Syllabus Spring 2016
Chemistry 527 Analytical Chemistry of Surfaces

MWF 12-12:50 pm
Room 146 Park Hall

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Course Description

This course is meant to introduce methods of surface analysis and their applications within a framework that includes a problem solving approach to complex real world systems. The course is divided into three areas, formal lecture material, teamwork based problem sets assignments and oral presentation/ research review paper. The grading will be based on two exams (both take home), problem sets (a shared team grade which the class will assign) and the presentation and review paper. The material to be covered in lecture will cover electron spectroscopy and related imaging methods, optical spectroscopies and ion and mass spectrometric and microcsopioc methods as they are applied to the determination of surface chemistry. The applications of these methods will be developed through the problem sets and the review papers. Topics such as catalysis, corrosion, adhesion, semiconductor materials, biomaterials, electrochemical surfaces, polymers, membranes and others of interest to the class will be discussed.

Learning Goals and Outcomes

successful work in this course will involve the following learning outcomes:

- Advanced understanding of surface chemical analysis and surface chemistry
- A strong understanding of the instrumentation and physics of measurement for electron spectroscopy, mass and ion spectrometry and vibrational spectroscopy of surfaces
- Develop research skills
- Develop critical thinking

These outcomes will be met by the combination of successful completion of take home mid-term and final exams, a final research paper and practical work in homework applications of methodology, along with classroom presentations on your papers and homework and your classroom discussion and participation.

Resource Material/Text

The required text for this course is: **Surface Analysis - The Principal Techniques 2nd Edition (2009)** edited by John C. Vickerman and Ian Gilmore. Information on other text materials will be available in class. You may wish obtain this from Amazon. Here is a link.

http://www.amazon.com/Surface-Analysis-Techniques-John-Vickerman/dp/0470017643/ref=sr_1_1?ie=UTF8&qid=1453403558&sr=8-1&keywords=vickerman+and+Gilmore

In addition UB Science Librarian Ben Wagner has produced a resource listing of other e-books and articles available in the Science and Engineering Library.

Grading Requirements

Those students auditing the course will be expected to participate in the group problem solving sessions and present an oral review paper. The grading will be based on an absolute total of 1000 points, distributed as follows.

Problem Set Team Grades	200 points
Oral Review Presentation	200 points
Submitted Review Paper	200 points
Mid-term Exam	100 points
Final Exam	300 points
Total	1000 points

Academic Integrity

Students in the course are subject to the University's Integrity policy (http://undergradcatalog.buffalo.edu/policies/course/integrity.shtml). Please familiarize yourself with this.

Students with Disabilities

Disabled students may seek accommodations for testing, and any in-class needs. The course leaders are especially concerned that ANY student needed accommodations be fully served. The UB Disability services office provides a registration system and a list of procedures (http://www.student-affairs.buffalo.edu/ods/) Please consult with them if you have any disability or educational need that might require accommodations.

CHE 527 Spring 2016
Lecture/Meeting Schedule

#	Date/Day	Lecture Topic (s)	Assignment
1	Jan 25	Molecular and Atomic Surface Structure; Surface Chemical Reactions; Method Overview Imaging and Microscopy Instrumentation	Form Groups
2	Jan 27	XPS/ESCA Principles	none
3	Jan 29	XPS/ESCA Principles II Homework groups	Choosing Surface Anal. Methods
4	Feb 1	XPS/ESCA Principles III Qualitative Analysis I	
5	Feb 3	XPS/ESCA Qualitative Analysis	
6	Feb 5	XPS Quantitative Analysis Homework groups	Chemical Shifts
7	Feb 8	XPS Quantitative Analysis II	
8	Feb 10	XPS Instrumentation	Demonstration on XPS
9	Feb 12	XPS Qual/Quant/Inst Homework Groups	Measuring Surface Concentrations
10	Feb 15	XPS Instrumentation	Instrumentation Designs
	Feb 17	No Class	Paper Topic Due by email
11/12	Feb 19	Auger Principles and Qualitative Analysis, Homework Groups	Predict Auger Spectra
13	Feb 22	Auger Qualitative Analysis	
14	Feb 24	Auger Quantitative Analysis	
15	Feb 26	Auger Quantitative Analysis Homework groups	Auger Surface Concentrations
16	Feb 29	Sputter Depth Profiling	**Take Home Midterm Handout**
17	Mar 2	Sputter Depth Profiling	
18	Mar 4	Auger/XPS Depth Profiling Homework Groups	Quantitative Depth Profiling by Auger/XPS
19	Mar 7	Ion Beam Principles	Midterm Due
20	Mar 9	Ion Beam Principles	
21	Mar 11	Low Energy Ion Scattering Homework Groups	Depth Profiles of Buried Interfaces
	Mar 14-18	SPRING BREAK	
22	Mar 21	Low Energy/High Energy Ion Scattering	
23	Mar 23	Rutherford Backscattering Spectrometry	
24	Mar 25	Intro to SIMS Ion Microscopy Homework Groups	ISS and RBS Analysis - When?
25	Mar 28	SIMS Quantitation	
26	Mar 30	SIMS Quantitation	
27	Apr 1	Static SIMS Principles	SIMS Quant Current Status
28	Apr 4	Static SIMS Principles	

#	Date	Lecture Topic	Assignment
29	Apr 6	Static SIMS Applications	
30	Apr 8	Static SIMS Applications Semiconductors	
31	Apr 11	Ion Beam Instrumentation	
32	Apr 13	Ion Beam Instrumentation TOF SIMS Demo	
33	Apr 15	Vibrational Methods	
34	Apr 18	ATR and RA FTIR	
35	Apr 20	Raman Imaging Microscopy	
36	Apr 22	HREELS	Literature Surveys
37	Apr 25	Make Up	
38	Apr 27	Make Up	
39	Apr 29	Make Up	
40	May 2	Student Presentations	
41	May 4	Student Presentations	**Paper Outline/Biblio**
42	May 6	Student Presentations	**Paper First Draft** **Final Exam Handout**
	May 14		**Final Exam Due**