

MENG 4362 – Biomaterials
Course Syllabus

Semester / Year	Fall 2023
Catalog Description	Introduction to biomaterials used in design of implantable devices and tissue replacement. Synthesis and processing of metallic, ceramic, polymeric and composite biomaterials. Analysis of mechanical and chemical properties, biocompatibility and biological response, degradation and regulatory compliance for biomaterials. A project is required at the end of the course.
Prerequisites	MENG 3319 – Material Science and Manufacturing
Section Number	030, 040
Instructor Name	Dr. Hussain Rizvi
Contact Information	Email: hrizvi@uttyler.edu Office: HEC A220
Class Type / Instruction Mode / Location	030: Face-to-face / HEC B208 040: Hybrid (Zoom synchronous) / TBA
Class Time	TuTh 11:00AM – 12:20 PM
Office Hours	Mo and Wed 8:30 AM – 10:00 AM, or by appointment.
No. of Credits	3 credits
Required Textbook	Biomaterials Science: An Introduction to Materials in Medicine, 4th edition. ISBN: 9780128161371
Optional References	- Joon Park, R.S. Lakes: Biomaterials: An Introduction. - Introduction to Biomaterials: Basic Theory and Engineering Applications. C. Mauli Agrawal, Joo L. Ong, Mark R. Appleford, Gopinath Man. Cambridge University Press 2014, 1st Edition. - Biomaterials: A Basic Introduction. Qizhi Chen and George Thouas. CRC Press, 2014, 1st Edition.
Additional Rules and Requirements	N/A
Evaluation Method	Midterm 25% Final Exam 25% Research Paper 20% Quiz 10% Homework 20%
Grading Policy / Scale	Letter grades, scale: A: 90 – 100; B: 80 – 89; C: 70 – 79; D: 60 – 69; F: < 60



Important Events / Dates	09/01/2023 (Fr): Census date 10/10/2023 (We): 1st midterm date 10/30/2023 (Mo): Last day to withdraw from one or more classes 12/05/2023 (We): (Tentative) Final																																																			
Attendance / Makeup policy / other rules	No makeup																																																			
Course Learning Objectives / ABET & PEOs Relation	By the end of this course, students will be able to: <ol style="list-style-type: none"> 1. Demonstrate an ability to assess the performance of biomaterials and their interactions with the biological environment. (SO2) 2. Understand the regulatory environment governing development, performance and commercialization of medical devices. (SO2) 3. Understand major classes of materials used in medicine: metals, ceramics and polymers. (SO1) 4. Develop analysis and critical-thinking skills for the evaluation of relevant literature. (SO 6) 																																																			
Tentative Topics / Course Plans	<table border="1"> <thead> <tr> <th>Week (Date)</th> <th colspan="2">Topics</th> </tr> </thead> <tbody> <tr> <td>1 (8/22, 8/24)</td> <td>(Mo) Introduction</td> <td>(Wed) Properties of Biomaterials</td> </tr> <tr> <td>2 (8/29, 8/31)</td> <td>(Mo) Bulk Properties</td> <td>(Wed) Surface Properties</td> </tr> <tr> <td>3 (9/5, 9/7)</td> <td>(Mo) Metallic Biomaterials</td> <td>(Wed) Metallic Biomaterials (Basic Principle)</td> </tr> <tr> <td>4 (9/12, 9/14)</td> <td>(Mo) Corrosion I</td> <td>(Wed) Corrosion II</td> </tr> <tr> <td>5 (9/19, 9/21)</td> <td>(Mo) Metallic Biomaterials: Titanium and alloys</td> <td>(Wed) Metallic Biomaterials: Stainless Steel, CoCr</td> </tr> <tr> <td>6 (9/26, 9/28)</td> <td>(Mo) Biodegradable Metals</td> <td>(Wed) Bio Ceramic I</td> </tr> <tr> <td>7 (10/3, 10/5)</td> <td>(Mo) Bio Ceramic II</td> <td>(Wed) Review</td> </tr> <tr> <td>8 (10/10, 10/12)</td> <td colspan="2">(Mo) Midterm</td> </tr> <tr> <td>9 (10/17, 10/19)</td> <td>(Mo) Polymeric Biomaterials II</td> <td>(Wed) Bioinert Polymers</td> </tr> <tr> <td>10 (10/24, 10/26)</td> <td>(Mo) Degradable Polymers</td> <td>(Wed) Hydrogels</td> </tr> <tr> <td>11 (10/31, 11/2)</td> <td>(Mo) Mechanical Testing of Polymers</td> <td>(Wed) Biomaterials Degradation in the Biological Environment I</td> </tr> <tr> <td>12 (11/7, 11/9)</td> <td>(Mo) Biomaterials Degradation in the Biological Environment II</td> <td>(Wed) Biomaterials Degradation in the Biological Environment III</td> </tr> <tr> <td>13 (11/14, 11/16)</td> <td>(Mo) Biocompatibility I</td> <td>(Wed) Biocompatibility II</td> </tr> <tr> <td>14 (11/21, 11/23)</td> <td colspan="2">Thanksgiving – No Class</td> </tr> <tr> <td>15 (11/28, 11/30)</td> <td>(Mo) Special Considerations for Implantable Devices and Biomaterials</td> <td>(Wed) Review</td> </tr> <tr> <td>16 (12/5, 12/7)</td> <td colspan="2">Final (tentative upon UT Tyler's final exam announcement)</td> </tr> </tbody> </table> <p>(Dr. Rizvi reserve the right to change schedule in course plan)</p>	Week (Date)	Topics		1 (8/22, 8/24)	(Mo) Introduction	(Wed) Properties of Biomaterials	2 (8/29, 8/31)	(Mo) Bulk Properties	(Wed) Surface Properties	3 (9/5, 9/7)	(Mo) Metallic Biomaterials	(Wed) Metallic Biomaterials (Basic Principle)	4 (9/12, 9/14)	(Mo) Corrosion I	(Wed) Corrosion II	5 (9/19, 9/21)	(Mo) Metallic Biomaterials: Titanium and alloys	(Wed) Metallic Biomaterials: Stainless Steel, CoCr	6 (9/26, 9/28)	(Mo) Biodegradable Metals	(Wed) Bio Ceramic I	7 (10/3, 10/5)	(Mo) Bio Ceramic II	(Wed) Review	8 (10/10, 10/12)	(Mo) Midterm		9 (10/17, 10/19)	(Mo) Polymeric Biomaterials II	(Wed) Bioinert Polymers	10 (10/24, 10/26)	(Mo) Degradable Polymers	(Wed) Hydrogels	11 (10/31, 11/2)	(Mo) Mechanical Testing of Polymers	(Wed) Biomaterials Degradation in the Biological Environment I	12 (11/7, 11/9)	(Mo) Biomaterials Degradation in the Biological Environment II	(Wed) Biomaterials Degradation in the Biological Environment III	13 (11/14, 11/16)	(Mo) Biocompatibility I	(Wed) Biocompatibility II	14 (11/21, 11/23)	Thanksgiving – No Class		15 (11/28, 11/30)	(Mo) Special Considerations for Implantable Devices and Biomaterials	(Wed) Review	16 (12/5, 12/7)	Final (tentative upon UT Tyler's final exam announcement)	
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University Policies	https://www.uttyler.edu/academic-affairs/files/syllabus_information_2021.pdf																																																			