

**Introduction to Materials Science [MENG 285]
Summer Session A: May 28 – June 29, 2018.
Syllabus**

Course Description:

This course will provide an introduction to materials science for engineering and science majors. The first part of the class will introduce basic topics including atomic and molecular bonding, crystal structure, deformation, and stress, strain, and failure. The second part of the course will cover a selection of materials, including metals, ceramics, polymers, emulsions, and dispersions. Discussion will include “soft materials” that dominate our daily experiences with consumer products, including food, pharmaceuticals, personal care products, and biological materials.

Instructor: Sara Hashmi

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Office hours available by appointment.

Required Textbook:

William D. Callister, Jr., & David G. Rethwisch: Materials Science & Engineering: An Introduction. Wiley, 9th edition (2014).

Non-textbook Readings:

Why Things Break, by Mark Eberhart

Cats' Paws and Catapults, by Steven Vogel

Stuff Matters, by Mark Miodownik

Optional Text:

Alberto Fernandez-Nieves and Antonio Manuel Puertas (Editors): Fluids, Colloids and Soft Materials: An Introduction to Soft Matter Physics (2016).

*****All books are available at the Yale Bookstore**

Prerequisites: Introductory physics and chemistry, and freshman-level math.

Class Meetings: Monday, Wednesday, Friday: 1-3:15 pm

*Exams will be held outside of lecture, on June 7, 19, and 29, times TBA.

Classroom Location: Mason 104 (to be confirmed)

Assignments: There will be eight Problem Sets. Short in-class quizzes will be held on Wednesdays, to assess non-textbook readings in addition to lecture material. *Quizzes will be held at the beginning of lecture, and will not be re-administered if students are late to class.* Each student will give an in-class presentation on the last class day, on a materials science topic of their choice, to be assessed by their peers.

Collaborative Work: Students are encouraged to work together on Assignments, but *must turn in their own work.*

In-Class Participation: Students are expected to be active participants in class. Lecture will include in-class discussions, activities, and demos.

Exams: There will be three non-cumulative exams. They will be closed book, and arranged for a mutually convenient time outside of lecture.

Grading:

Problem Sets	20%
Exams I, II, III	20% each*
Presentations	10%
Participation	10%

*Exam grades will each include contributions from the 1 or 2 preceding quizzes.

Course Outline/Weekly Agenda:

Week 1: Atomic & Molecular Bonding, Crystal Structure, Defects

Reading: C&R Chapters 1-4

Reading: Why Things Break, Chapters 1-3, p. 1-54

Assignment: PS1 due June 1; PS2 due June 4

Quiz 1: Wednesday May 30, including Why Things Break

Week 2: Diffusion, Materials Testing, Deformation & Failure

Reading: C&R Chapters 5-8

Reading: Cats' Paws & Catapults, Chapters 5-7, p. 82-152

Assignment: PS3 due June 8; PS4 due June 11

Quiz 2: Wednesday June 6

Exam I: Thursday, June 7, time TBA.

Week 3: Deformation & Failure cont.; Phase Diagrams & Kinetics

Reading: C&R Chapters 8-10

Assignment: PS5 due June 15

Quiz 3: Wednesday June 13, incl. Cats' Paws & Catapults;

Week 4: Focus on Materials: Metals, Ceramics, Glasses, Polymers

Reading: C&R Chapters 12-15

Reading: Stuff Matters, Chapters 4 & 7, p. 73-90 & 139-158

Assignment: PS6 due June 18; PS7 due June 22

Presentation drafts by appointment June 20

Exam II: Tuesday, June 19, time TBA.

Week 5: Focus on Materials: Suspensions, Emulsions, Gels

Assignment: PS8 due June 25

Quiz 4: Wednesday June 27, including Stuff Matters

Exam III: Thursday, June 28, time TBA.

Presentations will be held in class June 29