MEEN 4810 THERMAL MANAGEMENT

Fall 2021
3 credit hours, Tue Thur 2:30-3:50 p.m. NTDP F119

Instructor  Dr. Huseyin Bostanci
Office      NTDP F115L
Office Hours Tue 10:00AM -12:00PM, Thur 10:00AM -12:00PM (other times by appointment)
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Course Description
Pre-Requisite: MEET 4350 or consent of Instructor

Recommended Text
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.

<table>
<thead>
<tr>
<th>Week of</th>
<th>Lecture Topic</th>
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<tbody>
<tr>
<td>1 08/23/21</td>
<td>Thermal Management Overview, Device-Level Heat Generation</td>
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<td>2 08/30/21</td>
<td>Temperature Measurements, Heat Transfer Review</td>
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<td>3 09/06/21</td>
<td>Packaging Considerations in Thermal Management, Conduction Cooling</td>
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<td>4 09/13/21</td>
<td>Air Cooling I: Natural Convection and Radiation</td>
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<td>5 09/20/21</td>
<td>Air Cooling II: Forced Convection, Fans, Heat Sinks</td>
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<td>6 09/27/21</td>
<td>Review, Midterm Exam</td>
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<td>7 10/04/21</td>
<td>Thermoelectric Coolers</td>
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<td>8 10/11/21</td>
<td>Heat Pipes</td>
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<td>9 10/18/21</td>
<td>Microchannels</td>
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<td>10 10/25/21</td>
<td>Immersion Cooling</td>
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<td>11 11/01/21</td>
<td>Jet Impingement and Spray Cooling</td>
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<td>12 11/08/21</td>
<td>Vapor-Compression Refrigeration</td>
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<td>13 11/15/21</td>
<td>System-Level Thermal Management Architectures for Specific Applications</td>
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<tr>
<td>14 11/22/21</td>
<td>System-Level Thermal Management Architectures for Specific Applications</td>
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Final Exam (comprehensive) 12/07/16 Tue 1:30 -3:30 p.m.
Grading Criteria

- Midterm Exam: 35%
- Group Presentation: 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. Students will form 6 groups early in the semester. Each group will work on an assigned topic and give a presentation to the class at a determined date. Instructor will explain the format and grading guidelines of the 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)

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)
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) 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:// facultysuccess.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. **COVID-19 Impact on Attendance.** While attendance is expected as outlined above, it is important for all of us to be mindful of the health and safety of everyone in our community, especially given concerns about COVID-19. Please contact me if you are unable to attend class because you are ill, or unable to attend class
due to a related issue regarding COVID-19. It is important that you communicate with me prior to being absent so I may make a decision about accommodating your request to be excused from class. If you are experiencing any [symptoms of COVID-19](https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html) please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Hotline at 844-366-5892 or [COVID@unt.edu](mailto:COVID@unt.edu) for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure. While attendance is an important part of succeeding in this class, your own health, and those of others in the community, is more important.

20. **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.

21. **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 location 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.

22. **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](mailto: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](http://www.spot.unt.edu) or email [spot@unt.edu](mailto:spot@unt.edu).