Spring 2018

CHE/MT/PEP/NANO-525

Techniques of Surface and Nanostructure Characterization

Tue & Th 4:00 – 5:50 p.m., Place: Babbio 310

Office Hours – Stefan Strauf, Mon 11-noon, Friday after 11:40am-1pm, Burchard 724

Reference textbook: Characterization of Nanostructures, S. Myhra, J.C. Riviere, CRC Press, Taylor& Francis Group, ISBN: 978-1-4398-5415-0.

The goal of the course is to introduce students to the fundamentals, instrumentation, and applications of common analytical tools for surface and nanostructure characterization. The students will acquire the knowledge necessary for the selection of most suitable techniques and for the interpretation of the resultant information relevant to surface science and nanotechnology. The course will consist of 50% of lectures and 50% of demonstration experiments at Stevens labs.

Introduction	S. Strauf	1/18 lecture
Ellipsometry	S. Strauf	1/23 lecture 1/25 demo Burchard 5xx
Transmission Electron Microscopy; Electron Energy Loss Spectroscopy Scanning Electron Microscopy	Alex Chou	1/30 lecture, SEM&EDS 2/1 demo SEM&EDS LMSI, Burchard basement
Transmission Electron Microscopy; Electron Energy Loss Spectroscopy Scanning Electron Microscopy	Alex Chou	2/6 lecture on TEM&EELS2 2/8 demo TEM&EELS LMSI, Burchard basement
Atomic Force Microscopy	F. Fisher	2/13 lecture 2/15 demo LMSI, Burchard basement
Auger Electron Spectroscopy, X-Ray Photoelectron Spectroscopy	H. Du	2/22 lecture
Optics I Optical spectroscopy and Raman Scattering	S. Strauf	2/27 lecture 3/1 demo Burchard 725
Optics II Optical & quantum optical spectroscopy of nanostructures (PL, PLE, TRPL, HBT)	S. Strauf	3/6 lecture 3/8 demo, Burchard 725
BET technique	R. Besser	3/20 lecture 3/22 demo
Measurement of surface tension	E.H. Yang	3/27 lecture 3/29 demo
Dynamic Light Scattering	P. Muisener and Alex Chou	4/3 lecture 4/5 demo

		LMSI, Burchard basement
Quantum Information Processing	Yuping Huang	4/10 lecture 4/12 demo, Burchard 6xx
X-ray diffraction	S. Lee	4/17 lecture
Term paper presentations	F. Fisher/ S. Strauf	4/19, 4/24, 4/26,
Final exam	S. Strauf	TBD

Term Paper

The final paper and presentation will be a state of the art literature review of a NEW (not covered in class) nanoscale characterization technique that can be, and has been, used in your field of interest. You should first describe the fundamentals and operating principles of the technique, and then critically review at least 5 research articles which use the technique (or a related technique) to advance the field of nanoscience. The paper should be of 'publishable quality' and will be graded on organization, clarity, and grammar in addition to content. The maximum length of the paper is 10-pages (**11 font, 1 inch margins, single-spaced**); this page limit will require you to be selective and concise with the information that you include in your review. Students may discuss potential projects with the class instructors prior to selection. A 1-page written proposal of your literature review will be due April 1 and must be approved by the instructors.

Successful term papers will: (a) introduce a new characterization technique not covered in the course, (b) present the fundamentals of the technique in a manner that your audience will clearly understand the scientific basis supporting the technique, (c) discuss the requirements and limitations of the technique, and (d) through a discussion of recent, high-impact peer-reviewed scientific journals, describe the application of the technique in a way that illustrates the advantages and power of the technique.

All papers will be run through TurnItIn, a state-of-the-art anti-plagiarism software, with dire consequences should any inconsistencies be detected!

Term papers are due May 2.

Presentations of Term Paper

Presentations will be 17 minutes in length with 3 additional minutes allotted for questions and discussion. The final paper is specifically scheduled as such so that comments and feedback from your presentation can be incorporated into your final paper. The presentation dates are 4/19, 4/24, and 4/26.

Grading Policy

Homework 15%; term paper 30%; presentation 20%; final exam 35%.