

LOYOLA UNIVERSITY CHICAGO, DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY  
CHEM 395/435 – SYLLABUS, SPRING 2023

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Instructor: Dr. Mausumi Mahapatra  
Lectures: (Mon, Wed 4.15 PM – 5:30 PM, Flanner Hall 105)  
Office Hours: Tue 11 AM-1 PM, FH 401 or by appointment  
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E-mail: [mmahapatra1@luc.edu](mailto:mmahapatra1@luc.edu)

Please contact me using the Loyola email system for course-related communications. Course-related information will be posted on Sakai (sakai.luc.edu )

### **COURSE DESCRIPTION**

The objective of this course is for students to learn about the fundamental aspects of surface science and its applications in heterogeneous catalysis. The course will cover various spectroscopic and microscopic experimental techniques for the characterization of model catalyst surfaces. Literature studies will be included throughout the course material to understand the use of various characterization techniques in catalysis research.

### **COURSE MATERIALS**

- Modern Techniques of Surface Science by D.P. Woodruff and T.A. Delchar
- Practical Guide to Surface Science and Spectroscopy by Yip-Wah Chung
- Surface Science an Introduction  
<http://ntc.dvo.ru/lecture/books/%23Surface%20Science-An%20Introduction%202003.pdf>
- **Access to your LUC email and Sakai.** Check here often for general information, announcements, discussion forums, and grades.

### **COURSE STRUCTURE AND GRADING**

There are two 75-minute in-person lectures (Mon, and Wed) that will cover the detailed course materials. The course materials will cover the basics of surface science, ultra-high vacuum, and various spectroscopic and imaging techniques for the characterization of catalytic materials. The application of the course material will be demonstrated by giving examples from the literature with a major emphasis on “heterogeneous catalysis from a surface science perspective”. Homework (either problem sets or literature review) will be given every ~ 2 weeks. There will be a take-home final at the end of the course. Each student will give a presentation in the class (~15 minutes) on a literature paper. The Grading will be based on the

following:

Homework 40 %

Presentation 20 %

Final 40 %

The following grading standards will be used:

**A** 92 % and up    **B +** 82 % – 86.99 %    **C+** 67% - 71.99 %    **D** 52 % – 56.99 %

**A –** 87 % – 91.99 %    **B** 76 % – 81.99 %    **C** 62 % – 66.99 %    **F** Less than 52 %

**B –** 71 % – 75.99 %    **C –** 57 % – 61.99 %

### **LATE/MISSED WORK**

- If you for any reason require special accommodations during any of the exams, contact me **WELL BEFORE** the exam.
- If you miss deadlines or exams for valid reasons (emergencies related to family, medical, legal, or immigration issues) you must contact me by email within 48 hours of the exam to avoid failing the exam.

### **ACADEMIC CALENDAR**

You are responsible for understanding all processes and timelines associated with dropping or withdrawing from this course, filing for a PASS/FAIL conversion, etc. The Loyola University Chicago academic calendar that lists important dates and deadlines for the semester can be found at <https://www.luc.edu/academics/schedules>.

### Course Schedule (*tentative*)\*

Week	Dates	Lecture	Assignments
1	1/18	Introduction to Surface Science	
2	1/23 1/25	Ultrahigh Vacuum and its Components	
3	1/30 2/1	Basics of Two-Dimensional Crystallography	Homework 1
4	2/6 2/8	Surface Analysis: Microscopy	
5	2/13 2/15	Atomic Structure of Clean Surfaces and Surfaces with Adsorbates	
6	2/20 2/22	Growth of Thin Films and Nanostructure Formation	Homework 2
7	2/27 3/1	Adsorption, Desorption, and Diffusion on the Surface	
8	3/6 3/8	<b>Spring Break (no class)</b>	
9	3/13 3/15	Surface Analysis: Electron Spectroscopy Methods	Homework 3
10	3/20 3/22	Vibrational Techniques	
11	3/27 3/29	Diffraction Techniques	
12	4/3 4/5	Synchrotron-based Techniques/ Basics of DFT Calculations	Homework 4
13	4/10 4/12	Student Presentation and Discussion	
14	4/17 4/19	Student Presentation and Discussion	
15	4/24 4/26	Student Presentation and Discussion	
16		Final Exam May 3	

\* PLEASE NOTE THAT THE SCHEDULE IS APPROXIMATE WITH RESPECT TO

COVERAGES; WE MAY GET BEHIND OR AHEAD AS THE SEMESTER PROGRESSES. The instructor reserves the right to make changes to the schedule. Any changes will be announced in class or on Sakai.

### **ACADEMIC INTEGRITY**

All students in this course are expected to have read and to abide by the demanding standard of personal honesty, drafted by the College of Arts & Sciences, which can be viewed at:

<http://www.luc.edu/cas/advising/academicintegritystatement/>

A basic mission of a university is to search for and to communicate the truth as it is honestly perceived. A genuine learning community cannot exist unless this demanding standard is a fundamental tenet of the intellectual life of the community. Students of Loyola University Chicago are expected to know, to respect, and to practice this standard of personal honesty. Academic dishonesty can take several forms, including, but not limited to cheating, plagiarism, copying another student's work, and submitting false documents. Any instance of dishonesty (including those detailed on the website provided above or in this syllabus) will immediately result in a grade of F for the entire course and will also be reported to The Chair of The Department of Chemistry & Biochemistry who will decide what the next steps may be.

### **ABSENCE POLICY FOR STUDENTS IN CO-CURRICULAR ACTIVITIES (INCLUDING ROTC)**

Students missing classes while representing Loyola University Chicago in an official capacity (e.g., intercollegiate athletics, debate team, model government organization) shall be allowed by the faculty member of record to make up any assignments and to receive notes or other written information distributed in the missed classes. Students should discuss with faculty the potential consequences of missing lectures and the ways in which they can be remedied. Students must provide their instructors with proper documentation (develop standard form on web) describing the reason for and date of the absence. This documentation must be signed by an appropriate faculty or staff member, and it must be provided as far in advance of the absence as possible. It is the responsibility of the student to make up any assignments. If the student misses an examination, the instructor is required to give the student the opportunity to take the examination at another time. (<https://www.luc.edu/athletheadvising/attendance.shtml>)

### **ACCOMMODATIONS FOR RELIGIOUS REASONS**

If you have observances of religious holidays that will cause you to miss class or otherwise affect your performance in the class you must alert the instructor within 10 calendar days of the first class meeting of the semester to request special accommodations, which will be handled on a case by case basis who would like to review content that was presented.

### **PRIVACY STATEMENT**

Assuring privacy among faculty and students engaged in online and face-to-face instructional activities helps promote open and robust conversations and mitigates concerns that comments made within the context of the class will be shared beyond the classroom. As such, recordings of instructional activities occurring in online or face-to-face classes may be used solely for internal class purposes by the faculty member and students registered for the course, and only during the period in which the course is offered. Students will be informed of such recordings by a statement in the syllabus for the course in which they will be recorded. Instructors who wish to make subsequent use of recordings that include student

activity may do so only with the informed written consent of the students involved or if all student activity is removed from the recording. Recordings including student activity that have been initiated by the instructor may be retained by the instructor only for individual use.

### **COURSE REPEAT RULE**

Effective with the Fall 2017 semester, students are allowed only **THREE** attempts to pass Chemistry courses with a C– or better grade. The three attempts include withdrawals (W). After the second attempt, the student must secure approval for a third attempt. Students must come to the Chemistry Department, fill out a permission to register form or print it from the Department of Chemistry & Biochemistry website: <http://www.luc.edu/chemistry/forms/> and personally meet and obtain a signature from either the Undergraduate Program Director, Assistant Chairperson, or Chairperson in Chemistry. A copy of this form is then taken to your Academic Advisor in Sullivan to secure final permission for the attempt.

### **STUDENT ACCOMODATIONS**

The Student Accessibility Center (formerly known as Services for Students with Disabilities), Sullivan Center (773-508-3700), [www.luc.edu/sswd](http://www.luc.edu/sswd), has the mission “to serve students with documented disabilities by creating and fostering an accessible learning environment,” including “supporting faculty, staff, and administrators on matters such as ADA and Section 504 compliance, as it relates to individuals with disabilities.” Please direct all questions concerning accommodations of disabilities to the Student Accessibility Center. Academic accommodations afforded to students require documentation and review. The Student Accessibility Center will issue accommodation letters for registered students to present to their instructors: accommodations are not active until students present these letters to their instructors. If students’ accommodations involve attendance or deadlines, instructors and students will jointly complete and execute an Agreement Form articulating their terms. See <https://www.luc.edu/sac/faculty/facilitatingaccommodations/> for guidance about implementing various kinds of accommodations in a way that is appropriate to your class. The Student Accessibility Center stands ready to work with you.

### **YOUR WELL-BEING**

If there are events occurring in your life that cause the school to diminish in its priority, please discuss this with me or contact the Wellness Center (<http://www.luc.edu/wellness/index.shtml>) or the dean of students ([http://www.luc.edu/studentlife/dean\\_of\\_students\\_office.shtml](http://www.luc.edu/studentlife/dean_of_students_office.shtml)) for assistance. These are services that your tuition pays for and can be invaluable for your personal health and maintaining progress toward your degree. I am always willing to discuss how I can adapt the class and its materials so that you are successful