

Title: AGEN/BSEN 344, *Biological and Environmental Transport Processes*

Instructors:

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Description: Introduction to concurrent transport of energy and mass in biological and environmental processes. Modes of heat transfer, steady and non-steady state heat conduction, convective heat transfer, radiative heat transfer, and heat transfer with phase change. Introduction to equilibrium, kinetics, and modes of mass transfer, diffusion, dispersion, and convective mass transfer. Includes soil freezing and thawing, energy and mass balances of crops, diffusivities of membranes, animal energy balances, respiration, and photosynthesis.

Text Book: *Heat and Mass Transfer, Fundamentals & Applications, 6th Edition*, Yunus A. Cengel & Afshin J. Ghajar. McGraw-Hill. ISBN 978-0073398198.

Credit: 3 hours

Prerequisites: Math 221, BSEN 244 or MECH 200 (Thermodynamics, Differential Equations)

Co-Requisites: CIVE 310, MECH 310, or CHME 332 (Fluid Mechanics)

Course Objectives: At the conclusion of this course, students will be able to:

- ~ integrate and extend the concepts of thermodynamics and fluid dynamics to the analysis of transport processes in agricultural and biological systems (see competencies list)
- ~ apply the concepts of heat and mass transport to identify, formulate, and solve complex engineering problems (ABET Outcome 1)
- ~ acquire and apply new knowledge related to heat and mass transport concepts (ABET Outcome 7)
- ~ understand the limitations and applications of the solutions due to modeling assumptions

Topics: Equilibrium, Energy Conservation and Temperature
Modes of Heat and Mass Transfer
Governing Equations and Boundary Conditions of Heat and Mass Transfer
Steady State Heat Conduction and Mass Diffusion
Unsteady State Heat Conduction and Mass Diffusion
Convective Heat Transfer and Convective Mass Transfer
Heat Transfer w/ Phase Change
Equilibrium, Mass Conservation, and Kinetics
Other as determined by instructor

Grading:	Projects	70%	90% and above = A range
	Homework Reflections	30%	80% to 89.9% = B range
	Total	100%	70% to 79.9% = C range
			60% to 69.9% = D range
			59.9% or less = F range

Academic Dishonesty

“Students are expected to adhere to guidelines concerning academic dishonesty outlined in Section 4.2 of the University’s Student Code of Conduct (<http://stuafs.unl.edu/ja/code/>). The BSE Department process for grade and academic dishonesty appeals can be found at <http://bse.unl.edu/academicadvising-index>. Students are encouraged to contact the instructor for clarification of these guidelines if they have questions or concerns.”

Students with Special Needs:

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 Bldg.; 402-472-3787

Mental Health and Wellbeing Resources:

UNL offers a variety of options to students to aid them in dealing with stress and adversity. Counseling and Psychological & Services (CAPS) 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-Being 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.

Emergency procedures

Consult UNL emergency planning site for current emergency procedures: <https://emergency.unl.edu/>