

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

Instructor: David Mabie, Assistant Professor of Practice
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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, 5th Edition*, Yunus A. Cengel & Afshin J. Ghajar. McGraw-Hill. ISBN 978-0-07-339818-1.

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 environmental and biological systems
- ~ 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:	Exams (x3)	75%	90% and above = A range
	<u>Homework (x12)</u>	<u>25%</u>	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

Exam Schedule: Exam 1: February 7th 2019
Exam 2: March 14th 2019
Exam 3: April 25th 2019

Tentative Schedule for BSEN/AGEN 344

Week	Date	Lecture Topic	Reading	HW Assigned	HW Due Date
1	1/8/2019	Ch. 1 Introduction and Thermo Review	Ch. 1	HW 1	1/15/2019
	1/10/2019	Ch. 2 General Field Equation	Ch. 2		
2	1/15/2019	Ch. 2 Boundary Conditions		HW 2	1/22/2019
	1/17/2019	Ch. 3 Thermal Resistance	Ch. 3		
3	1/22/2019	Snow Day – No Class		HW 3	1/29/2019
	1/24/2019	Ch. 3 Finned Surfaces and Shape Factors			
4	1/29/2019	Ch. 4 Lumped System Analysis	Ch. 4	HW 4	2/5/2019
	1/31/2019	Ch. 4 Transient Conduction in Multidimensional Systems			
5	2/5/2019	Review for Exam 1			
	2/7/2019	Exam 1			
6	2/12/2019	Ch. 6 Fluids Review, Convection Fundamentals	Ch. 6	HW 5	2/19/2019
	2/14/2019	Ch. 7 External Forced Convection and Examples	Ch. 7		
7	2/19/2019	Ch. 8 Internal Forced Convection	Ch. 8	HW 6	2/26/2019
	2/21/2019	Ch. 9 Natural Convection	Ch. 9		
8	2/26/2019	Convection Example		HW 7	3/5/2019
	2/28/2019	Ch. 12 Fundamentals of Thermal Radiation	Ch. 12		
9	3/5/2019	Ch. 13 Radiation Heat Transfer	Ch. 13	HW 8	3/12/2019
	3/7/2019	Guest Lecture – Hot Wire Anemometer			
10	3/12/2019	Review for Exam 2			
	3/14/2019	Exam 2			
11	3/19/2019	Spring Break			
	3/21/2019	Spring Break			
12	3/26/2019	Ch. 11 Heat Exchangers (Lab downtime)	Ch. 11	HW 9	4/2/2019
	3/28/2019	Ch. 11 Heat Exchangers (Lab downtime)			
13	4/2/2019	Ch. 13 Radiation Examples		HW 10	4/9/2019
	4/4/2019	Ch. 14 Mass Diffusion (Steady State)	Ch. 14		
14	4/9/2019	Ch. 14 Mass Diffusion (Transient)		HW 11	4/16/2019
	4/11/2019	Ch. 14 Mass Convection			
15	4/16/2019	Ch. 14 Combined Heat and Mass Transfer		HW 12	4/23/2019
	4/18/2019	TBD			
16	4/23/2019	Review for Exam 3			
	4/25/2019	Exam 3			

Academic Dishonesty Policy

Students are expected to adhere to guidelines concerning academic dishonesty outlined in Article III.B. of the University's Student Code of Conduct which can be found at <http://stuafs.unl.edu/dos/code/>. Students are encouraged to contact the instructor to seek clarification of these guidelines whenever they have questions and/or potential concerns.

“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.”

Classroom Emergency Preparedness and Response Information

The following is the essential information for all Buildings and Classrooms. Individual Syllabi will contain information specific for the classroom.

- **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

Students with Disabilities Policy

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.