

**MSE 2001H – Fall 2012**  
**Principles and Applications of Engineering Materials**  
Mondays, Wednesdays, and Fridays 1:05-1:55 PM  
Erskine Love Bldg. 185

- Instructor:** Prof. Christopher Muhlstein,  
Room 274, Erskine Love Building  
Tel: (404) 385-1235  
e-mail: christopher.muhlstein@mse.gatech.edu
- Textbook:** James P. Schaffer, Ashok Saxena, Stephen D. Antolovich, Thomas H. Sanders, Jr. and Steven B. Warner, *The Science and Design of Engineering Materials*, Irwin, Chicago, IL. Please note that any edition of the textbook can be used and that it is considered a required resource for the course.
- Course Website:** T-square site will be used to post the course syllabus, lecture notes, homework, and homework-solutions. Important announcements will also be sent to your T-square account so please check it regularly.
- Quizzes and Exams:** All quizzes and exams will be closed book. No formula sheets other than the ones provided with the exam paper will be allowed. The exams will emphasize topics that are detailed in the textbook as outlined below.
1. Exam I- tentatively Ch. 1-4
  2. Exam II- tentatively Ch. 5-7
  3. Exam III- tentatively Ch. 8-9
  4. Final Exam- comprehensive (Ch. 1-10)
- Office Hours:** My office hours are on Mondays from 2:30 - 3:30 pm and the TAs office hours will be posted on T-square.
- Grades:** Your grade in the course will be determined based on your performance on four written examinations and a series of pop quizzes. The pop quizzes will be given at the start of the class period following the completion of the lectures associated with a given chapter. All exams and quizzes will be closed notes, closed book tests (i.e., no supplementary materials of any kind are to be used). The first three examinations will be held during the regular meeting time of the class on the dates indicated on the syllabus. The last examination will be administered during the final exam period. Final grades will be curved at the instructor's discretion based on a strategy that will be discussed during the first class meeting.

<u>Exam (Tentative Chapters and Date)</u>	<u>Percentage of Final Grade</u>
Exam I (Ch. 1-4, 9/21/2012)	15%
Exam II (Ch. 5-7, 10/22/12)	15%
Exam III (Ch. 8-9, 11/26/12)	15%
Pop Quizzes (start of some lectures)	20%
Final Exam (Ch. 1-10, Finals Week)	35%

**Midterm grades:** Midterm grades will be reported as “S” or “U”. A “U” will

indicate unsatisfactory performance, i.e., a “D” or “F.” The midterm grade will be determined by the grade on the first examination.

**Homework:** Homework problems will be given after each chapter is completed. Homework is not to be turned-in, and you are responsible for using the provided solutions to gauge your understanding of the material. Students are strongly encouraged to work on the homework and extra problems from the book. Neglecting the homework will likely jeopardize your performance in the class. Students are allowed/encouraged to study together (including working together on the homework assignments). You can ask question regarding your homework, although you should try to think about the problems before asking me or the TAs.

**Quizzes:** A 10-minute pop quiz may be given after finishing a chapter. Please note that there will not be a quiz after chapter 1 or 10 (the last chapter for the semester). Quizzes will be at the start of the following lecture and no supplemental reference materials will be allowed (i.e., they are closed to notes, the textbook, and other references).

**Make up policy:** Make-up quizzes and exams will only be permitted when absences are due to legitimate reasons such as illness, religious observance, or other events recognized by the Institute as a valid excuse. In any case, you must contact the instructor in advance of the test in writing (email is fine) to schedule a make-up quiz or exam. If you do not contact the instructor in advance, it may not be possible to schedule a make-up test. All make-ups will be administered during the week following the scheduled date of the quiz or exam. Make-up quizzes and exams may be different from those administered during the regular examination period.

**Grade Accuracy:** Errors in grading and/or recording of scores must be addressed within 7 days of posting by contacting the instructor in writing via email. Disputes after this one-week period will not be considered.

**Academic Integrity:** All students in this class are expected to respect the *Georgia Tech honor code* and behave in a professional manner when it comes to academic integrity. Any students violating the honor code or suspected of academic misconduct will be turned over to the office of Academic Integrity, Dean of Students to investigate the incident(s). Cheating off of another person’s test or quiz is unethical and unacceptable. Cheating off of anyone else’s work is a direct violation of the GT Academic Honor Code, and will be dealt with accordingly. *For any questions involving any Academic Honor Code issues, consult me, my teaching assistants, or [www.honor.gatech.edu](http://www.honor.gatech.edu).*

**Word:** Use of any previous semester course materials is allowed for this course; however, I remind you that while they may serve as examples for you, they are not guidelines for any tests, quizzes, homework, projects, or any other coursework that may be assigned during the semester

**Special Needs:** The Georgia Institute of Technology encourages qualified persons with disabilities to participate in its programs and activities. If you anticipate needing any type of accommodation in this course or have questions about physical access, please tell the

instructor as soon as possible.

**Course Objectives:** Students will learn the fundamentals of structure-property-processing relationships of engineering materials; the relationship of these fundamentals to the performance of these materials; the major properties, mechanical, chemical, electrical, and thermal properties of materials; students will be introduced to materials selection as part of engineering design; prepare students to undertake more in-depth courses in specialized areas within materials science and engineering.

**Course Outcomes:** Students should be able to: 1. Describe the five microstructural elements-atomic/molecular structure, defects, solute, precipitates, and grain boundaries and how they manifest themselves in each class of material. 2. Describe how the key microstructural elements are controlled by composition, temperature, time and deformation. 3. Describe the five key microstructural elements and how they relate to the properties of the major classes of materials.

**Teaching Assistants:** You are encouraged to contact your TAs for questions/problems. Following are names of your TAs and their e-mail addresses. Their contact and office hour information will be posted on T-square

TA: Maeling J.N. Tapp  
e-mail: maeling@gatech.edu

TA: Ngozi Eze  
e-mail: ngozi.eze@gatech.edu

TA: Ken Pradel  
e-mail: kpradel3@gatech.edu

TA: Guang Zhu  
e-mail: gzhu7@gatech.edu

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**Tentative Schedule**

<u>Week</u>	<u>Dates</u>	<u>Topics</u>	<u>Chapter</u>
1	8/20	Introduction to Materials	Ch. 1
	8/22	Atomic Bonding	Ch. 2
	8/24	Atomic Bonding	Ch. 2
2	8/27	Atomic Bonding	Ch. 2
	8/29	Crystal Structures	Ch. 3
	8/31	Crystal Structures	Ch. 3
3	9/3	<b>Labor Day Holiday</b>	
	9/5	Crystal Structures	Ch. 3
	9/7	Crystal Structures	Ch. 3
4	9/10	Imperfections in Solids- Point Defects	Ch. 4
	9/12	Imperfections in Solids- Point Defects	Ch. 4
	9/14	Imperfections in Solids- Point Defects	Ch. 4
5	9/17	Imperfections in Solids- Point Defects	Ch. 4
	9/19	Imperfections in Solids- Diffusion	Ch. 4
	9/21	<b>EXAM I (Chapters 1-4)</b>	
6	9/24	Imperfections in Solids- Linear Planer and Point Defects	Ch. 5
	9/26	Imperfections in Solids- Linear Planer and Point Defects	Ch. 5
	9/28	Imperfections in Solids- Linear Planer and Point Defects	Ch. 5
7	10/1	Non Crystalline and Semi-crystalline Solids	Ch. 6
	10/3	Non Crystalline and Semi-crystalline Solids	Ch. 6
	10/5	Non Crystalline and Semi-crystalline Solids	Ch. 6
8	10/8	Phase Equilibria and Phase Diagrams	Ch. 7
	10/10	Phase Equilibria and Phase Diagrams	Ch. 7
	10/12	Phase Equilibria and Phase Diagrams	Ch. 7
9	10/15	<b>FALL BREAK</b>	
	10/17	Phase Diagrams	Ch. 7
	10/19	Phase Diagrams	Ch. 7
10	10/22	<b>EXAM II (Chapters 5-7)</b>	
	10/24	Kinetics Microstructure and Phase Transformation	Ch. 8
	10/26	Kinetics Microstructure and Phase Transformation	Ch. 8
11	10/29	Phase Transformations	Ch. 8
	10/31	Phase Transformations	Ch. 8

	11/2	Phase Transformations	Ch. 8
12	11/5	Martensitic Transformations	Ch. 8
	11/7	Stress Strain Behavior	Ch. 9
	11/9	Ductile and Brittle Fracture	Ch. 9
13	11/12	Brittle Fracture	Ch. 9
	11/14	Fracture Mechanics	Ch. 9
	11/16	Fracture Mechanics	Ch. 9
14	11/19	Fatigue Fracture, Time Dependent Behavior – Creep	Ch. 9
	11/21	Fatigue Fracture, Time Dependent Behavior – Creep	Ch. 9
	11/23	<b>Official School Holiday (<i>Thanksgiving</i>)</b>	
15	11/26	<b>EXAM III (Chapters 8-9)</b>	
	11/28	Electrical Conductivity and energy band diagrams	Ch. 10
	11/30	Semiconductors: elemental, compound, n-type, p-type	Ch. 10
16	12/3	Semiconductors: elemental, compound, n-type, p-type	Ch. 10
	12/5	Semiconductors: elemental, compound, n-type, p-type	Ch. 10
	12/7	Temperature dependence	Ch. 10
17	12/10-14	<b>Final Exam (Exam week)</b>	