MTSE 4060: MATERIALS SELECTION AND PERFORMANCE
Fall 2025 Syllabus

Instructor Contact

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Lectures M/W 12:30 pm to 1:50 pm, DP B142
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Email: sameehan.joshi@unt.edu
Communication: Emails will be answered within 48 hours. Exam grades will be posted within 2 weeks after an exam is administered. Assignments and projects will be submitted as assigned, e.g. in class or via CANVAS. Students will participate in discussions related to course assignments as specified in class or in the rubric posted to CANVAS.

Welcome to UNT!

As members of the UNT community, we have all made a commitment to be part of an institution that respects and values the identities of the students and employees with whom we interact. UNT's full Non-Discrimination Policy can be found in the UNT Policies section of the syllabus.

Course Objectives

Specific Course Learning Outcome	ABET Outcome*						
	1	2	3	4	5	6	7
1. Understand how structure, properties, and processing interact to affect performance.	x						
2. Use digital materials' databases and design tools such as ANSYS Granta EduPack Software (formerly ANSYS CES EduPack Design).	x						x
3. Design and conduct computational exercises to explore materials performance via case studies.	x	x		x			
4. Recognize new design opportunities in materials by working on a team project and communicate their ideas with peers.	x		x		x		

*ABET Accreditation: https://materials.engineering.unt.edu/accreditation

Course Structure

The course has 2 weekly class periods and will follow a face-to-face format or via Zoom/Teams when noted. Participation in the class during lectures is mandatory. The lectures/assignments will involve computational instruction and exercises using software by ANASYS Granta EduPack (formerly CES EduPack). Software is accessible in B142, UG Lab (E138), and via Citrix

Course Prerequisites or Other Restrictions

MTSE 3000 and MTSE 3010. The student must be familiar with fundamentals of materials science – crystal structure, bonding, mechanical properties, and processing. Course

Description

I. Introduction to Materials Selection and Design (3 weeks)
   - Review of engineering materials and their properties
   - Organizing materials and processes
   - Strategic thinking: matching material to design
   - The design processes

II. Materials Property Charts, and Material and Process Selection Basics (3.5 weeks)

   - Material and structural indices
   - Selection strategy including computer-aided selection
   - Selection with multiple constraints and conflicting objectives
   - Processing for properties and systematic process selection

III. Case Studies Using Ashby Method (8 weeks)

   - Materials selection for strength-limited, fracture-limited, toughness-limited design
   - Materials selection for electric, magnetic, and optical design
   - Materials selection for wear, friction, and creep applications
   - Designing hybrid materials
   - Materials and environment – materials lifecycle, energy, eco-selection, and eco-audit

Textbook

- M. F. Ashby, *Materials Selection in Mechanical Design*, 5th Edition, Butterworth- Heinemann, 2017, ISBN: 978-0-08-100599-6 (E-reserve will be made available through UNT Library)

Teaching Philosophy

Students should be prepared to ask questions and participate during lectures. Each student must be proactive in getting any confusion they may have about course materials clarified.

Grading

An (A-F) grading scale will be used. The point percentages used to calculate the final grade are:

A >= 90;   B = 80-89;   C = 70-79;   D = 60-69;   F = < 60

Your grading will be based on the following areas of assessment:

- Assignments and Discussions   35%
- Project Report + Presentation   40%
- Exam (arrangements TBD)   15%
- Project Notebook   10%

Course Policies

Attendance Policy

Participation in class lectures is mandatory. If you are unable to attend a class, please email me. Excused absences include illness, conference travel, family emergency, religious holiday, and any other unplanned difficulty as determined by the instructor. Student(s) with 3 or more *unexcused absences* will be dropped from the class. Please don't disrupt classes by coming late.

Late Work

Late work will lead to one letter grade drop. Late work will NOT be accepted if submitted after the answers are posted. There will be no extra credit opportunities.

Examination Policy

The exam will be open book. You will have a set amount of time to turn in your answers for grading. A student who misses exam(s) due to unavoidable reasons such as conference travel, family emergencies, and sickness must show proof such as doctor's and/or advisor's note to the instructor to get permission and/or arrange for a makeup exam. Note: This policy may change during the course. If so, sufficient time will be provided to make adjustments to the testing and evaluation portions of the course.

Assignment Policy

The instructions for assignments and their due dates will be posted on CANVAS. You must upload your answers in PDF files on CANVAS. *Turnitin* or similar software for plagiarism are to be used to check your Project Report and your assignments. Use of AI (e.g. Chat GPT) is prohibited.

Note that the University is committed to providing reliable online course systems to all users. However, in the event of any unexpected server outage or any unusual technical difficulty which prevents students from completing a time sensitive assessment activity, the instructor will extend the time windows and provide an appropriate accommodation based on the situation. Students should immediately report any problems to the instructor and contact the UNT Student Help Desk: helpdesk@unt.edu or 940.565.2324 and obtain a ticket number. The instructor and the UNT

Instructor Responsibilities and Feedback

- The instructor will help students grow and learn, provide clear instructions for projects and assessments, answer questions about assignments, identify additional resources as necessary, provide grading rubrics, review and update course content.
- Please help the instructor by being proactive in asking questions and seeking help.

Syllabus Change Policy

Any changes to the syllabus (in an extraordinary situation) will be clearly communicated to the students during the course of the semester.

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. SPOT evaluation timeframe will be communicated via CANVAS.

MTSE 4060 Project Guidelines: Pace your efforts, and don't wait till the deadline.

1. **50% of course grade for both your written report and poster presentation combined.** Each student will also rate their team members' contribution to team-cohesion, quantity and quality of effort. This rating will be factored into your project grades.

2. *TENTATIVE PROJECT TIMELINE*:

   a) **Team**: *Form your own two-member teams*, and email me team info by 09/08/2025. The instructor will create a blank notebook for each team on CANVAS as soon as teams form.

   b) **Project Notebook**: Each team **must** maintain a project notebook on CANVAS. The team members will regularly discuss and make project notes, activities, and progress. This notebook will be graded at the end of the project term. ABET also requires us to focus on *Continuous Quality Improvement* (CQI). This notebook will help collect your thoughts and chart the progress. Do not ignore this requirement. A poorly maintained notebook will be penalized by at least a letter grade.

   c) **Topic**: Each team will discuss and select a project topic that will study *design, materials selection, and manufacturing* for an application. The topics selected by each team must be emailed to me on 09/22/2025. These activities must be duly entered into your project notebook.

      1. For example, one of your preceding classes studied the design and processing of better helmets to reduce football-related head injuries.

      2. First, they investigated the mechanisms of impact and brain damage, current state-of-the-art for the helmets, identifying its strength and weaknesses in preventing brain damage.

      3. Next, they explored new helmet designs and underlying science to enhance protection.

      4. This part of their project was devoted to exploring stresses experienced by helmet, skull, and brain under impact and whether a perfect helmet protection system is even feasible using currently available materials.

   d) **Project Outline**: *Email* your project outline to the instructor by 10/06/2025. Analyze and focus on product design, preliminary materials selection, processing, and manufacturing. The students must have a fair idea of their topic by this time.

   e) **Project Analysis**: Preliminary analysis, a set of 3 key papers, and survey should be finished by 10/20/2025. Each team must meet with the instructor in person to discuss their project outline. All of these activities must be duly entered into your project notebook.

   f) **First Draft**: Due by 11/05/2025. Meet the instructor in person for feedback. You must summarize instructor feedback in your project notebook.

   g) **Final Paper**: Due by 12/11/2025. Each team must submit their written project report through the CANVAS portal created by the instructor. This report will be automatically checked for plagiarism. Papers with plagiarized components will receive a score of zero.

   h) **Presentation:** Each team will present their work during the last week of the semester (Dec. 01 – Dec. 03) before the final exams. Each team will also formally evaluate the presentations of other teams on CANVAS.

i) **Project Requirement**: Each team should interview at least one outside materials expert to get feedback. An MTSE faculty cannot be this so-called *external expert*. So, it is important that you do not wait till the last minute. This component has a 10% weight in your project grade and the <u>details of your discussions must be summarized in your written report and your project notebook</u>.

3. Your report <=15 pages (single spaced, 12-point Symbol and/or Times New Roman fonts, and 1-inch margins around) – abstract, background, figures, tables, and references are *excluded from* the page limit.

4. **Legends and labels in the embedded figures and graph axes should be font size 12 and be clearly legible. Use only metric/SI units.**

5. Follow the writing guidelines of Ashby placed in your <u>reading list folder</u> on the CANVAS.

MTSE 4060 Project Report: Some Suggested Components

1. Project Statement with Objective(s) – Have you clearly articulated this?

2. List of Components / Subsystems Currently Used. What are their (dis)advantages? What alternate design strategies and materials can be explored?

3. Design Requirements – Have you developed the design requirements table (function, constraint, objective, free variable) for each component?

4. Model for Each Component – Have you developed a model or taken a model from literature?

5. Identify the Appropriate Materials Indices.

6. Materials Selection Chart – use the ANSYS Granta EduPack software to:

    a. Develop Materials property charts.

    b. Identify multiple constraints and penalty functions.

7. Development of Materials Selection Table – Have you included a short list of candidate materials with relevant property and index columns?

8. Materials Selection Postscript.

9. Process Selection – What processes can be used with the materials selected in step-8?

10. Shape Considerations – Will your shape considerations dictate material and process choice?

11. Choice of Appropriate / Optimal Materials Microstructure.

12. Hybrid Materials – Will a hybrid material approach provide a better choice? If yes, develop it.

13. Conclusions – Distill steps 8-11 to make conclusions and final recommendations.

14. References/Citations.

Use of AI (e.g.Chat GPT) in report writing is prohibited.

*CAUTION***: There will be a penalty for not following the above guidelines.**

Course Technology & Skills

Minimum Technology Requirements

The minimum technology requirements for students in this course:

- Use a Windows-based Computer
- Reliable internet access
- Speakers
- Microphone
- Plug-ins
- Microsoft Office Suite
- CANVAS Technical Requirements
  (https://clear.unt.edu/supported-technologies/canvas/requirements)

Computer Skills & Digital Literacy

Course-specific technical skills learners must have to succeed in the course include:

- Using CANVAS and Citrix Workspace
- Using email with attachments
- Downloading and installing software
- Using spreadsheet programs
- Using presentation and graphics programs

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

CANVAS Technical Help: https://community.canvaslms.com/docs/DOC-10554-4212710328

Rules of Engagement

Engagement Guidelines: **https://clear.unt.edu/online-communication-tips**

Dr. Joshi, University of North Texas (based on 2020 Syllabus by Prof. Srivilliputhur) | 8

Some expectations of how students should interact with each other and with their instructors include:

- While the freedom to express oneself is a fundamental 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.
- 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 individuals' 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!"
  - √ Cautiously use 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.

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. Plagiarism and cheating will result in an **F grade (Fail) for that assignment and a referral to the committee handling academic misconduct for further action.**

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/).

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) to learn more.

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 a student's Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail Eagle Connect (https://it.unt.edu/eagleconnect).

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 [Nov. 21 – Dec. 8] 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.

Sexual Assault Prevention

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment, sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore prohibit 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. UNT's Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim's compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and

connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565- 2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at oeo@unt.edu or at (940) 565 2759.

<mark>Important Notice for F-1 Students taking Distance Education Courses</mark>

Federal Regulation

To read detailed Immigration and Customs Enforcement regulations for F-1 students taking online courses, please go to the Electronic Code of Federal Regulations website (http://www.ecfr.gov/). The specific portion concerning distance education courses is located at Title 8 CFR 214.2 Paragraph (f)(6)(i)(G).

The paragraph reads:

(G) For F-1 students enrolled in classes for credit or classroom hours, no more than the equivalent of one class or three credits per session, term, semester, trimester, or quarter may be counted toward the full course of study requirement if the class is taken on-line or through distance education and does not require the student's physical attendance for classes, examination or other purposes integral to completion of the class. An on-line or distance education course is a course that is offered principally through the use of television, audio, or computer transmission including open broadcast, closed circuit, cable, microwave, or satellite, audio conferencing, or computer conferencing. If the F-1 student's course of study is in a language study program, no on-line or distance education classes may be considered to count toward a student's full course of study requirement.

University of North Texas Compliance

To comply with immigration regulations, an F-1 visa holder within the United States may need to engage in an on-campus experiential component for this course. This component (which must be approved in advance by the instructor) can include activities such as taking an on-campus exam, participating in an on-campus lecture or lab activity, or other on-campus experience integral to the completion of this course.

If such an on-campus activity is required, it is the student's responsibility to do the following:

(1) Submit a written request to the instructor for an on-campus experiential component within one week of the start of the course.

(2) Ensure that the activity on campus takes place and the instructor documents it in writing with a notice sent to the International Student and Scholar Services Office. ISSS has a form available that you may use for this purpose.

Because the decision may have serious immigration consequences, if an F-1 student is unsure about his or her need to participate in an on-campus experiential component for this course, s/he should contact the UNT International Student and Scholar Services Office (telephone 940-565-2195 or email internationaladvising@unt.edu) to get clarification before the one-week deadline.

Student Verification

UNT takes measures to protect the integrity of educational credentials awarded to students enrolled in distance education courses by verifying student identity, protecting student privacy, and notifying students of any special meeting times/locations or additional charges associated with student identity verification in distance education courses.

See [UNT Policy 07-002 Student Identity Verification, Privacy, and Notification and Distance Education Courses](https://policy.unt.edu/policy/07-002) (https://policy.unt.edu/policy/07-002).

Use of Student Work

A student owns the copyright for all work (e.g. software, photographs, reports, presentations, and email postings) he or she creates within a class and the University is not entitled to use any student work without the student's permission unless all of the following criteria are met:

- The work is used only once.
- The work is not used in its entirety.
- Use of the work does not affect any potential profits from the work.
- The student is not identified.
- The work is identified as student work.

If the use of the work does not meet all of the above criteria, then the University office or department using the work must obtain the student's written permission.

Download the UNT System Permission, Waiver and Release Form

Transmission and Recording of Student Images in Electronically-Delivered Courses

1. No permission is needed from a student for his or her image or voice to be transmitted live via videoconference or streaming media, but all students should be informed when courses are to be conducted using either method of delivery.

2. In the event an instructor records student presentations, he or she must obtain permission from the student using a signed release in order to use the recording for future classes in accordance with the Use of Student-Created Work guidelines above.

3. Instructors who video-record their class lectures with the intention of re-using some or all of recordings for future class offerings must notify students on the course syllabus if students' images may appear on video. Instructors are also advised to provide accommodation for students who do not wish to appear in class recordings.

   Example: This course employs lecture capture technology to record class sessions. Students may occasionally appear on video. The lecture recordings will be available to you for study purposes and may also be reused in future course offerings.

Academic Support & Student Services

Student Support Services

Mental Health

UNT provides mental health resources to students to help ensure there are numerous outlets to turn to that wholeheartedly care for and are there for students in need, regardless of the nature of an issue or its severity. Listed below are several resources on campus that can support your academic success and mental well-being:

- Student Health and Wellness Center: https://studentaffairs.unt.edu/student-health-and-wellness-center
- Counseling and Testing Services: https://studentaffairs.unt.edu/counseling-and-testing-services
- UNT Care Team: https://studentaffairs.unt.edu/care
- UNT Psychiatric Services (https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry)
- Individual Counseling (https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling)

Chosen Names

A chosen name is a name that a person goes by that may or may not match their legal name. If you have a chosen name that is different from your legal name and would like that to be used in class, please let the instructor know. Below is a list of resources for updating your chosen name at UNT.

- UNT Records
- UNT ID Card
- UNT Email Address
- Legal Name

Additional Student Support Services

- [Registrar](https://registrar.unt.edu/registration) (https://registrar.unt.edu/registration)
- [Financial Aid](https://financialaid.unt.edu/) (https://financialaid.unt.edu/)
- [Student Legal Services](https://studentaffairs.unt.edu/student-legal-services) (https://studentaffairs.unt.edu/student-legal-services)
- [Career Center](https://studentaffairs.unt.edu/career-center) (https://studentaffairs.unt.edu/career-center)
- [Counseling and Testing Services](https://studentaffairs.unt.edu/counseling-and-testing-services) (https://studentaffairs.unt.edu/counseling-and-testing-
- services)
- [UNT Food Pantry](https://deanofstudents.unt.edu/resources/food-pantry) (https://deanofstudents.unt.edu/resources/food-pantry)

Academic Support Services

- [Academic Resource Center](https://clear.unt.edu/canvas/student-resources) (https://clear.unt.edu/canvas/student-resources)
- [Academic Success Center](https://success.unt.edu/asc) (https://success.unt.edu/asc)
- [UNT Libraries](https://library.unt.edu/) (https://library.unt.edu/)
- [Writing Lab](http://writingcenter.unt.edu/) (http://writingcenter.unt.edu/)

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