be found at http://go.utdallas.edu/syllabus-policies.
These descriptions and timelines are subject to change at the discretion of the Instructor.