UNIVERSITY OF NEBRASKA-LINCOLN
DEPARTMENT OF BIOLOGICAL SYSTEMS ENGINEERING

AGEN/BSEN 225: Engineering Properties of Biological Materials
Fall 2022

INSTRUCTOR: Dr. Jenny Keshwani
249 L.W. Chase Hall
402-472-9614
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CREDITS: 3 hours (2 hours class, 2 hours lab per week)

LECTURE: MF 12:00 – 12:50 PM, 116 L.W. Chase Hall

LABORATORY: All lab sections meet in 15 L.W. Chase Hall W 10-11:50
W 12-1:50
Thur 9-10:50
Thur 3-4:50 PM

TEACHING ASSISTANTS:

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OFFICE/STUDENT HOURS:
To be determined based on class poll.
The purpose of office/student hours is to provide time for students to interact one-on-one with me (the course instructor) or our teaching assistants. There are many benefits to visiting us during office hours, including: a better understanding of course and lab material, life wisdom from someone that has successfully navigated an engineering degree, ideas for who to connect with around campus given your interests/needs, and often some humor to lighten a tough semester 😊

COURSE OBJECTIVES:
Upon completion of the course, a student should be able to:

1. Identify and apply appropriate units and dimensions to describe a biological material. (ABET Criterion 1)
2. Describe the unique aspects of biological materials and evaluate their effect on material function. (ABET Criterion 1)
3. Explain the general categories, definitions, and measurement methods of engineering properties. (ABET Criterion 1)
4. Analyze and interpret properties of biological materials to draw conclusions and make informed decisions using engineering judgement. (ABET Criterion 6)
5. Develop and conduct an experiment related to engineering properties of biological materials. (ABET Criterion 6)

ATTENDANCE:
Students are expected to attend weekly class meetings during the regularly scheduled time (M/F 12:00 – 12:50 pm). As needs arise, our course may include a virtual Zoom meetup to accommodate limitations. Course videos provided on Canvas should be viewed prior to attending class to ensure you are prepared to complete in-class activities. Contact the instructor to discuss your individual needs regarding class attendance. This policy is subject to change based on current UNL policy and Lancaster County DHMs. Continue to check https://covid19.unl.edu/ for the latest information.

HOMEWORK:
Homework assignments are due at 5:00 pm on Fridays. Homework will be considered late if submitted after 10:00 am the following Monday morning. Late homework will be penalized 25% per day. All assignments will be submitted through Canvas.

CLASS ACTIVITIES:
Students will complete group activities each week. Activities will be built on homework and course content videos. Potential activities will include solving problems or photo scavenger hunts. All work will be submitted on Canvas. Activity work is due at the completion of the class meeting.

INDIVIDUAL PROJECTS:
Two individual projects will be completed during this course. Students will use the engineering design process to apply course content and lab techniques. Project videos will be submitted on Canvas.

FINAL PROJECT:
The final comprehensive project will be completed with your lab team. This project will build upon the individual projects. Student teams will use the engineering design process to solve a personally relevant problem related to engineering properties of biological materials. Final project videos will be submitted on Canvas.

COURSE LABORATORY:
TECHNICAL MEMOS:
All lab experiences will require a written technical memo prepared according to a prescribed format. Memos are due one week after completion of the lab exercise. Memos should be typed unless otherwise noted. All materials submitted late will be penalized 25% per day.

LAB SAFETY:
Eye and/or face protection is mandated by federal Occupational Safety and Health Administration (OSHA) standards, as well as state law (Nebraska Revised Statute, Section 85-901), which requires use of American National Standards Institute (ANSI)-approved eye protection by students, faculty, staff, and visitors at UNL who observe or participate in vocational, technical, industrial arts, chemical, or chemical-physical courses of instruction involving potential exposure to hot molten metals or other molten metals, milling, sawing, turning, shaping, cutting, grinding, or stamping of any solid materials, heat treatment, tempering, or kiln firing of any metal or other materials, gas or electric arc welding or other forms of welding processes, caustic or explosive materials, and chemical, physical, or combined chemical-physical laboratories involving caustic or explosive material, hot liquids or solids, injurious radiation, or other hazards not enumerated. Contact lenses and prescription glasses do not provide eye protection in the industrial sense and must not be worn in a hazardous environment without addition of the appropriate safety eyewear. Some laboratory assignments in this course will require the use of appropriate eye protection and students will not be allowed to complete the assignment without proper personal protection equipment, which will be supplied by the instructor, unless otherwise indicated.

HONORS CREDIT:
Students desiring Honors credit for the course will work with Dr. Keshwani to plan and execute an independent design or research project.

GRADING:
Neatness, spelling, and presentation will be considered when grading. Any questions concerning an individual grade, or the grading approach should be directed to the instructor. A tentative grading scale is presented below.

Course work:			**Grading Scale:**	882	A
Homework (15 pts x 11)		165		841	B+
Class Activities (15 pts x 11)		165		784	B
Lab Memos (25 pts x 8)		200		744	C+
Individual Projects (100 pts x 2)		200		686	C
Final Project		150		646	D+
	Total	**980**		588	D

TENTATIVE COURSE SCHEDULE:

		Lab Topic	Class Topic	Homework
M	8/22		Introduction	Introduction and Statistics
F			Engineering properties - activity	
M	8/29	Intro videos & team contracts	Phys - mass... porosity	Biological materials
F			Biological materials - activity	
M	9/5	Physical Properties: Size & Shape	Labor day - no class	Physical properties
F			Phys - activity	
M	9/12	Physical Properties: Particle Size	Phys - particle size distribution & standards	Reflection break
F			Phys - activity	
M	9/19	Moisture Properties	Water - MC/EMC, water activity, isotherms	Moisture content 1
F			Water - activity	
M	9/26		Soil as a biological material	Moisture content 2
F			Water - activity	
M	10/3	Physical Properties: Hydraulic Conductivity	Mech - stress/strain, hookean	Mech properties of solids
F			Mech - activity	
M	10/10	Mech Properties: Compression & Shear	Mech - non-hookean & viscosity	Project 1 due
F			Mech - activity	
M	10/17		Fall Break - no class	Stress
F			Mech - activity	
M	10/24	Mech Properties: Flexure & Rupture	Mech - viscoelasiticity, spring/dashpot	Mech properties & viscosity
F			introduce final project & activity	
M	10/31	Mech Properties: Viscosity	Class summary	Viscoelasticity
F			Class summary - activity	
M	11/7	Mech Properties: Viscoelasticity	worktime for final project	Class review - all topics
F			worktime for final project	
M	11/14		worktime for final project	Project 2 due
F			worktime for final project	
M	11/21		Thanksgiving - no class	
F			Thanksgiving - no class	
M	11/28		worktime for final project	Final project due
F			submit final project via Canvas	

EMERGENCY RESPONSE:

Fire Alarm (or other evacuation):

In the event of a fire alarm: Gather belongings (Purse, keys, cellphone, N-Card, etc.) and use the nearest exit to leave the building. Do not use the elevators. After exiting notify emergency personnel of the location of persons unable to exit the building. Do not return to building unless told to do so by emergency personnel.

Tornado Warning:

When sirens sound, move to the lowest interior area of building or designated shelter. Stay away from windows and stay near an inside wall when possible.

Active Shooter:

Evacuate: If there is a safe escape path, leave belongings behind, keep hands visible and follow police officer instructions.
Hide out: If evacuation is impossible secure yourself in your space by turning out lights, closing blinds and barricading doors if possible.
Take action: As a last resort, and only when your life is in imminent danger, attempt to disrupt and/or incapacitate the active shooter.

UNL Alert:

Notifications about serious incidents on campus are sent via text message, email, unl.edu website, and social media. For more information go to: http://unlalert.unl.edu

Additional Emergency Procedures can be found here:
http://emergency.unl.edu/doc/Emergency_Procedures_Quicklist.pdf

Academic Honesty:

Academic honesty is essential to the existence and integrity of an academic institution. The responsibility for maintaining that integrity is shared by all members of the academic community. The University's Student Code of ConductLinks to an external site. addresses academic dishonesty. Students who commit acts of academic dishonesty are subject to disciplinary action and are granted due process and the right to appeal any decision.

The BSE Department process for grade and academic dishonesty appeals can be found at
https://engineering.unl.edu/downloads/files/AcademicDishonesty_Appeals_1.pdf
Students are encouraged to contact the instructor for clarification of these guidelines if they have questions or concerns.

Diversity & Inclusion:

The University of Nebraska-Lincoln does not discriminate on the basis of race, ethnicity, color, national origin, sex (including pregnancy), religion, age, disability, sexual orientation, gender identity, genetic information, veteran status, marital status, and/or political affiliation.

Services for Students with Disabilities:

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can discuss options privately. To establish reasonable accommodations, I may request that you register with Services for Students with Disabilities (SSD). If you are eligible for services and register with their office, make arrangements with me as soon as possible to discuss your accommodations so they can be implemented in a timely manner. SSD contact information: 117 Louise Pound Hall; 402-472-3787.

Writing Center:
The Writing Center can provide you with meaningful support as you write for this class as well as every course in which you enroll. Trained undergraduate and graduate peer consultants are available to talk with you about all forms of communication. You are welcome to bring in everything from lab reports, presentations, and research papers to cover letters, application essays, and graduate theses and dissertations. Writing Center Consultants can work with you at any stage of the writing process, from brainstorming and organizing your ideas through polishing a final draft.
There are two ways you can connect with a Consultant: Online (a real-time, video conversation) and eTutoring (email feedback). To learn more about these options and view video tutorials, please visit our Online Writing Services PageLinks to an external site.. You can sign up any time by visiting unl.mywconline.com. For more information about the Writing Center, please visit unl.edu/writing.

Academic Support Services:
You can schedule free appointments for individual academic coaching with First-Year Experience and Transition Program staff through MyPLAN. You can also take advantage of study stops--which provide individual and group study with learning consultants in a variety of disciplines--and free group workshops on topics such as time management, goal setting, test preparation, and reading strategies. See success.unl.eduLinks to an external site. for schedules and more information.

Counseling and Psychological Services:
UNL offers a variety of options to students to aid them in dealing with stress and adversity. Counseling and Psychological & Services (CAPS)Links to an external site.; is a multidisciplinary team of psychologists and counselors that works collaboratively with Nebraska students to help them explore their feelings and thoughts and learn helpful ways to improve their mental, psychological and emotional well-being when issues arise. CAPS can be reached by calling 402-472-7450. Big Red Resilience & Well-BeingLinks to an external site. (BRRWB) provides one-on-one well-being coaching to any student who wants to enhance their well-being. Trained well-being coaches help students create and be grateful for positive experiences, practice resilience and self-compassion, and find support as they need it. BRRWB can be reached by calling 402-472-8770.