BMEN 5321 – Biomaterials Compatibility

Fall 2021

Instructor: Dr. Melanie Ecker
Office: K240C
Office Hours: Tu/Th 1:00-2:00 PM or by appointment (also available via zoom)
Email: melanie.ecker@unt.edu

Course Structure:

This will be a face-to-face class with additional content available on Canvas.

Class Schedule: Tu/Th 2:30PM - 3:50PM, NTDP D202

The instructor will deliver content related to this course and will make the slides available to the students on Canvas. In addition, the students are expected to contribute to the class by giving presentations related to the course contents (see Attendance and Academic Performance for more information). If the class needs to move to remote delivery due to COVID-19, this class will be held synchronous via zoom.

Course Description:

Relevance of mechanical and physical properties to implant selection and design; effect of the body environment on metallic, ceramic, and plastic materials; tissue engineering; rejection mechanisms used by the body to maintain homeostasis regulatory requirements.

Brief List of Topics:

- Biomaterials Introduction
- Metals
- Ceramics
- Polymers
- Composites
- Material Characterization
- Protein Interaction
- Cell Interaction
- Immune System
- Foreign Body Response
- Biocompatibility
- Biocompatibility Testing
- Special Topics in Biomaterials Compatibility
Materials:

- Class notes and research articles
- ISO 10993 series (available at the DP Library)

Prerequisites: Graduate classification

Course Technology & Skills:

Minimum Technology Requirements:

- Computer
- Reliable internet access
- Speakers
- Microphone
- Camera
- Microsoft Office Suite
- Canvas Technical Requirements (https://clear.unt.edu/supported-technologies/canvas/requirements)

Computer Skills & Digital Literacy:

- Using Canvas
- Using Zoom
- Using email with attachments
- Downloading and installing software
- Using spreadsheet programs
- Using presentation and graphics programs
- Using word processing software

Course Objectives:

The course will teach the principles of biomaterials used for tissue engineering and for biomedical devices to students so they may perform interdisciplinary research in the area of materials for biomedical problems. Research is becoming more cross-disciplinary and this course will help student get familiar with how to use engineering approaches to study biomaterials and their interaction with cells and tissues. The three principal course goals are:

1. To learn basic tissue structures and their functions.
2. To learn about different materials that can be used as biomaterials.
3. To learn the experimental tools used to understand tissue functions, interactions between materials and tissues, and the assessment of their compatibility.


**Course Requirements:**

**Attendance and Academic Performance:**

1. Regular and punctual class attendance is expected. Attendance is taken during every class meeting and begins on the first day of the semester.
2. Participation: Students are expected to answer questions and discuss the topics related to the course materials in the classroom and in discussion forums on Canvas. This will count towards your participation grade.
3. There will be short quizzes, minute papers and background knowledge probes without prior notification throughout the semester. These activities will be available on Canvas. The quizzes will allow one attempt only.
4. Two assignments will be written homework:
   - a. The first written homework will be research paper discussion with guided questions. The purpose of this assignment is to learn how to critically read a research paper. Not all publications follow the same standards and the authors do not follow always good research practices. The paper to be discussed will be given by the instructor.
   - b. The second written homework will be a term paper at the end of the semester. You will be asked to solve a biomedical problem relevant to this course. The purpose of this paper is to apply what was learned in this class and to demonstrate that you have understood the concepts of biocompatibility.
5. Oral Presentations:
   - a. One assignment will be an oral research paper discussion similar to a journal club. The purpose of this assignment is again to learn how to critically read a research paper, but also to learn how to effectively communicate scholarly content. The papers to be discussed will be given by the instructor. The presentation is expected to be 15 minutes.
   - b. Oral presentations of Special Topics will be throughout the semester. Presentations are expected to be 20 minutes and to cover a topic relevant to the course. The purpose of this assignment is to practice scholarly communication. Students may pick their own topics but must discuss it with the instructor.
6. You will be asked to prepare a scientific poster based on a research paper of your choice. You need to pick a paper that is relevant to the course content (this may be your own research if appropriate). Create the poster as if the research presented in the paper was your own and you want to present the work at a scientific meeting/conference to your peers.

**Grade Evaluation:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Attendance</td>
<td>5%</td>
</tr>
<tr>
<td>Class Participation</td>
<td>10%</td>
</tr>
<tr>
<td>Written Homework</td>
<td>35% (15% + 20%)</td>
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</table>
Oral Presentations  30% (15% + 15%)
Poster          10%
Quizzes         10%

Grade Policy:

A    90-100%
B    80-89%
C    70-79%
D    60-69%
E    < 60%

Class Policies:

Best Practices:

- While the freedom to express yourself is a fundamental human right, any communication that utilizes cruel and derogatory language on the basis of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law will not be tolerated.
- Treat your instructor and classmates with respect in any communication online or face-to-face, even when their opinion differs from your own.
- Ask for and use the correct name and pronouns for your instructor and classmates.
- Speak from personal experiences. Use “I” statements to share thoughts and feelings. Try not to speak on behalf of groups or other individual’s experiences.
- Use your critical thinking skills to challenge other people’s ideas, instead of attacking individuals.
- Avoid using all caps while communicating digitally. This may be interpreted as “YELLING!”
- Students are encouraged to discuss class material and homework in order to better understand concepts. However, all the homework you submit must be of your own. Direct copying of a solution (from a friend or a book) will be considered as plagiarism and a violation of the University Honor Code.
- Please use Canvas regularly as it will contain course contents and materials, assignments, quizzes, announcements, and discussion forums.
- All students are responsible for announcements made in a lecture, on the student access website or via the class email list.
- Students are expected to read materials assigned thoroughly and search related literatures using PubMed, Web of Science, or Google Scholar.
- Be cautious when using humor or sarcasm as tone is sometimes lost in an email or discussion post and your message might be taken seriously or sound offensive.
- Proofread and fact-check your sources.
- Keep in mind that online posts can be permanent, so think first before you type.
• Be careful with personal information (both yours and other’s).
• Do not send confidential information via e-mail
• It is the responsibility of students with certified disabilities to provide the instructor with appropriate documentation from the Dean of Students Office (see http://www.unt.edu.oda).

**Face Coverings:** UNT encourages everyone to wear a face covering when indoors, regardless of vaccination status, to protect yourself and others from COVID infection, as recommended by current CDC guidelines. Face covering guidelines could change based on community health conditions.

**Attendance Policy:** Regular and punctual class attendance is expected. Attendance is taken during every class meeting and begins on the first day of the semester.

- **Excused absences** do not lower your overall grade in this class. Excused absences are those that are both valid and verifiable, i.e. illness, bereavement, and school-related activities. I will ask for verification and I expect that you will be responsible for getting any notes/materials that you missed.
- Two **unexcused absences** are permitted, no questions asked (although I encourage you to be here for every class meeting). Each class missed after that will reduce your final grade. If a special problem should arise, please see me. If an emergency occurs and you cannot notify me in class, leave a message.

Students are expected to attend class meetings regularly and to abide by the attendance policy established for the course. It is important that you communicate with the professor prior to being absent, so you and the professor can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

If you are experiencing any symptoms of COVID-19 (https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html) please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Team at COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure.

**Course Materials for Remote Instruction:** Remote instruction may be necessary if community health conditions change, or you need to self-isolate or quarantine due to COVID-19. Students will need access to a webcam and microphone to participate in fully remote portions of the class via zoom. Information on how to be successful in a remote learning environment can be found at https://online.unt.edu/learn

**Late Submission Policy:** Homework assignments are to be turned via Canvas on the due date. Late submission will be accepted, but there will be a penalty of 10% per day of delay.

**Withdraws:** Note that students wishing to drop the course must take appropriate action (Details can be found in the following link: http://essc.unt.edu/registrar/schedule/withdraw.html). It is your
responsibility to make sure all of the requisite paperwork is submitted. Ceasing attendance does not automatically drop you from the course.

**Equality Statement:** The instructor is dedicated to establishing a learning environment that promotes diversity of the students including (but not limited to) race, class, culture, religion, gender, sexual identity, and physical ability. It is important that this is a safe classroom environment. We will practice being generous and respectful members of our classroom community. Anyone noticing discriminatory behavior in this class, or who feels discriminated against, should bring it to the attention of the instructor immediately.

**Americans with Disabilities Act:** The University of North Texas does not discriminate on the basis of an individual’s disability and complies with Section 504 and Public Law 101-336 (Americans with Disabilities Act) in its admissions, accessibility, treatment, and employment of individuals in its programs and activities. A copy of the College of Engineering ADA Compliance Document is available in the Dean’s Office.

All reasonable accommodation will be made to facilitate special needs. If special accommodations are required, the student must first meet with the staff of the Office of Disability Accommodation (ODA), Union Suite 322, (940) 565-4323. After meeting with that office, please contact me to discuss what accommodations will be necessary. For more information, see [http://www.unt.edu/oda](http://www.unt.edu/oda).

*It is the responsibility of the student to inform the instructor of any disabling condition that will require modifications by the 12th class day.*

**Course Evaluation:** Student Perceptions of Teaching (SPOT) is the student evaluation system for UNT and allows students the ability to confidentially provide constructive feedback to their instructor and department to improve the quality of student experiences in the course. Please submit your evaluation as it helps me to reflect on my teaching and to improve my delivery methods.

**Getting Help**

**Technical Assistance**
Part of working in the online environment involves dealing with the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

**UIT Help Desk:** [UIT Student Help Desk site](http://www.unt.edu/helpdesk/index.htm)

**Email:** helpdesk@unt.edu

**Phone:** 940-565-2324

**In Person:** Sage Hall, Room 130
Walk-In Availability: 8am-9pm

Telephone Availability:
- Sunday: noon-midnight
- Monday-Thursday: 8am-midnight
- Friday: 8am-8pm
- Saturday: 9am-5pm

Laptop Checkout: 8am-7pm

For additional support, visit Canvas Technical Help (https://community.canvaslms.com/docs/DOC-10554-4212710328)

Student Support Services
UNT provides mental health resources to students to help ensure there are numerous outlets to turn to that wholeheartedly care for and are there for students in need, regardless of the nature of an issue or its severity. Listed below are several resources on campus that can support your academic success and mental well-being:

- **Student Health and Wellness Center** (https://studentaffairs.unt.edu/student-health-and-wellness-center)
- **Counseling and Testing Services** (https://studentaffairs.unt.edu/counseling-and-testing-services)
- **UNT Care Team** (https://studentaffairs.unt.edu/care)
- **UNT Psychiatric Services** (https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry)
- **Individual Counseling** (https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling)

Other student support services offered by UNT include

- **Registrar** (https://registrar.unt.edu/registration)
- **Financial Aid** (https://financialaid.unt.edu/)
- **Student Legal Services** (https://studentaffairs.unt.edu/student-legal-services)
- **Career Center** (https://studentaffairs.unt.edu/career-center)
- **Multicultural Center** (https://edo.unt.edu/multicultural-center)
- **Counseling and Testing Services** (https://studentaffairs.unt.edu/counseling-and-testing-services)
- **Pride Alliance** (https://edo.unt.edu/pridealliance)
- **UNT Food Pantry** (https://deanofstudents.unt.edu/resources/food-pantry)

Academic Support Services

- **Academic Resource Center** (https://clear.unt.edu/canvas/student-resources)
- **Academic Success Center** (https://success.unt.edu/asc)
- **UNT Libraries** (https://library.unt.edu/)
- **Writing Lab** (http://writingcenter.unt.edu/)
- **MathLab** (https://math.unt.edu/mathlab)
UNT Policies

**Academic Integrity Policy.** Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University. [https://policy.unt.edu/policy/06-003](https://policy.unt.edu/policy/06-003)

**ADA Policy.** UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one’s specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website [https://disability.unt.edu/](https://disability.unt.edu/). [https://policy.unt.edu/policy/16-001](https://policy.unt.edu/policy/16-001)

**Emergency Notification & Procedures.** UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). [https://emergency.unt.edu/emergency-notifications](https://emergency.unt.edu/emergency-notifications)

In the event of a university closure, please refer to Canvas for contingency plans for covering course materials. For more information related to Emergency Guidelines visit: [https://emergency.unt.edu/emergency-guidelines-0](https://emergency.unt.edu/emergency-guidelines-0)

**Equality Statement.** The University of North Texas prohibits discrimination and harassment because of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law in its application and admission processes; educational programs and activities; employment policies, procedures, and processes; and University facilities. The University takes active measures to prevent such conduct and investigates and takes remedial action when appropriate. The University also prohibits and takes actions to prevent retaliation against individuals who report or file a charge of discrimination, harassment, or sexual misconduct; participate in an investigation, or oppose any form of discrimination, harassment, or sexual misconduct. For more information or to file a complaint, please visit [https://ied.unt.edu/equal-opportunity](https://ied.unt.edu/equal-opportunity).

**Sexual Assault Prevention.** UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore prohibit sexual misconduct.
If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT’s Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim’s compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565-2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at oeo@unt.edu or at (940) 565 2759.
https://deanofstudents.unt.edu/sexual-misconduct/reporting-sexual-misconduct

**Retention of Student Records.** Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Blackboard online system, including grading information and comments, is also stored in a safe electronic environment for one year. Students have the right to view their individual record; however, information about student’s records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University’s policy. See UNT Policy 10.10, Records Management and Retention for additional information.

**Acceptable Student Behavior.** Student behavior that interferes with an instructor’s ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT’s [Code of Student Conduct](https://deanofstudents.unt.edu/conduct) (https://deanofstudents.unt.edu/conduct) to learn more.

**Access to Information - Eagle Connect.** Students’ access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student’s Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail [Eagle Connect](https://it.unt.edu/eagleconnect).  

**Student Evaluation.** Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 of the long semesters to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation
email that the survey has been submitted. For additional information, please visit the SPOT website (http://spot.unt.edu/) or email spot@unt.edu.

**Important Notice for F-1 Students taking Distance Education Courses**

*Federal Regulation.* To read detailed Immigration and Customs Enforcement regulations for F-1 students taking online courses, please go to the Electronic Code of Federal Regulations website (http://www.ecfr.gov/). The specific portion concerning distance education courses is located at Title 8 CFR 214.2 Paragraph (f)(6)(i)(G).

The paragraph reads:

(G) For F-1 students enrolled in classes for credit or classroom hours, no more than the equivalent of one class or three credits per session, term, semester, trimester, or quarter may be counted toward the full course of study requirement if the class is taken on-line or through distance education and does not require the student's physical attendance for classes, examination or other purposes integral to completion of the class. An on-line or distance education course is a course that is offered principally through the use of television, audio, or computer transmission including open broadcast, closed circuit, cable, microwave, or satellite, audio conferencing, or computer conferencing. If the F-1 student's course of study is in a language study program, no on-line or distance education classes may be considered to count toward a student's full course of study requirement.

*University of North Texas Compliance.* To comply with immigration regulations, an F-1 visa holder within the United States may need to engage in an on-campus experiential component for this course. This component (which must be approved in advance by the instructor) can include activities such as taking an on-campus exam, participating in an on-campus lecture or lab activity, or other on-campus experience integral to the completion of this course.

If such an on-campus activity is required, it is the student’s responsibility to do the following:

1. Submit a written request to the instructor for an on-campus experiential component within one week of the start of the course.
2. Ensure that the activity on campus takes place and the instructor documents it in writing with a notice sent to the International Student and Scholar Services Office. ISSS has a form available that you may use for this purpose.

Because the decision may have serious immigration consequences, if an F-1 student is unsure about his or her need to participate in an on-campus experiential component for this course, s/he should contact the UNT International Student and Scholar Services Office (telephone 940-565-2195 or email internationaladvising@unt.edu) to get clarification before the one-week deadline.

**Student Verification.** UNT takes measures to protect the integrity of educational credentials awarded to students enrolled in distance education courses by verifying student identity, protecting student privacy, and notifying students of any special meeting times/locations or additional charges associated with student identity verification in distance education courses.
Use of Student Work. A student owns the copyright for all work (e.g. software, photographs, reports, presentations, and email postings) he or she creates within a class and the University is not entitled to use any student work without the student’s permission unless all of the following criteria are met:

- The work is used only once.
- The work is not used in its entirety.
- Use of the work does not affect any potential profits from the work.
- The student is not identified.
- The work is identified as student work.

If the use of the work does not meet all of the above criteria, then the University office or department using the work must obtain the student’s written permission.

Download the UNT System Permission, Waiver and Release Form

Transmission and Recording of Student Images in Electronically-Delivered Courses

1. No permission is needed from a student for his or her image or voice to be transmitted live via videoconference or streaming media, but all students should be informed when courses are to be conducted using either method of delivery.

2. In the event an instructor records student presentations, he or she must obtain permission from the student using a signed release in order to use the recording for future classes in accordance with the Use of Student-Created Work guidelines above.

3. Instructors who video-record their class lectures with the intention of re-using some or all of recordings for future class offerings must notify students on the course syllabus if students' images may appear on video. Instructors are also advised to provide accommodation for students who do not wish to appear in class recordings.

Example: This course employs lecture capture technology to record class sessions. Students may occasionally appear on video. The lecture recordings will be available to you for study purposes and may also be reused in future course offerings.

No notification is needed if only audio and slide capture is used or if the video only records the instructor's image. However, the instructor is encouraged to let students know the recordings will be available to them for study purposes.