

MENG 4362 – Biomaterials

Course Syllabus

Semester / Year	Fall 2022
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.
Prerequisites	MENG 3319 – Material Science and Manufacturing
Section number	030, 040
Instructor name	Dr. Hussain Rizvi
Contact info	Email: hrizvi@uttyler.edu Office: HEC A220
Class Type / Location	030: Face-to-face / HEC A216 041: Hybrid (Zoom synchronous) / RBN 03041
Class Time	MoWed 4:00 pm – 5:25 pm
Office Hours	TuTh 10 – 11:30 AM, or by appointment
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 requirements	N/A
Evaluation Method	Midterm 25% Final Exam 25% Analysis of Journal articles 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	Census date: 9/2/2022 Midterm date: 10/10/2022 Last day to withdraw from one or more classes: 11/4/2022 TBD: Final exam (tentative upon UT Tyler’s final exam announcement)
Attendance / Makeup policy	No makeup
Course Learning Objectives / ABET & PEOs relation	<ol style="list-style-type: none"> 1. Demonstrate an ability to assess the performance of biomaterials and their interactions with the biological environment. (SO 2) 2. Understand the regulatory environment governing development, performance and commercialization of medical devices. (SO 2) 3. Understand major classes of materials used in medicine: metals, ceramics and polymers. (SO 1) 4. Develop analysis and critical-thinking skills for the evaluation of relevant literature. (SO 6)
Tentative Topics	<ol style="list-style-type: none"> 1. Basic Properties of Biomaterials 2. Classes of Materials Used in Medicine 3. Biomaterials Degradation in the Biological Environment. 4. Biocompatibility 5. Special Considerations for Implantable Devices and Biomaterials.
Other	N/A

Course Plan:

Week (Date)	Topic	
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)	Labor Day – No Class	(Wed) Metallic Biomaterials (Basic Principle)
4 (9/12, 9/14)	(Mo) Corrosion I	(Wed) Corrosion II
5 (9/19, 9/20)	(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	(Wed) Polymeric Biomaterials I
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)	

(Dr. Rizvi reserve the right to change schedule in course plan)

University, College, and Department Policies:

1. Modifications

The instructor reserves the right to change this syllabus partially or fully at any point in time. Sufficient time and notice will be provided to the class before the activation of the changes.

2. UT Tyler Honor Code

Every member of the UT Tyler community joins together to embrace: Honor and integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do.

3. Student Standards of Academic Conduct

Disciplinary proceedings may be initiated against any student who engages in scholastic dishonesty, including, but not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, or material which has been submitted within a different course without explicit approval of the instructor, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

- i. “Cheating” includes, but is not limited to:
 - copying from another student’s test paper;

- using, during a test, materials not authorized by the person giving the test;
 - failure to comply with instructions given by the person administering the test;
 - possession during a test of materials, or devices and instruments allowing access to materials, which are not authorized by the person giving the test, such as class notes or specifically designed “crib notes” as well as cell phones, to name a few. The presence of textbooks constitutes a violation if they have been specifically prohibited by the person administering the test;
 - using, buying, stealing, transporting, or soliciting in whole or part the contents of an unadministered test, test key, homework solution, or computer program;
 - collaborating with or seeking aid from another student or person during a test or other assignment without explicit authorization;
 - discussing the contents of an examination with another student who will take the examination;
 - divulging the contents of an examination, for the purpose of preserving questions for use by another, or removing material from the exam location, when the instructor has designated that the examination is not to be removed from the examination room or not to be returned or to be kept by the student;
 - substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course-related assignment;
 - paying or offering money or other valuable thing to, or coercing another person to obtain an unadministered test, test key, homework solution, or computer program or information about an unadministered test, test key, home solution or computer program;
 - falsifying research data, laboratory reports, and/or other academic work offered for credit;
 - taking, keeping, misplacing, or damaging the property of The University of Texas at Tyler, or of another, if the student knows or reasonably should know that an unfair academic advantage would be gained by such conduct; and
 - misrepresenting facts, including providing false grades or resumes, for the purpose of obtaining an academic or financial benefit or injuring another student academically or financially. ii.
 “Plagiarism” includes, but is not limited to, the appropriation, buying, receiving as a gift, or obtaining by any means another’s work and the submission of it as one’s own academic work offered for credit.
- iii. “Collusion” includes, but is not limited to, the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any section of the rules on scholastic dishonesty.
- iv. All written work that is submitted will be subject to review by plagiarism software.
- v. Penalty for any related infractions will be decided at the discretion of the instructor including, but not limited to, granting of a failing grade in part or the course or in the entire course.

4. Students Rights and Responsibilities

To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link: <http://www.uttyler.edu/wellness/rightsresponsibilities.php>

5. Important Covid-19 Information for Classrooms and Laboratories

It is important to take the necessary precautions to ensure a healthy and successful year. UT Tyler continues to urge you to protect yourselves against the flu, COVID and any new threats that may be

developing. Be diligent about preventive measures such as washing hands, covering sneezes/coughs, social distancing and vaccinations, which have proven to be successful in slowing the spread of viruses. Encourage those who don't feel well to stay home, and if they show symptoms, ask them to get tested for the flu or COVID. Self-isolation is important to reduce exposure (CDC quarantine/isolation guidelines). Please work with your faculty members to maintain coursework and please consult existing campus resources for support.

6. Recording of Class Sessions

Class sessions may be recorded by the instructor for use by students enrolled in this course. Recordings that contain personally identifiable information or other information subject to FERPA shall not be shared with individuals not enrolled in this course unless appropriate consent is obtained from all relevant students. Class recordings are reserved only for the use of students enrolled in the course and only for educational purposes. Course recordings should not be shared outside of the course in any form without express permission.

7. Campus Carry

We respect the right and privacy of students 21 and over who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at <http://www.uttyler.edu/about/campus-carry/index.php>

8. UT Tyler a Tobacco-Free University

All forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors.

Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless tobacco, snuff, chewing tobacco, and all other tobacco products.

There are several cessation programs available to students looking to quit smoking, including counseling, quitlines, and group support.

For more information on cessation programs please visit www.uttyler.edu/tobacco-free.

9. Grade Replacement/Forgiveness and Census Date Policies

Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at <http://www.uttyler.edu/registrar>. Each semester's Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar.

Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.

The Census Date is the deadline for many forms and enrollment actions of which students need to be aware. These include:

- Submitting Grade Replacement Contracts, Transient Forms , requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
- Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
- Schedule adjustments (section changes, adding a new class, dropping without a “W” grade)
- Being reinstated or re-enrolled in classes after being dropped for non-payment
- Completing the process for tuition exemptions or waivers through Financial Aid

10. State-Mandated Course Drop Policy

Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date).

Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

11. Disability/Accessibility Services

In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA) the University of Texas at Tyler offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including a non-visible diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or you have a history of modifications or accommodations in a previous educational environment, you are encouraged to visit <https://hood.accessiblelearning.com/UTTyler> and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with Cynthia Lowery, Assistant Director of Student Services/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at <http://www.utt Tyler.edu/disabilityservices>, the SAR office located in the University Center, # 3150 or call 903.566.7079.

The University of Texas at Tyler has a continuing commitment to providing reasonable accommodations for students with documented disabilities. Like so many things this Fall, the need for accommodations and the process for arranging them may be altered by the COVID-19 changes we are experiencing and the safety protocols currently in place. Students with disabilities who may need accommodation(s) in order to fully participate in this class are urged to contact the Student Accessibility and Resources Office (SAR) as soon as possible, to explore what arrangements need to be made to ensure access. During the Fall 2020 semester, SAR will be conducting all appointments via ZOOM. If you have a disability, you are encouraged to visit <https://hood.accessiblelearning.com/UTTyler> and fill out the New Student Application. For more information, please visit the SAR webpage at <http://www.utt Tyler.edu/disabilityservices> or call 903.566.7079.

Student Absence due to Religious Observance

Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second class meeting of the semester.

12. Student Absence for University-Sponsored Events and Activities

If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

13. Social Security and FERPA Statement

It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

14. Emergency Exits and Evacuation

Everyone is required to exit the building when a fire alarm goes off. Follow your instructor's directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services.

15. UT Tyler Resources for Students

- UT Tyler Writing Center (903.565.5995), writingcenter@uttyler.edu
- UT Tyler Tutoring Center (903.565.5964), tutoring@uttyler.edu
- The Mathematics Learning Center, RBN 4021, this is the open access computer lab for math students, with tutors on duty to assist students who are enrolled in early-career courses.
- UT Tyler Counseling Center (903.566.7254)