

Material Characterization - Course Syllabus

Course Number: MSE 307

Course Title: Material Characterization

Academic Semester: Spring
Semester Start Date: Jan 24, 2016

Academic Year: 2015/ 2016
Semester End Date: May 19, 2016

Class Schedule: Wednesday-Thursday 4:00-5:30 pm

Classroom Number: 3137 bld 9

Instructor(s) Name(s): Enzo Di Fabrizio
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Office Location: room 3235 bld 3 sea side

Office Hours: Sunday-Tuesday 3-5 pm

COMPREHENSIVE COURSE DESCRIPTION

- Course description:

This course will introduce the basic principles of materials characterization and the common characterization techniques available at KAUST. It will cover the following topics:

Basic principles, interaction of radiation and particle beams with matter.

Diffraction methods.

Images, optical, scanning, transmission electron, scanning tunneling and field ion microscopy.

Microanalysis and Spectroscopy, energy dispersive, wavelength dispersive, Auger Processes, Electron, Ion growth, SIMS, ESCA.

Thermal analysis: DTA, DSC.

Depending on availability and functionality of equipments, lab visits and demonstrations will be scheduled to the class to discuss some case studies.

GOALS AND OBJECTIVES

Course Objectives

The objectives of the course are 4. They are aimed to guide the student to become aware of:

- 1) the latest Fabrication Technologies and their relation with material structuring and properties
- 2) the most advanced imaging instruments for investigating the modern material at the highest topographic resolution.
- 3) the common used analytical tools for characterizing modern materials at highest sensitivity
- 4) the latest advancement in spectroscopy for getting structural and elemental analysis of Material

REQUIRED KNOWLEDGE

No specific prerequisites, aside a basic knowledge of electromagnetism and introductory quantum mechanichs.

In any case the lectures are organized in a way that modular recalls will be given to the student in a way that each lecture is self explaining.

REFERENCE TEXTS

textbook(s):

Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, Yang Leng, Wiley & Sons; 1st Edition, June 2008,

(Optional) Materials Characterization (Vol. 10), George M. Crankovic, Kathleen Mills, Ruth E. Whan, ASM Handbook Committee

Additional lecture notes/ Hand outs

- Reference books:
- Characterization of Materials, 2 Volume Set (Hardcover), Elton N. Kaufmann (Editor); Publisher: Wiley-Interscience (2003)

Additional Text books

- High-Resolution Imaging and Spectrometry of Materials (Springer Series in Materials Science), Frank Ernst and Manfred Ruehle (Eds), Springer (2003)
- Transmission Electron Microscopy. A Textbook for Materials Science. Bd. I - IV , David B. Williams and C. Barry Carter, Springer Netherlands; 6th Corr. Edition, (1996)

- Atom Probe Tomography: Analysis at the Atomic Level , Michael K. Miller Kluwer Academic / Plenum Publishers, (2000)

METHOD OF EVALUATION

Percentages %	Graded content
(50%) (50%)	<ul style="list-style-type: none"> • Grading: • Exam: <p>Comprehensive Final Mid-Term</p> <p>Both are oral exams. Students will be examined in four different topics. Students are free to select two topics for the mid- term and two different topics for the final.</p>

COURSE REQUIREMENTS

Assignments

- Homework policy: Home work will be announced and solution will be posted later, students are asked to verify their own solutions.

Course Policies

A max number of absences of 2 lectures with justification.

Late work policy will be examined case by case. If this will be serious a warning will be given to the student.

NOTE

The instructor reserves the right to make changes to this syllabus as necessary.