Special Topics in Physical Chemistry

(Surface Science and Catalysis on Nanomaterials)

CHM 6580

Fall 2020

Class Meeting Times:	M W F period 3 (9:35-10:25 AM)
Class format:	online via Zoom and Canvas (Zoom Privacy: Our class sessions are not audio-visually recorded. If there is a change in policy students will be notified.)
Instructor:	Dr. Wei David Wei
Phone:	352-392-2050
E-mail:	wei@chem.ufl.edu
Office Hours:	M: 10:30-11:30 am W: 2:00-3:00 pm or by appointment
Office Location:	CLB 311D
Grading Criteria:	(30%) Class participation, quizzes, and in-class discussions (20%) Problem sets (20%) Term paper and group work (30%) Final presentation
Scheme:	100-90%(A); 89-85%(A-) 84-80%(B+); 79-75%(B); 74-70%(B-) 69-67(C+); 66-64%(C); 63-60%(C-) 59-57(D+); 56-54%(D); 53-50%(D-) <50% (F)
Holidays (no class):	09/07 (Labor Day), 11/11 (Veterans Day), 11/25 – 27 (Thanksgiving holidays)
Tests:	No final exam Quizzes and Problem sets in class
Class Text:	Materials will be provided. No required textbook for the

course. We will be working from selected book chapters, handouts, review articles and research papers, distributed electronically. However, there are many excellent texts that treat various aspects of the course and will be helpful in gaining a better understanding and in preparation of the term papers. Extra recommended reading materials are:

Kolasinski, Surface Science: Foundations of Catalysis and Nanoscience

Hornyak Gabor L., Introduction to Nanoscience & Nanotechnology

O'Connor, Sexton, Surface Analysis Methods in Materials Science

Somorjai, Introduction to Surface Chemistry and Catalysis

Course Objectives: Understand chemical and physical phenomena particular to surfaces and interfaces of nanomaterials

Introduction to modern surface science methods and their application to current research topics on nanomaterials.

Critical interpretation of surface analysis data and surface science research reports.

Term paper will be 4-6 pages to present a surface analysis method not discussed in class or discuss a modern problem or novel material that has been addressed or characterized using a combination of techniques. The papers will be peer-reviewed by two of your classmates before final "submission" on the last day of class. Short presentations (~30min.) will take place in the last weeks of the semester. More details on this later.

Attendance is mandatory and participation in class discussion is a very important part of the course. A key objective of the course is critical reading and

interpretation of surface analysis data and papers. All will be done in the class. If you must miss class, please contact me in advance.

Since exams are during normal class hours, make-up exams are granted **solely** at the discretion of the instructor. Any request for make-up exams should have a legitimate excuse, and be made to Dr. Wei no later than 1 week prior to the exam date. Students should also familiarize themselves with the UF Student Honor Code posted on the web at www.chem.ufl.edu/~itl/honor.html. Students with disabilities must first register with the Dean of Students Office; the Dean of the Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation.

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/.

The following is a tentative schedule for the semester. All aspects of this schedule are subject to change, but we will try to keep on schedule.

Introductions
Kinetic theory of gases Ultra-high vacuum
Surface Structures
Low-energy electron diffraction
Adsorption Diffusion and growth at surfaces
Overview of surface analytical methods

Nanoscience and nanotechnology
Thermal desorption spectroscopy
Reactions at surfaces Thin film growth on surfaces
Scanning probe microscopy overview
AFM
SEM
STM
SNOM
Vibrational spectroscopy overview
IR
SERS
HREELS
Surface composition analysis
Electron/ion energy analyzers
Excitation sources
XPS
AES
SEM/EDX
Surface photoemission spectroscopy
UPS and 2PPE
Student presentations
Student presentations
Student presentations