

ME 265-03 Fall 2011

Intermediate Materials Science

Course Schedule

Monday-Friday, 14:50PM-16:05PM, Teer 211

Instructors

Prof. Stefano Curtarolo, 233 Hudson Hall, Phone: 660-5506, e-mail: stefano@duke.edu

Course Description

Structure and properties of solid materials: crystal structure and bonding, reciprocal space, free electron model, energy bands in solids, origin of electromagnetic, thermal and mechanical properties, concepts of thermally activated processes and characterization methods.

Office Hours

Curtarolo: by appointment.

Text Book

extracts from:

J. Shaffer, *et al.*, *The Science and Design of Engineering Materials* (second edition)

ISBN: 0-256-24766-8, McGraw Hill, (1999)

Ebook: <https://create.mcgraw-hill.com/shop/#/catalog/details?isbn=9781121004306>.

extracts from:

Neil W. Ashcroft, N. David Mermin, *Solid State Physics*, ISBN 0-03-083993-9, (1976)

Paperback: <http://www.amazon.com/Solid-State-Physics-Neil-Ashcroft/dp/0030493463>

extracts from:

Charles Kittel, *Introduction to Solid State Physics*, Wiley; 8 edition (July 12, 2004).

Paperback: <http://www.amazon.com/Introduction-Solid-Physics-Charles-Kittel/dp/0471111813>

handouts:

Stefano Curtarolo, *Handouts from "solid state engineering I and II (ME265)"* (2011).

Stefano Curtarolo, *Handouts from "introduction to materials science (ME83)"* (2011).

Tentative Course Outline

0. Discussion of outcomes (1)
1. Structure of crystals (1)
2. Bonding in solids (1)
- 3-4. Diffraction and reciprocal lattice (2)
- 5-6. Thermodynamics of materials: order/disorder and source of entropy in solids (2)
- 7-11. Electron in Solids: Electrical and Thermal Properties (5)
- 12-13. Phonons in Solids: Thermal Properties and entropic stabilization (2)
- 14-15. Thermally Activated Processes (2)
- 16-17. Metals and Alloys (2)
- 18-20. Mechanical Properties of Materials (3)
- 21-24. Semiconductors (4)