

50:750:420 - Methods of Material Characterization

Instructor	Dr. Sean O'Malley	E-mail	omallese@camden.rutgers.edu
Phone	856-225-6159	Office Hours	T & R from 3:20 – 4:20pm
Office	CNS 216F	Final Exam	TBA

Class time: T & R from 2:00 – 3:20pm

Lab time: by appointment

Text: "Materials Characterization Techniques" by Zhang, Li, and Kumar, ISBN 978-1-4200-4294-8 (*It is not required that you purchase this book*)

Other useful books:

- "Materials Characterization: Introduction to Microscopic and Spectroscopic Methods" by Yang Leng, ISBN 978-0-470-82298-2 (*good text, slightly more advanced, missing some techniques that the above text includes but also includes some that the above text doesn't cover*)
- "Semiconductor Material and Device Characterization" by Dieter Schroder, ISBN 0-521-37095-7 (*very good graduate level text that is specialized to semiconductor characterization*)

Description:

This course is meant to provide *you* the student with a working knowledge and understanding of modern characterization techniques commonly encountered in the physical sciences. The course will contain both lecture and lab components.

Learning goals:

Upon completion of this course you (the student) should have acquired the ability to select an appropriate characterization method, setup and operate the necessary instrumentation, and interpret your data.

Details:

- 1) Office hours are just a formality – You may stop by my office anytime, however I may or may not be available.
- 2) There will be **two semester exams** and a **final** pertaining to the material covered during lecture. (100 pts ea.)
- 3) There will be **quizzes** and **labs assignments**. (up to 30 pts ea.)
- 4) At the end of the semester each student must write a report and give a presentation on a characterization technique that has not been discussed in class. (In most cases I will assign the topic, 100 pts)

Grading:

A	90-100%	C	67-75%
B+	87-89%	D	55-66%
B	80-86%	F	<55%
C+	76-79%		

Instructor's Statement:

Do not engage in any form of academic dishonesty. If you do not know what academic dishonesty is, please consult this statement:

<http://www.camden.rutgers.edu/RUCAM/info/Academic-Integrity-Policy.html>.

I will report any violations of this policy to the campus Judicial Officer.

Please note that it is necessary to explain all steps that you take on exams – make an effort to **clearly** show your work. Answers without justification will not be accepted! You may be asked to explain your reasoning.

Do not bring cell phones to class or disrupt class in any way. If you do so, you will be asked to leave and will not be welcomed back for the rest of the class period. The use of computers will be at my discretion – in general they will not be necessary or welcome.

Attendance is strongly suggested at all class meetings in accordance with the policies and guidelines set forth in the student manual.

Attending the lecture is not enough. Take notes in class and read-up on the relevant topics on the web or in textbooks.

Class Resources:

<https://sakai.rutgers.edu/portal>

Class Outline:

- 1) Optical Microscopy
- 2) Ultraviolet-Visible Spectroscopy (UV/VIS)
- 3) Fourier Transform Infrared Spectroscopy (FTIR)
- 4) Photoluminescence (PL) and Cathodoluminescence (CL)
- 5) X-ray Diffraction (XRD)
- 6) X-ray Fluorescence (XFS) and X-ray Photoelectron Spectroscopy (XPS)
- 7) 4-Point Probe
- 8) Atomic Force Microscopy (AFM)
- 9) Scanning Electron Microscopy, Scanning Tunneling Microscopy (STM) and Tunneling Electron Microscopy (TEM)
- 10) Mass Spectrometry
- 11) Liquid/Gas Chromatography (HPLC/GC)
- 12) Thermogravimetric Analysis (TGA)