

MEEN 4810 THERMAL MANAGEMENT

Fall 2025

3 credit hours, Tue Thur 2:30-3:50 p.m. NTDP D207A

Instructor Dr. Huseyin Bostanci
Office NTDP F115L
Office Hours Tue 1:00 -2:30PM, Thur 1:00 -2:30PM (other times by appointment)
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Course Description

Comprehensive review of thermal management technologies. Conventional and emerging methods of air cooling, thermo-electrics, heat pipes, microchannels, immersion cooling, jet impingement and spray cooling, vapor-compression refrigeration. Introduction to computational thermal analysis. System-level thermal management architectures for specific applications. Future trends in thermal management.

Pre-Requisite: MEEN 3210 (Heat Transfer) or consent of Instructor

Recommended Text

Yeh, L.-T., Thermal Management of Microelectronic Equipment, 2nd Ed., ASME Press, 2016, ISBN: 9780791861097.

DOI: <https://doi.org/10.1115/1.861097>

Course Outline

This is a tentative course outline. Instructor will attempt to follow it closely, and reserves the right to substitute any other relevant material at any point throughout the course.

	Week of	Lecture Topic
1	08/18/25	Thermal Management Overview, Device-Level Heat Generation
2	08/25/25	Temperature Measurements, Heat Transfer Review
3	09/01/25	Packaging Considerations in Thermal Management, Conduction Cooling
4	09/08/25	Air Cooling I: Natural Convection and Radiation
5	09/15/25	Air Cooling II: Forced Convection, Fans, Heat Sinks
6	09/22/25	Review, Midterm Exam
7	09/29/25	Thermoelectric Coolers
8	10/06/25	Heat Pipes
9	10/13/25	Microchannels
10	10/20/25	Immersion Cooling
11	10/27/25	Jet Impingement and Spray Cooling
12	11/03/25	Vapor-Compression Refrigeration
13	11/10/25	System-Level Thermal Management Architectures for Specific Applications
14	11/17/25	System-Level Thermal Management Architectures for Specific Applications
15	11/24/25	Thanksgiving Break- No classes
16	12/01/25	Future Trends in Thermal Management Applications, Review

Final Exam (comprehensive) 12/09/25 Tue 1:30 -3:30 p.m.

Grading Criteria

Midterm Exam	35%
Homework Assignments	20%
Final Exam	40%
Attendance, Attitude, Participation	5%

Expected Grade Distribution

A: ≥90%, B: 80-89%, C: 70-79%, D: 60-69%, F: <60%

Policies and Procedures

1. This syllabus is subject to change during the semester with changes to be announced in class.
2. This course provides opportunities for students to take advantage of several software packages supported by the department in the classroom or in lab experiments, in simulation studies, homework assignments, or in projects.
3. The course website, Canvas, at <https://canvas.unt.edu/> will be used for posting announcements, course materials, assignments, and grades. Students are encouraged to check the course website often.
4. Undergraduate students will be given several homework assignments for individual study. Optionally, undergraduate students can also work with graduate students on the assigned topic for presentation.
5. For all classes, cell phones must be silenced. For exams, cell phones must be placed in backpacks and left at the front of the classroom.
6. No textbook, notes/notebooks, and electronics except basic scientific calculator, are allowed in exam.
7. Grades are based in part on the student's ability to communicate. You must present your work in a well-organized and well-articulated manner with appropriate depth.
8. Requests for the review of a graded exam/assignment must be made within one week of the grade announcement. Upon review, the exam/assignment score may increase, remain the same, or decrease.
9. There will be no make-up exams or assignments unless you have a documented, university-excused absence. If you know in advance that you will miss an exam, you must contact instructor before the scheduled exam.
10. An "I" (incomplete) grade is given only for extenuating circumstances and in accordance with University and Departmental Policies.
11. The instructor reserves the right to change the grade distribution at the end of the semester. If any changes occur, the changes will be less stringent than the distribution above.
12. **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>)

13. **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.
14. **Academic Integrity Standards and Sanction for Violations:** 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. Any violation of academic honesty in an exam or assignment will result in a grade of zero and a report to <https://faculty.success.unt.edu/academic-integrity>.
 15. **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. The Code of Student Conduct can be found at deanofstudents.unt.edu/conduct.
 16. **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 your Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail: eagleconnect.unt.edu/.
 17. **ADA Statement:** 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 at disability.unt.edu.
 18. **Attendance Policy:** Attendance to the fullest extent possible is highly encouraged as engagement, participation and interaction are important elements of the learning process. Attendance will be taken during lectures, and will be considered as part of the final grade calculation.
 19. **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 Blackboard for contingency plans for covering course materials.

20. **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 students' 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.
21. **Student Perceptions of Teaching Effectiveness (SPOT):** 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 and 14 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 at www.spot.unt.edu or email spot@unt.edu.