

MECHANICAL PROPERTIES OF MATERIALS
MTSE 610-101 (CRN 95459)

Wednesday 6:00 pm – 8:50 pm, FMH 404

Instructor: Dr. Oktay Gokce Tiernan 456
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Office hours: By appointment

Course Description: Overview of mechanical properties of ceramics, metals, and polymers, emphasizing the role of processing and microstructure in controlling these properties.

Learning Outcomes:

The Materials students will be able to deal with the stresses, strains and displacements of near-stationary structural materials subjected to applied loads. The students will learn the basics of solid mechanics within the context of processing-structure-properties-performance that characterizes Materials Science and Engineering. After having a sound understanding of the fundamentals of material behavior, students should be able to choose proper structural modification methods for the materials at micro/nano scale to tailor the desired performance properties at macro scale.

Textbook: Thomas H. Courtney, MECHANICAL BEHAVIOR OF MATERIALS (2nd edition), Waveland Press, 2005, ISBN-13: 978-1577664253.

Course website: The lecture outlines and additional material will be posted on the course website at Canvas. Go to <https://canvas.njit.edu/> ; log in with your UCID.

Project: Present paper in class (15 to 20-min talk + questions), and ~ 7 page report (not including figures).

Date:	Subject (book chapter):
Week 1	Introduction, Overview of Mechanical Behavior (Ch. 1)
Week 2	Elastic Behavior (Ch. 2)
Week 3	Dislocations (Ch. 3)
Week 4	Plastic Deformation in Single and Polycrystalline Materials (Ch. 4)
Week 5	Strengthening of Crystalline Materials (Ch. 5)
Week 6	<i>Midterm Exam (Ch 1-Ch. 5)</i>
Week 7	High-Temperature Deformation of Crystalline Materials (Ch. 7)
Week 8	Deformation of Noncrystalline Materials (Ch. 8)
Week 9	Fracture Mechanics (Ch. 9)
Week 10	Fatigue of Engineering Materials (Ch. 12)
Week 11	Embrittlement (Ch. 13)
Week 12	<i>Projects</i>
Week 13	<i>Projects</i>
Final Exam Week (December 20)	<i>Final Exam (Comprehensive)</i>

Final Grade consists of the following items:

Midterm Exam: 30%

Final Exam: 30%

Projects: 20% (Presentation from a selected journal article and a report. Also a second report as a critique on another student's presentation project is requested)

Homework: 20%