

BMEN 3350 Biomedical Transport

Fall 2026

Instructor: Dr. Yong Yang
Office: K240G NTDP
Phone: 940-565-2982
Class: NTDP K120, 10:40 am – 12:00 PM, Monday & Wednesday
Office Hours: 9:30 – 10:30 AM on Monday
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Communication Expectations: Please directly email to yong.yang@unt.edu for all course-related questions.

Welcome to UNT!

As members of the UNT community, we have all made a commitment to being part of an institution that respects and values the identities of the students and employees with whom we interact. UNT does not tolerate identity-based discrimination, harassment, and retaliation. UNT's full Non-Discrimination Policy can be found in the UNT Policies section of the syllabus.

Course Description

Students will learn to develop fundamental relationships for momentum, energy, and mass transfer from microscopic and macroscopic balance equations and to apply these basic relationships to biological systems that include biochemical reactions, interphase transport, and transient phenomena.

Course Structure: in-person

Course Prerequisites or Other Restrictions: BMEN 3350 requires a solid foundation of calculus and a clear understanding of biology and physiology.

Course Objectives

This course addresses ABET Student Outcome 1: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

By the end of this course, students will be able to:

1. understand and use the basic equations describing momentum, energy, and mass flux.
2. understand the differences between diffusive and convective transport.
3. formulate governing equations using macroscopic balances to biological problems involving momentum, heat, and mass transfer.
4. formulate governing equations using microscopic balances to solve simple 1-D transport problems
5. determine and use various boundary conditions to solve the differential equations formulated in this course.
6. differentiate between steady-state and transient problems and formulate balances for each type.

Materials:

Lecture notes and handouts provided by the instructor will serve as the primary materials for this course.

Recommended Textbook: *Introductory Transport Phenomena*, R. Byron Bird, Warren E. Stewart, Edwin N. Lightfoot, Daniel J. Klengenberg, John Wiley and Sons, 2015

Additional Reference: *Transport Phenomena in Biological Systems*, 2nd Edition, G.A. Truskey, F. Yuan, D.F. Katz, Pearson Prentice Hall, 2009.

Assignments

<i>Assignment</i>	<i>Points Possible</i>	<i>Percentage of Final Grade</i>
<i>Assignments 1 – 7</i>	<i>14 points</i>	<i>14%</i>
<i>Exam 1 – Momentum Transfer</i>	<i>25 points</i>	<i>25%</i>
<i>Exam 2 – Heat Transfer</i>	<i>25 points</i>	<i>25%</i>
<i>Final Exam</i>	<i>36 points</i>	<i>36%</i>
<i>Total Points Possible</i>	<i>100 points</i>	<i>100%</i>

Grading

Score	Grade
≥95	A+
90≤, <95	A
87≤, <90	A-
85≤, <87	B+
80≤, <85	B
77≤, <80	B-
75≤, <77	C+
70≤, <75	C
67≤, <70	C-
65≤, <67	D+
60≤, <65	D
57≤, <60	D-
<57	F

Course Policies

Attendance Policy

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 and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor and instructional team if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

Examination Policy

1. **Open-book and Open-notes:** All exams will be open-book and open-notes. However, no electronic devices will be permitted during the exams.
2. **Make-Up Exams:** Consistent with UNT guidelines, students who are absent from regularly scheduled examinations due to an authorized University activity will have the opportunity to take them at an alternate time. Make-up exams for absences due to any other reason will be at the discretion of the instructor.
3. **Exam Grading Appeals:** Any request to appeal an exam grade must be submitted **in writing on the day the exam is returned to the class**. Students who are absent from that class will forfeit the opportunity to request a regrade. The instructor reserves the right to regrade **the entire exam**, rather than only the specific problem(s) identified in the appeal.

Assignment Policy

1. All problem sets are due at the beginning of class or at the specified due time. Assignments must be submitted as a hard copy.
2. Late assignments will not be accepted and will receive no credit.

3. You may (and are encouraged to) ask your classmates questions about the problem sets. However, all work you submit must be your own. Assignments that are clearly copied from another student will receive no credit and may be subject to the University's Student Academic Integrity policies.
4. The use of generative AI tools, including ChatGPT, is not permitted for problem sets, exams, or any other course assignments unless explicitly authorized by the instructor.
5. Problem sets and exams should be neat and easy to follow. Problem sets and exams must be neat, organized, and easy to follow. Each problem should begin on a new page. Your final answer should be **boxed**, including appropriate **units**. No credit will be given for answers without supporting work. Points may be deducted for missing or incorrect units, or work that is difficult to follow. The final answer should be rounded to the appropriate number of significant figures.

Instructor Responsibilities and Feedback

I will try all means to help you grow and learn. All instructions including the assignments, notes, and announcements will be posted at Canvas.

Approximate Syllabus

Week	Date	Topic	Chapter
1	8/17	Introduction to Transport Phenomena; Syllabus; Review of differential equations	
2	8/24	Momentum transport concepts Shell Balances for momentum balances	1 2
3	8/31	Shell Balances for momentum balances	2
4	9/7	No class on 9/7 (Labor Day) Shell Balances for momentum balances	2
5	9/14	Differential equations of change (EOC)	3
6	9/21	Differential equations of change (EOC) Turbulent flow Review on momentum transport	3 4
7	9/28	Thermal conductivity and energy transport Shell balances for energy transport Exam 1 on Momentum Transport (9/30)	9 10
8	10/5	Shell balances for energy transport	10
9	10/12	Shell balances for energy transport Heat transfer and convective transport	10 11
10	10/19	Heat transfer and convective transport	11
11	10/26	Review on Heat Transport Diffusivity and mass transport	17
12	11/2	Exam 2 on Energy Transport (11/2) Shell balances for mass transport	18
13	11/9	Shell balances for mass transport Equations of change for multicomponent systems	18 19
14	11/16	Equations of change for previous problems	19
15	11/22	Thanksgiving Break	
16	11/30	Review on momentum, energy, and mass transport	
	12/8	Final Exam: Monday, 10:30 am - 12:30 pm	

Note:

- The tentative schedule is subject to change depending on the class progress
- Mid-term exam schedules are subject to change.

Syllabus Change Policy

Any change or adjustment to the syllabus during the class will be posted at Canvas.

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) (<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) (<https://community.canvaslms.com/docs/DOC-10554-4212710328>)

Rules of Engagement

Rules of engagement refer to the way students are expected to interact with each other and with their instructors. Here are some general guidelines:

- 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!”
- Be cautious when using humor or sarcasm in emails or discussion posts as tone can be difficult to interpret digitally.
- Avoid using “text-talk” unless explicitly permitted by your instructor.
- Proofread and fact-check your sources.
- Keep in mind that online posts can be permanent, so think first before you type.

See these [Engagement Guidelines](https://clear.unt.edu/online-communication-tips) (<https://clear.unt.edu/online-communication-tips>) for more information.

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.

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/).

Prohibition of Discrimination, Harassment, and Retaliation (Policy 16.004)

The University of North Texas (UNT) 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.

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). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

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 Canvas 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.

Student Evaluation Administration Dates

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 [insert administration dates] 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.

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.

Survivor Advocacy

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct. Federal laws and UNT policies prohibit discrimination on the basis of sex as well as 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. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-5652648.