

Syllabus Outline

MSE 2001- B: Principles and Applications of Engineering Materials – Summer 2017

Catalog Description: (3-0-3)

The structure-property-processing-performance relationships of engineering materials are described. Materials selection is treated as a part of engineering design.

Prerequisites: CHEM 1310 General Chemistry I or CHEM 1211K Chemical Principles I

Textbook: William D. Callister, Jr., *Materials Science and Engineering –An Introduction*, Published by John Wiley & Sons, Inc. Any recent edition of the book can be used.

Instructor: Dr. Krishna Parachuru

Contact Information: LOVE 171; 404-894-0029; krishna.parachuru@mse.gatech.edu

Office Hours: After Wednesday lecture class or by prescheduled appointment

Class Hours: 9:30 – 10:45 AM; MWF

Classroom: MRDC 2404

Topics Covered:

Bonding in materials, the crystal structure of metals and ceramics, and defects in materials will be introduced. Basic principles of phase diagrams and phase transformations will be given with particular emphasis on microstructural evolution and the effect of microstructure on the mechanical properties of metals and alloys. Introductory level knowledge of mechanical properties, testing methods, strengthening mechanisms, and fracture mechanics will be provided.

Other topics covered include structure, properties, and processing of ceramics; structure, properties and processing of polymers and composites; electrical, thermal, and optical properties of materials.



Serve-Learn-Sustain

This course is part of Georgia Tech's Serve-Learn-Sustain (SLS) initiative, which provides students with opportunities to combine their academic and career interests with their desire to make worthwhile contributions to the world and build sustainable communities where people and nature thrive, in Georgia, the United States, and around the globe. More information about SLS can be found at www.serve-learn-sustain.gatech.edu. Visit the website to sign up for the [SLS Email List](#), view the full list of [affiliated courses and projects](#), and find links to Facebook, Instagram and Twitter.

Grading

Quiz 1 (June 5)	7%
Test 1 (June 21)	30%
Quiz 2 (July 7)	7%
Test 2 (July 19)	30%
Preliminary Group Project- SLS Credit (June 30)	5%
Final Group Project – SLS Credit (July 21)	15%
Attendance & Participation	6%

Major specific group projects and group members (maximum 4) working on individual projects will be determined within the first two weeks of the class. Each group is expected to submit a preliminary project report on June 30, detailing the progress achieved to date. Final project report and 10 minute group presentations are due on July 21. There is no final exam for the course. Contributions of individuals within the group will be evaluated by other group members.

All group projects will identify 10 most consumed materials (by volume) within the industries representing their own major. They will analyze the recyclability, degradability and environmental hazards associated with each of the materials and rank them in the order 1 to 5 in terms of their environmental sustainability (1 being most friendly and 5 least friendly). They will also look at the most commonly used fabrication technologies for the first three volume consumption materials and analyze the additional polluting factors (water contamination, excess energy consumption, release of harmful gases, use of other hazardous materials, etc.) involved in the conversion of these materials into finished products. Finally, they will suggest cost effective alternatives for the most unfriendly materials and the most unfriendly manufacturing processes such that the alternative materials and processes can become more sustainable in the long run.