MSE 2001 – Principles and Applications of Engineering Materials – Summer 2026
Georgia Tech, School of Materials Science and Engineering

Instructor: Prof. Kacher (he, him, his) josh.kacher@mse.gatech.edu
Office Hours: By appointment

Pre-requisites: D or better in Chem 1310 or Chem 1211K

Primary Texts:
Materials: Engineering, Science, Processing, and Design (2nd Ed) by Ashby, *et al.* (2009). E-Book: https://learning.oreilly.com/library/view/materials-2nd-edition/9781856177436/
(You will need to log-in to GT Library; make sure to use the "O'Reilly Safari Ebooks" link.)

Engineering Materials Science by Ohring (1995). E-Book:
https://www.sciencedirect.com/book/9780125249959/engineering-materials-science
(You will need to log-in to GT Library)

Other Required Tools:
- Canvas – Course announcements, class notes, and HW assignments will be posted on Canvas
- Pen/pencil and paper – Quizzes will take place in class on pencil and paper

Quizzes:

- Quizzes will be held every Monday and Wednesday
- Quizzes are closed book/closed note, but open discussion
- Quizzes will be turned in on paper directly after the quiz closes
- The lowest quiz score will be dropped

Homework:

- Homework will be assigned over and submitted through Canvas
- You are encouraged to do homework in groups
- Assignments will be due every Tuesday night by midnight

Exams:

- Exams will be held in class every other Thursday, starting with the second Thursday
- Exams will be completed on paper and submitted in class
- Exams are closed book, closed notes, no calculators or other electronic devices

Course Description
MSE 2001 will teach students the fundamental principles of process-structure-property relations to design engineering materials, including metals, ceramics, polymers, semiconductors, and composites. Students will learn the "vernacular" of materials science and engineering to facilitate technical communication, broaden design vision, and establish a foundation for further study of the subject area (if desired).

Course Objectives

By the end of this course, students should be able to:

- Use an understanding of material properties to discuss and predict material performance upon subjection to external stimuli including mechanical stress, heat, electrical voltage, electrochemical potentials, magnetic fields, and/or optical illumination.
- Describe the structure of materials at the atomic and microstructural levels and explain how different structural features impact material properties.
- Describe and predict how defects will alter the properties of a material.
- Apply thermodynamic and kinetic principles to design materials processing schemes to achieve desired materials structures using tools such as phase diagrams and TTT diagrams.

Course Evaluation*

- Quizzes: 20%
- Homework: 15%
- Exam 1: 20% (July 9th)
- Exam 2: 20% (July 25th)
- Final Exam (Comprehensive): 25%

Course Grades

Score	90% - 100%	80% - 89.99%	60% - 79.99%	40% - 59.99%	≤ 40%
Grade	A	B	C	D	F

***There will be no opportunities for extra credit.**

COURSE EXPECTATIONS & GUIDELINES

Academic Integrity: Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. See GT Honor Code: **http://www.catalog.gatech.edu/policies/honor-code/**. Student(s) suspected of cheating/plagiarizing will be reported to Office of Student Integrity.

Accommodations for Individuals with Disabilities: If you have learning needs that require special accommodation, please contact ODS office at http://disabilityservices.gatech.edu/, or (404)894-2563 as soon as possible, to discuss your needs and obtain an accommodations letter. Please also let me know about your special needs.

Student Use of Mobile Devices: Please silence all mobile devices at the beginning of class. Laptops and IPADS may be used during class but only for the purpose of taking notes.

Student-Faculty Expectations: At Georgia Tech we believe that it is important to continually strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See http://www.catalog.gatech.edu/rules/22/ for basic expectations that you can have of me,

and that I have of you. Simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. I encourage you to be committed to these ideals while in this class.

Sexual Harassment: MSE is committed to a community that actively resists sexual and gender harassment. If you see or experience any of the following: sexual harassment, domestic and dating violence, sexual assault and stalking, resources are available:

- **Confidential VOICE Advocates** (GT Wellness Center- VOICE) can provide support 24/7 and explore resources and options. If after hours, call 404-894-9000 and ask to speak to the On-Call VOICE Advocate. You do not need to make a report nor provide any information other than your phone number for a VOICE advocate to contact you.
- Sexual violence or harassment can be reported directly to Georgia Tech's **Title IX Coordinator**, Chris Griffin, (404) 385-5583 chris.griffin@gatech.edu.

Please note that faculty, staff, and TAs are mandatory reporters and are required to inform the Title IX Coordinator should they become aware of any student experiencing sexual violence or sexual harassment.