MTSE 3000 (Tuesday, Thursday, 8:30am-9:50am)
“Fundamentals of Materials Science and Engineering”
Spring Semester 2021

Instructor Contact
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Pronouns: she, her
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Office Hours: By appointment

Communication Expectations: Lectures, homework assignments, and solutions will be posted on Canvas https://unt.instructure.com.

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 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
Principles of bonding, structure, and structure/property relationships for metals and their alloys, ceramics, polymers and composites. Emphasis on properties and how processes change structure and, consequently, properties.

Brief list of topics to be covered
I. Electronic and Atomic Structure and Bonding
   Atomic Structure
   Bonding Types and correlations with properties
II. Material Building Blocks
   Crystalline Structures (Metals and Ceramics)
   Miller Indices
   Single Crystals
   Polycrystalline materials
   Non-crystalline materials
   Polymeric Structures
   Defects
III. On Microstructure-Property Relationships
   Mechanical Properties
   Deformation and Strengthening Mechanisms

IV. On Microstructural Evolution
   Phase Diagrams
   Diffusion
   Phase Transformations

V. Materials in Application
   Failure and Corrosion
   Material Applications and Processing
   Team Presentations on Material Applications

VI. Other Considerations (environment, health, availability, design)
   Electrical, Thermal, Magnetic and Optical Properties
   Characterization

Course Structure
The course is offered remotely and consists of lectures that will be provided via Zoom, homework. Quizzes, team projects, and exams will also be performed in real time via Zoom.

Course Prerequisites or Other Restrictions
Corequisite(s): PHYS 1710. CHEM 1410/CHEM 1430 or CHEM 1415/CHEM 1435.

Course Objectives
1. Demonstrate ability to relate bond energy to properties of engineering materials.
2. Interpret various crystal structures using Miller Indices for planes and directions.
3. Determine contributions of various strengthening mechanisms, including solid solution strengthening, precipitation strengthening, strain hardening, and grain size strengthening (the Hall-Petch relationship).
4. Demonstrate ability to read a phase diagram, including determining phase diagram type, predict phase compositions (given c0 and T), and predict microstructures for given compositions.
5. Interpret mechanical properties, including yield strength, ultimate tensile strength, and elastic modulus from engineering plots of $\sigma-\varepsilon$.
6. Exhibit awareness of societal implications associated with various materials, including specifically occupational safety and health and global availabilities of commodity material.
7. Conduct and present a material selection survey as part of a team for current materials applications.

Course Outcomes
1. An ability to apply knowledge of mathematics, science, and engineering, and the ability to apply and integrate knowledge of structure, properties, processing, and performance to solve materials selection and design problems within realistic constraints. (Course Objectives 1,2,3,4,5,7)
2. An ability to design and conduct experiments, as well as to analyze and interpret data (Course Objectives 1,2,4,5)
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. (Course Objective 7)
4. An ability to function on multi-disciplinary teams. (Course Objective 7)
5. An ability to identify, formulate, and solve engineering problems. (Course Objective 7)
6. An understanding of professional and ethical responsibility. (Course Objective 6)
7. An ability to communicate effectively. (Course Objective 7)
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. (Course Objectives 6,7)
9. A knowledge of contemporary issues. (Course Objectives 2,6,7).

Materials


**Other Suggested Textbooks:** *Introduction to Materials Science for Engineers*, by Shackleford, Prentice Hall

**Lecture Notes will be posted on Canvas:** Lectures, homework assignments, and solutions will be posted on Canvas [https://unt.instructure.com](https://unt.instructure.com)

Course Technology & Skills

Minimum Technology Requirements

- Computer
- Reliable internet access
- Microsoft Office Suite
- [Canvas Technical Requirements](https://clear.unt.edu/supported-technologies/canvas/requirements)

Computer Skills & Digital Literacy

- Using Canvas
- Using email with attachments
- Using spreadsheet programs
- Using Microsoft Word.

Technical Assistance

In case of some issues with accessing Canvas, please contact the Student Help Desk.

**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)

Rules of Engagement
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.

Course Requirements

Tentative Grading Scheme with weight percent contributions to the final grade (subject to change):

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points Possible</th>
<th>Percentage of Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework average</td>
<td>Out of 100</td>
<td>10%</td>
</tr>
<tr>
<td>Quiz average</td>
<td>Out of 100</td>
<td>10%</td>
</tr>
<tr>
<td>Exam average</td>
<td>Out of 100</td>
<td>60%</td>
</tr>
<tr>
<td>Team project</td>
<td>Out of 100</td>
<td>20%</td>
</tr>
<tr>
<td>Total Grade Possible</td>
<td>Out of 100</td>
<td>100%</td>
</tr>
</tbody>
</table>

Grading
A = 90-100
B = 80-89.9
C = 70-79.9
D = 60-69.9
Team Project:

For the project, there will be a final paper (10%) and a presentation (10%). On the last examination, you will score your team members according to both their participation and their accuracy.

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.

Course Policies

Attendance Policy

All students are expected to attend each class and to submit the lab report after completing the lab.

Class Participation

1. Canvas will be used as the primary communication tool. It will be used exclusively for posting homework assignments, homework solutions, topical coverage of each exam, formula sheets for exams, and grades.
2. Your assignments and exams will be graded within two weeks after the due date or the day of the exam. If you see that your grade is not posted on Canvas, the assignment or exam has not been graded. Late assignments (homework or project) will NOT be accepted.
3. Each quiz will be limited to one or two problems with a time limit of 15 minutes. The content will be based on recent homework problems and sample problems gone over in class.
4. Each exam will include a combination of (A) multiple choice questions, (B) short answer questions, and (C) quantitative problems. Exams are open books/open notes.

Late Work

Class Attendance is Mandatory. Regular attendance in Zoom class and active listening/participating in classroom discussion is necessary for optimal learning. Please notify me if you have to miss a class or will be late. Additional pop-quizzes may be given due to overall classroom attendance and participation.

Examination Policy

Makeup Exam Policy: If a student cannot take an exam on the scheduled date due to some unavoidable circumstances, such as out of town business trip, sickness, etc., then he/she must notify the instructor in writing before the scheduled exam time to schedule a makeup exam. If allowed, a 10% penalty will be assessed.

Technical Difficulties: The University is committed to providing a reliable online course system 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 Student Help Desk will work with the student to resolve any issues at the earliest possible time.

Syllabus Change Policy
In case there are changes to the syllabus, the students will be instructed during the lab and using Canvas Announcements.

UNT Policies

Academic Integrity Policy
You will be expected to conduct yourself in a professional manner. Academic dishonesty such as plagiarism and cheating will NOT be tolerated. Therefore, students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:
* cheating – use or attempted use of unauthorized materials, information or study aids
* fabrication – falsification or invention of any information
* assisting – helping another commit an act of academic dishonesty
* tampering – altering or interfering with evaluation instruments and documents
* plagiarism – representing the words or ideas of another person as one’s own.
For more information about academic integrity and the University's policies and procedures in this area, please see the UNT academic manual. Any student in violation of these policies will be given an overall F grade (Fail).

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/eaglconnect).

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.

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.

Important Notice for F-1 Students taking Distance Education Courses

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).

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.

No notification is needed if only audio and slide capture is used or if the video only records the instructor's image. However, the instructor is encouraged to let students know the recordings will be available to them for study purposes.

**Class Recordings & Student Likenesses**

Synchronous (live) sessions in this course will be recorded for students enrolled in this class section to refer to throughout the semester. Class recordings are the intellectual property of the university or instructor and are reserved for use only by students in this class and only for educational purposes. Students may not post or otherwise share the recordings outside the class, or outside the Canvas Learning Management System, in any form. Failing to follow this restriction is a violation of the UNT Code of Student Conduct and could lead to disciplinary action.

**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)

**Additional Student Support Services**

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

**Academic Support Services**

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