

Description: CHEM 303 is a laboratory course designed to give Chemistry majors hands-on experience with methods, analysis, and equipment used in physical chemistry. Students will acquire broad knowledge of laboratory skills central to physical chemistry and learn how to analyze, evaluate, and report their own experimental data.

Course Objectives: Upon completion of this course, students will be able to

1. Have a better understanding of physical chemistry concepts including UV/Vis and fluorescence spectroscopy, light diffraction, optical rotation, chemical equilibrium, catalysis, and enzyme kinetics,
2. Understand limits of models assuming ideal behavior and account for deviations from ideal behavior,
3. Perform experiments in a precise and accurate way,
4. Detect and correct experimental errors while performing an experiment,
5. Collect experimental data followed by analysis and error calculations using Microsoft Excel,
6. Prepare written reports that describe experimental methods and results,
7. Orally present experimental work and results using Microsoft PowerPoint.

Meeting Times and Locations:

Section	Day/Time	Location	Instructor	Teaching Assistant
001 (Lab)	Thursdays 1:00 PM – 5:00 PM	Flanner 016	Dr. Jessica Eisenberg jeisenberg2@luc.edu Office: LSB-124 Phone: 773-508-8714	Grant Steiner gsteiner@luc.edu Office: FH-020 (Gates Lab)
002 (Disc.)	Tuesdays 2:30 PM – 3:20 PM	Flanner 007	Dr. Mausumi Mahapatra mmahapatra1@luc.edu Office: FH-401 Phone: 773.508.3169	Maxwell Gillum millum@luc.edu Office: FH-019 (Killelea Lab)

Academic Calendar: It is the student's responsibility to know both the schedule for this course (posted above) as well as the University's official [Academic Calendar](#). Students are responsible for attending all classes for the entire term.

Pre- or Co-requisite: CHEM 302. Restricted to Chemistry majors.

Required Materials:

1. Bound composition notebook (not spiral bound and with no tear-out perforations),
2. Access to Microsoft 365. This is provided by Loyola to students,
3. Safety goggles (We provide a pair to you on the first day). If you wish to get your own, they must be Type G, H, or K goggles and must meet the requirements of ANSI Z87.1,
4. Long-sleeved, full-length laboratory coat (OPTIONAL),
5. Appropriate clothing and footwear as described in the laboratory safety rules,
6. A non-erasable, waterproof pen,
7. Access to Sakai.

This course utilizes materials that require a device with high-speed internet access. Wired (ethernet cable) internet is preferred, but WI-FI is acceptable if the connection is reliable. Students are responsible for having access to a suitable device and the internet access necessary for submitting all online assignments by the posted due dates. If you do not have a desktop/laptop computer or Internet service, go to the Information Commons or contact ITS for information on their loan equipment program within the first few days of the start of the course and arrange for them.

Email: Faculty email addresses are posted on the open Internet for every software bot and spammer in the world to see. Emails from outside sources are often blocked or filtered automatically. Because of this and a Federal law relating to student privacy (FERPA), students must use their Loyola email address when contacting the TA or the instructor about this course. Please put "Chem 303" in the subject line of any messages to your TA or instructor. Additionally, be sure to check your email often and read the messages for important course updates.

Office Hours: Office hours for the instructor and TA are posted on Sakai.

Course Homepage: All course materials are posted on Sakai.luc.edu. Students should check the Sakai site for this course frequently as it is central to how the lab operates. **Please note that all course materials should be accessed under the Lessons tab** where details are broken down by topic/experiment. Certain assignments may not open properly if attempts are made to access them through other tabs.

Grading: The course grade consists of the following components:

1. 6 Lab Notebook Entries (lowest score will be dropped)	40%
2. 7 Lab Reports (2-3 oral reports, 4-5 written reports)	40%
3. Lab Performance/Safety	10%
4. <u>Discussion Assignments</u>	10%
Total:	100%

A>93%, A->90%, B+>87%, B>83%, B->80%, C+>77%, C>73%, C->70, D+>67%, D≥60%, F<60%

Attendance: This is a lab course, so attendance is mandatory. Students will be working in pairs for all experimental work, and absences put strain on one partner and can put both students behind, so they should be avoided whenever possible. Should an absence be necessary due to illness, religious holidays, or university-sanctioned events, let the instructor know as soon as possible. Unexcused absences will result in an automatic loss of points on the lab notebook for the experiment of the absence but note that the lowest notebook entry score will be dropped from overall grade calculations. Lab reports are still expected to be submitted if a lab period is missed; the reported results will be either based on the data collected by your lab partner or data provided by the TA or instructor. Consult with your instructor for details.

Lab Safety: Working safely in the laboratory is something that everyone must always consider. Note that students must bring eye protection to every experiment. Students must also dress in appropriate clothing and footwear such that there is no exposed skin. Lab coats are suggested, but optional. For the sake of hygiene and other reasons, students may not borrow goggles. Any student not properly prepared will not be allowed to perform the experiment and marked with an unexcused absence. Other violations of the safety rules (e.g. removing goggles in the lab, eating or drinking, etc.) will result in safety point deductions. Repeated or significant safety violations may also result in the student being expelled from the lab. Details on the lab safety rules are posted on Sakai and discussed during the first lab period.

Pre-lab Preparation: Success in lab depends on advanced preparation. Students who come to class prepared tend to get better results, finish faster, and have fewer accidents. Therefore, every week before coming to lab, all students are expected to have watched any background videos and read the lab protocol(s) posted on Sakai under the Lessons tab for a particular experiment.

Lab Notebook Entries: The ability to keep good records is a valuable skill in many fields. A properly maintained notebook keeps the experimental details and results all in one place. One of the most important facets of experimental work is that data should be recorded as completely and accurately as possible. Sometimes, important discoveries are made when things don't go exactly as expected. Therefore, it is critical that students report their actual procedure and data, not what it is thought that the correct answer should be. Similarly, lab notebook entries are not meant to be written as instructions for others, but as a written record of what happened while performing the experiment. Therefore, procedures should be written entirely in past tense to document the experiment as it was actually performed.

Notebook entries should be written during every lab and include the following sections: 1) title and objective of the experiment, 2) potential safety hazards and waste disposal, 3) a description of the actual experimental procedure including a description of the experimental apparatus and materials used, and 4) all collected data. While students are working in pairs and for most experiments there may be a division of labor among the two students, the lab notebook of each student should include all the experimental work performed. After an experiment is completed, the pages will be scanned and uploaded to Sakai to maintain a digital record of the work as well as for grading purposes. The upload must be submitted as a single file in the PDF format, and the contents must be legible and oriented correctly. No notebook pages can be submitted for grading via email.

Note: due to the time and software required for thorough data analysis, discussion of the experimental results and detailed conclusions will be included in the lab reports, NOT in the submitted notebook entries.

Lab Reports: Both oral presentations and written papers are ways that scientists formalize their experiments and share the results with others. At the end of each experiment, students are expected to either write or orally present their experimental findings. Each report will summarize the experimental procedure, thoroughly analyze the results, and discuss what was concluded about the experimental data. Information about which experiments will be reported in oral vs. written form will be posted on Sakai. Reports will generally be due during the lab period following the conclusion of the experiment, but specific due dates are posted on Sakai. Written reports must be submitted as a single PDF file on Sakai by the posted deadline. Oral reports will consist of an approximately 10-minute presentation with prepared slides using Microsoft PowerPoint. More detailed instructions are posted on the course website.

Discussion: This course incorporates a 50-minute discussion section once per week as an integral component. Attendance during this segment is mandatory, as additional material and assignments will be presented, contributing to the overall point accrual for the course. To optimize the learning experience, participation in the discussion section is essential. The instructional approach involves delivering the lecture content in one class session. Subsequently, the following session is dedicated to practical application, wherein students actively engage in working on their reports/assignments and watch instructive videos through online platforms. The lowest discussion score will be dropped in the final grading.

Re-grades: All requests to have any submitted assignment re-graded must be submitted in writing within one week after the graded materials are returned to the student. Students should email both the instructor and TA to question the specific portion(s) of their assignment that they feel was scored incorrectly for a re-grade.

Late Policy: Assignments may be submitted late but will receive a late deduction. A 10% penalty will be applied for each day (or fraction of a day) delay of submitting an assignment to the course website. Assume that technology will fail sometimes, so always plan ahead and do not leave completion/submission of your assignments to the last possible moment. Should you have a legitimate reason for missing a deadline, contact your instructor before the deadline.

Hard Deadline: All materials of any kind must be submitted by 5 PM on Friday, April 26, 2024. No materials will be accepted after this time. Final grades will be calculated based only on materials submitted by this deadline. If there are substantial materials that are missing and that cannot be submitted before this deadline, the student should consider withdrawing from the course or requesting an Incomplete by completing [this form](#) prior to the end of the term.

Interactions with Teaching Assistants: To increase the amount of individual assistance students receive in lab courses, Teaching Assistants will participate in delivering this course. If at any time during the semester you have any questions or concerns about the behavior of your Teaching Assistant, please contact the instructor.

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.”

Regarding the use of Artificial Intelligence: our Provost has expressed to “Let us all make sure we are learning and sharing best practices and not allowing AI to do the learning for us.” In this course, any work you submit for credit must represent your own ideas and understanding of the assigned material. If you are uncertain

about any case where your use of AI may be in conflict with University or course standards, please see your instructor to discuss your concerns.

Any instance of dishonesty (including those detailed on the website provided above) will be reported to The Chair of The Department of Chemistry & Biochemistry, who will decide what the next steps may be. The penalty may include a grade of zero for that assignment and/or failure of the course.

Health, Safety, and Well-Being On-Campus: Please be familiar with and adhere to all current policies and protocols posted on the Campus Info & Resources site:

<https://www.luc.edu/healthsafetyandwellbeing/campusinforesources/>

Course/Instructor Evaluation – SmartEval: The following information came from the University regarding course evaluations, “Towards the end of the course, the students will receive an email from the Office of Institutional Effectiveness reminding them to provide feedback on the course. They will receive consistent reminders throughout the period when the evaluation is open, and the reminders will stop once they have completed the evaluation.

- The evaluation is completely anonymous. When the results are released, instructors and departments will not be able to tell which student provided the individual feedback.
- Because it is anonymous and the results are not released to faculty or departments until after grades have been submitted, the feedback will not impact a student’s grade.
- The feedback is important so that the instructor can gain insight into how to improve their teaching and the department can learn how best to shape the curriculum.”

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). The Department advises that it is preferable to complete a course with a grade of C or C-, and to demonstrate growth in future coursework, rather than to withdraw from a course.

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: <https://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 Accommodations: Loyola University Chicago provides reasonable accommodations for students with disabilities. Any student requesting accommodations related to a disability or other condition is required to register with the Student Accessibility Center (SAC). Professors will receive an accommodation notification from SAC, preferably within the first two weeks of class. Students are encouraged to meet with their professor individually in order to discuss their accommodations. All information will remain confidential. Please note that in this class, software may be used to audio record class lectures in order to provide equitable access to students with disabilities. Students approved for this accommodation use recordings for their personal study only and recordings may not be shared with other people or used in any way against the faculty member, other lecturers, or students whose classroom comments are recorded as part of the class activity. Recordings are deleted at the end of the semester. For more information about registering with SAC or questions about accommodations, please contact SAC at 773-508-3700 or SAC@luc.edu.

Loyola University 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 i.e., “Athletic Competition & Travel Letter” 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 to the professor in the first week of a semester. It is the responsibility of the student to make up any assignments. If the student misses an examination, the instructor is required to allow the student to take the examination at another time. (<https://www.luc.edu/athleteadvising/attendance.shtml>)

Students who will miss class for an academic competition or conference must provide proper documentation to their instructor as early in the semester as possible.

Accommodations for Religious Reasons: If you have observances of religious holidays that will cause you to miss class or otherwise effect 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.

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 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. Additionally, all materials from this course cannot be shared outside the course without the instructor's written permission.

Tentative Lab Schedule (Subject to Change):

Week	Dates	Experiments
1	Jan 18	Introductions
2	Jan 25	Diffraction, Uncertainty, and Solid Structure
3	Feb 1	Measuring Planck's Constant and the Work Function of a Metal
4	Feb 8	UV-Vis Absorption of Fluorescein for pKa Determinations
5	Feb 15	UV-Vis Absorption of Fluorescein for pKa Determinations (cont.)
6	Feb 22	Glucose Mutarotation: Kinetics and Equilibrium
7	Feb 29	Glucose Mutarotation: Kinetics and Equilibrium (cont.)
8	Mar 7	SPRING BREAK - No labs
9	Mar 14	Invertase Catalysis of Sucrose
10	Mar 21	Invertase Catalysis of Sucrose (cont.)
11	Mar 28	EASTER BREAK - No labs
12	Apr 4	Kinetics and TSA of A6PR and M6PR
13	Apr 11	Kinetics and TSA of A6PR and M6PR (cont.)
14	Apr 18	Kinetics and TSA of A6PR and M6PR (cont.)
15	Apr 25	Wrap-up/Check-out

Tentative Discussion Schedule (Subject to Change): Bolded dates have required in-person attendance.

Week	Dates	Discussion Topics/Assignments
1	16-Jan	Introductions
2	23-Jan	Diffraction, Uncertainty, and Solid Structure
3	30-Jan	Measuring Planck's Constant and the Work Function of a Metal
4	6-Feb	Work remotely on Diffraction, Uncertainty, and Solid Structure lab report
5	13-Feb	Work remotely on Measuring Planck's Constant and the Work Function of a Metal lab report
6	20-Feb	Mass Spectra Fragmentation Pattern
7	27-Feb	Work remotely on Mass Spectra Fragmentation Pattern assignment
8	5-Mar	SPRING BREAK - No discussion
9	12-Mar	Infrared Spectra: Patterns Based on Molecular Vibrations
10	19-Mar	Work remotely on Infrared Spectra: Patterns Based on Molecular Vibrations assignment
11	26-Mar	EASTER BREAK - No discussion
12	2-Apr	Techniques and Applications of Fourier Analysis
13	9-Apr	Work remotely on Techniques and Applications of Fourier Analysis assignment
14	16-Apr	Watch video remotely on Computation of Rovibrational Values
15	23-Apr	Wrap-up