

MTEN613, Characterization of Materials

NJIT, Spring 2024 Syllabus

1/9/2024

Time and Location: Thursday, 6pm-9pm --- Mechanical Engineering Dept. 224

Instructor: Mirko Schoenitz,

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Course materials: canvas.njit.edu

“Office hours”

Mo-Fr 10am-5pm in person (YCEES 218), or by phone, or via Webex;

I will be available with 24 h notice – I may be available on shorter notice.

Books:

(recommended, available electronically at NJIT library)

- *Materials Characterization, Introduction to Microscopic and Spectroscopic Methods*, Leng, Y., Wiley, 2013:
https://primo.njit.edu/permalink/01NJIT_INST/dcbe8h/alma994911658605196
- *ASM Handbook Vol 10: Materials Characterization (2019 Edition)*:
https://primo.njit.edu/permalink/01NJIT_INST/dcbe8h/alma992240273405196

(also useful)

Materials Characterization Techniques, Zhang, S., Li, Lin., Kumar, A., CRC Press, 2009

Introduction to the Principles of Materials Evaluation, Jiles, D.C., CRC Press, 2008

Grading: Exams (30 % each), research presentation (30 %), weekly assignment (10 %)

| Date | Topics | Assigned reading |
|--------|--|-----------------------------|
| 18-Jan | Introduction/Overview: materials structure and matter-radiation interactions | -- |
| 25-Jan | Electron Microscopy I: SEM, Microanalysis | Zhang Ch. 7, Leng Ch. 4 & 6 |
| 1-Feb | Electron Microscopy II: TEM | Leng Ch. 3 |
| 8-Feb | Surface Analysis: XPS, AES | Zhang Ch. 3 (+Ch. 2) |
| 15-Feb | Probe Microscopy: STM, AFM | Zhang Ch. 4 |
| 22-Feb | Diffraction I: XRD, Phase ID | Zhang Ch. 5 |
| 29-Feb | Diffraction II: Phase Analysis, Rietveld | TBA |
| | (research paper selection for presentation is due) | |
| 7-Mar | Midterm | |
| 21-Mar | Vibrational Spectroscopy: IR, Raman | Leng Ch. 9 |
| 28-Mar | Thermal Analysis I: Fundamentals | Zhang, Ch. 10 |
| 4-Apr | Thermal Analysis II: Kinetic analysis | TBA |
| 11-Apr | Mechanical testing | TBA |
| 18-Apr | Research Presentations 1 | |
| 25-Apr | Research Presentations 2 | |
| 9-May | Final | |

Academic Integrity:

Exams will be open-book, open-notes, but strictly without electronic devices. For exams, any attempts at cheating will be reported to the Dean of Students. For everything else, including homework, collaboration is greatly encouraged.

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