MTSE 3000
“Fundamentals of Materials Science and Engineering”
Fall Semester 2020 – 3 credit hours

Instructor: Dr. Xiao Li, Office: E119, Discovery Park
E-mail: Xiao.Li@unt.edu Phone: 940-565-2603
Office Hours: Tuesday 2:00 pm - 3:00 pm; Thursday 2:00 pm – 3:00 pm in Zoom. Please email the questions in advance.
Lecture: Tuesday and Thursday, 10:00 a.m. – 11:20 a.m in Zoom. Webcam and microphone will be needed.
Location: Remote teaching

Teaching Assistant: TBD

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: Atomic structure and interatomic bonding; Structure of metals and ceramics; Polymer structures; Imperfections in solid; Mechanical properties; Deformation and strengthening mechanism; Phase diagrams; Phase transformation.

Course (Learning) 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 \( c_0 \) 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 Outcome:
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)

Lecture Notes will be posted on Canvas: Lectures, homework assignments, solutions will be posted on Canvas; quizzes and exams will be conducted via Canvas. https://unt.instructure.com/login/ldap.

Notes:
1. Canvas and Zoom will be used as the primary communication tool. They will be used exclusively for lecture teaching; posting homework assignments, homework solutions, formula sheets for exams and grades; submitting homework; conducting quizzes and exams.
2. Each quiz will be limited to one or two problems with a time limit of 20 minutes. The content will be based on recent homework problems and sample problems gone over in class.
3. Each exam will include a combination of (A) multiple choice questions, (B) short answer questions, and (C) quantitative problems.
4. There would be three exams, which will be weighted equally to determine the exam average component of the grade. Each exam builds up on understanding previous chapters and, hence, the second and third exams are progressively comprehensive.
5. For all exams and quizzes, you may use a calculator during the exam. Webcam will be needed to allow you to enter and take the quiz or exam through LockDown Browser. Earphones, cell phones, other laptops, etc. will not be allowed.

Team Project:
For the project, there will be a final paper (5%) and a presentation (5%). On the final examination, you will score your team members according to both their participation and their accuracy.

Calculators: Programmable calculators are not allowed. Bring them to quizzes and exams. You must have an inexpensive scientific calculator that can solve:
- Trig functions (SIN, COS, TAN)
- Exponentials ($e^x$)
- Square Root
- $x^y$
- Natural Logs (LN)
- Logs (LOG)
- Inverse

Cell Phones: Please remember to turn off phones prior to class. Cell phones are not allowed during quizzes or examinations.

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

**Prerequisites:** PHYS 1710. CHEM 1410/CHEM 1430 or CHEM 1415/CHEM 1435.

**Tentative Grading Scheme with weight percent contributions to the final grade (subject to change):**
- Homework Average: 15%
- Quiz Average: 15%
- Exam Average: 60%
- Team Project: 10%

**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.

**Class Attendance is Mandatory.** Please notify me if you have to miss a class or will be late.

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 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.

**Class Materials for Remote Instruction**
The UNT fall schedule requires this course to have fully remote instruction. Additional remote instruction may be necessary if community health conditions change or you need to self-isolate or quarantine due to COVID-19. Students will need access to a webcam and microphone to participate in fully remote portions
of the class. Information on how to be successful in a remote learning environment can be found at https://online.unt.edu/learn.

Statement on Face Covering
Face coverings are required in all UNT facilities. If you need in-person discussion with instructor, please make an appointment and wear face coverings when you show up at the instructor’s office. If you are unable to wear a face covering due to a disability, please contact the Office of Disability Access to request an accommodation. UNT face covering requirements are subject to change due to community health guidelines. Any changes will be communicated via the instructor.

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.

Disabilities Accommodation
The University of North Texas complies with Section 504 of the 1973 Rehabilitation Act and with the Americans with Disabilities Act of 1990. The University of North Texas provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please see the instructor and/or contact the Office of Disability Accommodation at 940-565-4323 during the first week of class.

Additional Policies
Authorized Absences and Extenuating Circumstances
Absences due to extenuating circumstances or participation in sponsored must be verified by the Dean of Students. Consideration of such absences will be made for quizzes and examinations, but not homework. For participation in sponsored activities, you must seek approval prior to the absence. For extenuating circumstances, you have 1 week to contact me and/or the Dean of Students to begin the process.

Absence for Religious Holidays
In accordance with state law, a student absent due to the observance of a religious holiday may take examinations or complete assignments scheduled for the day(s) missed, including those missed for travel, within a reasonable time after the absence. The student is responsible to notify the instructor of each class of the date of the anticipated absence as early in the semester as possible. Only holidays or holy days observed by a religion whose place of worship is exempt from property taxation under Section 11.20 of the Tax Code may be included. A student who is excused under this provision may not be penalized for the absence.

Academic Integrity – Plagiarism and cheating will NOT be tolerated.
Statement of Expectations for Student Conduct
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). In addition, your case will be forwarded to university administrators, and you may be subject to additional punishments/sanctions according to university policies. If you have any questions on this, please discuss with me or someone in the Office of Academic Integrity.