

Syllabus: **MSE 5322, Microstructural Characterization of Materials**
Fall, 2016 T/Th, 2-3:15 pm; ITE-127.

Instructor: Prof. Bryan D. Huey
IMS Plaza, Room 158, 486 3284, bryan.huey@uconn.edu
Office Hours: Wednesday **1-2**, or by appointment

Teaching Assistant: Tyler Flanagan tyled.flanagan@uconn.edu
Office Hours: Monday **3:30-4:30**, IMS reading room

Communications with Huey or Flanagan: For any email messages sent to Professor Huey or TA Flanagan, **include 5322 in the subject line** to be sure they don't get lost in our very full mailboxes. Be aware that the ease and immediacy of sending messages does not guarantee an immediate response.

Course Web Page: [huskyCT](#)

Required Textbook: Introduction to Microscopic and Spectroscopic Methods, 2nd edition
by Y. Leng, Wiley VCH (2013).

Goals: To introduce fundamental concepts of microstructural characterization, including concepts, interpretation, equipment, and limitations. This course will therefore help you to identify appropriate characterization techniques for research and analyze their results. The class is not hands-on, and will not teach the actual use of any particular method, but rather will emphasize operational theories, selection of appropriate techniques for scientific questions, and interpretation of corresponding results.

Lab Projects: None, though optional lab visits may be arranged.

Topics: The class will cover a range of microscopy techniques (optical, fluorescence, confocal, scanning electron, transmission electron, focused ion beam, helium ion, x-ray transmission, atomic force, and scanning tunneling). We will also learn several methods that are primarily spectroscopic (Auger electron, x-ray photoelectron, energy and wavelength dispersive, EELS, infrared, and Raman). We will not cover DTA, or DSC, although the book includes sections describing these methods as well.

Assessment: Grading is based on performance on homework assignments (5*12%), in class presentations (4%), a midterm (12%), and a comprehensive final exam (24%).

Prerequisites: This class is a core course for MSE graduate students, and therefore is taught primarily with their background in mind. Concepts such as atomic and molecular orbitals, band diagrams, Newtonian forces, electromagnetic interactions, phase diagrams, unit cells, crystal lattices, and crystal defects will be used extensively. If this material is unfamiliar to you, be prepared to do substantial additional work throughout the term to keep up with the class. If this content is totally foreign to you, it would be wise to first take a more introductory MSE course.

Homework: Assignments handed in *after the start of class* lose credit depending on the timing. You may work together on homework assignments (only), BUT, you must hand in *your own work, in your own words*. You may NOT work together on exams. The department, and university, take any hint of plagiarism or cheating very seriously. <http://www.mse.engr.uconn.edu/statement-on-plagiarism-and-cheating>

MSE 5322 Schedule, Fall 2016

Lecture	Date	General Topic	Reading	Presenters	Deadlines
1	8/30/2016	introduction			
2	9/1/2016	optical	Chapter 1		
3	9/6/2016	optical			
4	9/8/2016	xrays-absorption	Chapter 2		
5	9/13/2016	xrays-diffraction-I			
6	9/15/2016	xrays-diffraction-II			
7	9/20/2016	xrays-diffraction-III			HW1 due
8	9/22/2016	diffraction IV		GT	
9	9/27/2016	TEM	Chapter 3	DT	
10	9/29/2016	TEM II		AG,MB	HW2 due
11	10/4/2016	TEM III/Midterm Prep		HL	
12	10/6/2016	MIDTERM			
13	10/11/2016	SEM	Chapter 4	TN	
14	10/13/2016	ESEM		CH	
15	10/18/2016	EDS/WDS	Chapter 8	YD,RO	
16	10/20/2016	EELS	Chapter 6	AL,KC	HW3 due
17	10/25/2016	mass spec, IR (guest lecture)	Chapter 8,9		
	10/27/2016	TBA (MST meeting)			
	11/1/2016	TBA (MST meeting)			
18	11/3/2016	XPS, AES	Chapter 7	HSK,SR	
19	11/8/2016	FIB, HIM, XIM/PIM		TR,YS	
20	11/10/2016	Nanoindentation and SPM (guest lecture)	Chapter 5	TM,JS	HW4 due
21	11/15/2016	AFM		JF,MT	
22	11/17/2016	AFM II		CC,EC	
	11/22/2016	Thanksgiving break			
	11/24/2016	Thanksgiving break			
23	11/29/2016	STM		AJ,JH	
	12/1/2016	no class (MRS meeting)			
24	12/6/2016	STM		TW	
25	12/8/2016	Final prep, Surveys			HW5 due
final	12/12-12/18	Exams one day this week (TBA)			