COURSE SYLLABUS

MSE 2001– Principles and Applications of Engineering Materials, Summer 2026
Sections RCH, 3 credit hours

Instructor: Prof. Wenshan Cai

Class schedule: This class is offered for students in the China Summer Program. There will be two class meetings per week. The exact time and location are TBD.

Email: wcai@gatech.edu

Course webpage: Canvas course site MSE 2001 CSP Summer 2026

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 "vocabulary" 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 Learning Outcomes:

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.

Prerequisites:

D or better in Chem 1310 or Chem 1211K.

Required Course Materials:

Primarily online notes. Lecture slides/notes will be posted online prior to each class.

Supplementary Texts (optional reading to enhance your learning):

- *Materials: Engineering, Science, Processing, and Design* by Ashby, *et al.* (2009).
  E-Book: https://learning.oreilly.com/library/view/materials-2nd-edition/9781856177436/
  (Sign in with your GT Email and verify with SSO)
- *Engineering Materials Science* by Ohring (1995).
  E-Book: https://www.sciencedirect.com/book/9780125249959/engineering-materials-science
- *Materials Science and Engineering: An Introduction* by Callister and Rethwisch
  Available in GT Library Reserves or you can check online.

Grading Policy and Weighting:

Homework, in-class quizzes, two midterm exams, and a final exam will be used to evaluate performance with the following weights:

15%	+	15%	+	2 × 20%	+	30%	=	100%
homework		quizzes		midterm exams		final exam		total

Attendance Policy:

Class attendance is expected, and attendance credit is incorporated into the in-class quizzes, with half of each quiz grade based on attendance and half based on correctness.

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. Review Georgia Tech's Honor Code and the student Code of Conduct at:

https://catalog.gatech.edu/policies/honor-code/
https://catalog.gatech.edu/rules/18/

Accommodations for Students with Disabilities:

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement:

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations (http://www.catalog.gatech.edu/rules/22/) articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.