

**MTSE 3090**  
**Materials Science and Engineering Laboratory I**  
Dept. of Materials Science & Engineering, Fall 2026

**Credits and contact hours:** 1 Credit. Friday (10:40 am-1:30 pm), Primary Lab Rooms E-138 (UG Lab 1), E-135A (UG Lab), E-145 (UG Lab 3), E-146, Discovery Park

**Instructor's or course coordinator's name:** Dr. Xiao Li, Office: E-119 Discovery Park,  
Xiao.Li@unt.edu

**Text book, title, author, and year**

No required textbook. The instructor will provide the laboratory manual.

**Specific Course Information**

- a. Brief description of the content of the course (catalog description)  
Laboratory designed to introduce students to some of the most common materials processing, testing, characterization methods. Topics will include polymer, glasses, and nanocomposites materials.
- b. Prerequisites or co-requisites  
MTSE 3000, 3001
- c. Indicate whether a required, elective, or selected elective course in the program  
Required

**Specific goals for the course**

- a. Specific outcomes of instruction
  1. Students will learn how to conduct module-specific processing techniques (e.g., heat-treatments, sintering, molding, casting, 3D printing)
  2. Students will learn how to characterize materials using the different techniques specific to each of the modules (e.g., optical microscopy, scanning electron microscopy (SEM)-energy dispersive spectroscopy (EDS), X-Ray Diffraction, Raman spectroscopy)
  3. Students will collect, analyze, and interpret data in teams and will share data with other teams assigned to other roles within each lab module.
  4. Students will learn materials structure-property relationships for each module
  5. Students will analyze and interpret data related to each of the modules and present the data in the form of original laboratory reports conforming to research and academic standards
  6. Students will learn to relate concepts learned in the lab modules involving modern engineering tools to solve practical engineering problems
- b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes that are addressed by the course.

This course addresses ABET Criterion 3 Student Outcome(s): 5, 6, 7.

### **Brief list of topics to be covered**

1. Introduction, safety training refresher/quiz safety testing completion (1 week)
2. Polymers – Thermoplastic and thermoset/Thermophysical, mechanical and tribological characterization, polymer 3D printing demonstration (5 weeks)
3. Ceramics – Melting of oxide glasses/Structure and composition characterization (4 weeks)
4. Nanocomposites – Dye sensitized solar cell/Structure-property characterization (3 weeks)

**Course Requirements:** Mandatory attendance. Three safety trainings must be completed before coming to labs: **Chemical Lab Safety, Chemical Fume Hood Safety, Gas Cylinder Handling Safety, and Hazard Communication Training @**

**<https://riskmanagement.unt.edu/training.html>**. You must pass the quiz, print out that you passed it, and upload the certificate to the Canvas in order to start the lab modules.

**Grading:** Lab attendance/participation is required for each of the labs. Lab reports are due at the end of each session (dates will be announced by Instructor).

Grading is based on lab attendance/participation and the reports as follows:

**Lab attendance/participation:10%, polymer materials:30%, ceramics:30%, nanocomposite materials:30%**

**Academic Integrity:** As is understood by the vast majority of students, our basic relationship is based on trust. **Do not plagiarize lab reports (see pages 55-61 in Lab manual for examples and how to cite references).**

**LAB Reports:** The lab includes three modules. After the lab experiments are completed, the students are required to write project reports summarizing his or her work on their class lab. This report must be typed, single spaced, 12-point Symbol and/or Times New Roman fonts, and with 1-inch margins around. The report will follow the style of a standard laboratory report and must include the following sections: *Title, Author and affiliation, Abstract, Introduction (of the method used and properties calculated), Results, Discussions (comparing the results with corresponding experimental values, or theory), Conclusions, References, and Acknowledgments*. You must include appropriate visual figures from the experiments (including charts, graphs, and images) and captions. All the legends and labels in the charts and graphs must be at least a 12-point font when scaled to fit to the report. Collaboration with your group members in preparing the reports is acceptable. However, in the main, the report should be primarily yours and blatant copying will result in failing grade. Submit your lab reports on Canvas. Late lab reports will not be accepted.

**LAB I Schedule (will be adjusted according to lab situation)**

| Week | Date  | <b>Polymers</b><br>(Room: <b>E-146</b> )<br>TA: TBD                                         | <b>Ceramics</b><br>(Room: <b>E-135A/145</b> )<br>TA: TBD | <b>Nanocomposites</b><br>(Room: <b>E-138/145</b> )<br>TA: TBD |
|------|-------|---------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|
| 1    | 8/21  | Introduction, lab overview, and chemical lab safety information<br>(all students) → DP D202 |                                                          |                                                               |
| 2    | 8/28  | Group 1                                                                                     |                                                          | Group 2                                                       |
| 3    | 9/04  | Group 1                                                                                     |                                                          | Group 2                                                       |
| 4    | 9/11  | Group 1                                                                                     |                                                          | Group 2                                                       |
| 5    | 9/18  | Group 1                                                                                     | Group 2                                                  |                                                               |
| 6    | 9/25  | Group 1                                                                                     | Group 2                                                  |                                                               |
| 7    | 10/02 |                                                                                             | Group 2                                                  | Group 1                                                       |
| 8    | 10/09 |                                                                                             | Group 2                                                  | Group 1                                                       |
| 9    | 10/16 |                                                                                             |                                                          | Group 1                                                       |
| 10   | 10/23 | Group 2                                                                                     |                                                          |                                                               |
| 11   | 10/30 | Group 2                                                                                     | Group 1                                                  |                                                               |
| 12   | 11/06 | Group 2                                                                                     | Group 1                                                  |                                                               |
| 13   | 11/13 | Group 2                                                                                     | Group 1                                                  |                                                               |
| 14   | 11/20 | Group 2                                                                                     | Group 1                                                  |                                                               |

**The group assignment will be announced at first class on 8/21.**