# **CHEM 280:** Environmental & Chemical Analysis

The purpose of this syllabus is to describe the course, resources, and policies. It is meant to help all students understand the expectations and requirements for the course, and it should be used as a reference for questions about policies. When updates to the syllabus are made during the term, a new version will be posted electronically, and all students will be notified.

**CLASS BEHAVIORAL EXPECTATIONS.** We strive for a learning environment of equity, respect, and inclusiveness. Therefore, all of us are expected to follow these basic principles:

* Demonstrate respect for oneself and for others.
* Treat others with dignity and behave in a way which promotes a physically and psychologically safe, secure, and supportive climate.
* Allow all community members to engage as full and active participants where the free flow of ideas is encouraged and affirmed.

**Preferred NAME aND Gender Pronouns.** This course affirms people of all gender expressions and gender identities. If you prefer a different name or pronoun than what is indicated on the class roster, please let me know. Please correct me on your preferred name and gender pronouns. If you have any questions or concerns, please do not hesitate to contact me.

**CAMPUS RESOURCES.** Loyola University is dedicated to helping students succeed in their education endeavors. There are many resources to assist you with your courses. You can find brief descriptions of the various types of support with links to the respective pages, as well as quick links to each, at <https://www.luc.edu/sas>.

## Course Information

**Course:** CHEM 280: Quantitative Methods in Chemistry (3 credit hours, lecture and discussion)

**Prerequisites:** Chem 240 & 260. **Pre or Co-requisite:** Chem 272

A student missing a co- or prerequisite may be withdrawn at any time.

**Time Zone:** This syllabus lists dates/times using Chicago local time (U.S. Central Time Zone)

**Lectures:** Section 001 TuTh 11:30am-12:45pm Cuneo Hall 218.

**Discussion:** Section 002: We 2:45-3:35pm Flanner Hall 105

**LOCUS Course Description & Outcomes:**

Lecture and discussion course designed to create foundational knowledge and proficiency in essential chemistry concepts and skills. Topics include the chemical analytical process, sample preparation, quantitative analysis, and data evaluation and validation. These topics will expand and enhance the ability to use chemical principles to analyze various types of environmental samples.  
Outcomes:  Students will increase their ability to use both qualitative and quantitative reasoning to follow the chemical analytical process for various types of samples encountered in the Environment, Life Sciences, and Industry.

## Instructor Information

**Section Instructor: Dr. Conrad Naleway**

**Office: Flanner Hall 200-C**

**Email: cnalewa@luc.edu**

**Email timing:** (Optional, list your preferred policy)

**Office Hours Schedule:** Flanner 200-C: Tuesdays 2-3 PM

Zoom: Monday 6-7 PM [Zoom link](https://luc.zoom.us/j/4950829636)

and by appointment.

## Required Course Materials

## PDF Textbook: David Harve, Open Textbook Library ( free) – [*Analytical Chemistry 2.1 pdf*](https://open.umn.edu/opentextbooks/textbooks/486) (downloaded copy of the textbook in Sakai Resources)

## Optional Textbook( any edition): Daniel C. Harris – *Quantitative Chemical Analysis*

## Laptop computer or a programable tablet (such as a IPad or Pro/Surface) will be necessary to perform calculations using software programs such as EXCEL

## Loyola Sakai course management site: [*sakai.luc.edu/portal/*](http://sakai.luc.edu/portal/) and tools integrated into the site,

## Access to your LUC email and the course website (Sakai). Check here often for general information, announcements, discussion forums, and grades.

### Copyright/Intellectual Property reminder

Course materials provided by your instructors at Loyola, including my materials, may not be shared outside any course without the instructor’s written permission. Content posted without permission will be in violation of Copyright/Intellectual Property laws. Class meetings may not be recorded without the instructor’s written permission.

## Learning

Learning will be assessed as described in the Grading System information found later in this syllabus.

**Course Description:**

The course focuses on fundamental aspects of essential chemistry concepts and skills. Topics include the chemical analytical process, sample preparation, quantitative analysis, and data evaluation & validation. The theory of techniques and applications used in biomedical, forensic, environmental, cosmetic, chemistry, and more will also be highlighted.  Examples will be drawn from fields where quantitative analysis is commonly applied such as environmental monitoring, food & beverage safety, forensic science, chemical process control, personal care products, and cultural heritage. After completing the course, you will be able to apply the most suitable analytical process for a variety of analytes and samples.

**Course Goals:**

1. Acquaint students with some of the most popular classical and modern techniques in chemical analysis
2. Teach the chemical analytical process, sample preparation methods, quantitative analysis using classical and modern techniques, data evaluation & validation
3. To acquaint the student with some of the most popular classical, fundamental, and modern techniques as well as state-of-the-art applications of chemical quantitative analysis used in Forensic, Biomedical, and Environmental Chemistry.
4. Connect course topics to real-world applications and first-hand experiences
5. Review appropriate applications of chemical analysis topics to real-world scenarios related to STEM
6. If time permits, expand on fundamental analytical aspects of acid/base chemistry, redox chemistry, electrochemistry, and ionic equilibria.

**Outcomes:**

1. List the steps in the chemical analytical process and provide a summary of details for all the steps
2. Explain how to complete sample preparation and isolate an analyte as well as choose the appropriate analytical technique for sample analysis
3. Differentiate between the calibration methods of external, internal, and standard addition and identify the practical application for each of the calibration methods
4. Evaluate classical and modern analytical techniques/methods that can quantify the same analyte, briefly explain the analytical technique as well as list its pros & cons

# **Course Topics:**

Topics to be covered this semester. Each main topic contains multiple sub-topics.

|  |  |  |
| --- | --- | --- |
| Terminology, Analytical Process | Chemical Measurement Process | Buffers and Acid/Base Chemistry |
| Analytical Figures of Merit | Chromatography | Complex Redox Chemistry |
| Sampling Error | Atomic Spectroscopy | Selective Electrode Chemistry |
| Statistics & Quality Assurance | Molecular Spectroscopy | Ionic Strength & Activity |
| Complexometric titrations | Mass Spectrometry | Coupled and Multi-Equilibria |

## Academic Integrity

I view violations of Academic Integrity as a very serious offense against your fellow students and against the integrity of the university, as well as a personal affront to me. There will be zero tolerance for infractions. If you believe there has been an infraction by someone in the class, please bring it to my attention. If caught, I will pursue disciplinary action against all parties TO THE FULLEST EXTENT POSSIBLE; this may result in failure, suspension or expulsion.

Academic integrity is the pursuit of scholarly activity in an open, honest, and responsible manner. Academic integrity is a guiding principle for all academic activity at Loyola University Chicago, and all members of the University community are expected to act in accordance with this principle. Please open and read the foldout for the third item, “Academic Integrity” in the [Undergraduate Academic Standards and Regulations.](https://catalog.luc.edu/academic-standards-regulations/undergraduate/)

Academic dishonesty can take several forms, including, but not limited to cheating, plagiarism, copying another student’s work, submitting false documents, and deliberately disrupting the performance of other class members. Standards apply to both individual and group assignments.

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 me to discuss your concerns.

Any instance of dishonesty (including those detailed on the website provided above or in this syllabus) will be reported to the Chair of The Department of Chemistry & Biochemistry who will decide what the next steps may be. Dishonest behavior such as any form of cheating may cause to fail (grade = 0 or “F”) an assignment, examination, or the course, depending on the severity of the case. That grade assigned because of cheating cannot be “dropped”.

## Attendance

Students are expected to attend lectures and discussions. Attendance will be taken early in the term to better access if registered students are attending and to potentially motivate students to attend. However attendance will not affect your grade other than missing out on details of topics presented and potential credit for in-class participation.

### Accommodations for Religious Observances

If you have observances of religious holidays that will cause you to miss class or otherwise effect your academic work in the course you must alert the instructor ***no later than Friday of Week 2 in the semester*** to request accommodations. Advance notice must be sent to the instructor through Loyola email by this deadline.

### 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/travelcompetitionpolicy/>)

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.

## Information about Accessibility Support

### Student Support: Requests for Accommodation

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 equal 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](https://www.luc.edu/sac/) at 773-508-3700 or [SAC@luc.edu](mailto:SAC@luc.edu).

*If you use the Testing Center, please schedule all of the tests for this class at the beginning of the semester.  If a scheduled test date changes, you will still be accommodated if you had scheduled your test in advance.*

*If you have any questions or concerns regarding the implementation of your accommodations in this course, please contact the SAC for assistance.*

## Information about Title IX

Please refer to the information at this link: [Office for Equity & Compliance's recommended syllabus language](https://www.luc.edu/equity/otherresources/resourcesforfacultystaff/syllabuslanguage/)

## Additional scheduling and dates information

* A link to the official Loyola calendar can be found here: <https://www.luc.edu/academics/schedules/>
* The Withdraw deadline for the semester is on Monday, March 24

### Final Exam:

The University sets the schedule for all final exams. The final will be held on:

***Tuesday April 29 at 9:00am***

You will have exactly 2 hours to complete the exam. Additional time will not be granted, even if you start late. There will be no make-up final exams given under any circumstance, and the exam will not be given early, either.

Instructors may not reschedule final exams for a class for another day and/or time during the final exam period. There can be no divergence from the posted schedule of dates for final exams. Individual students who have four (4) final examinations scheduled for the same date may request to have one of those exams rescheduled. If a student reports having four final examinations scheduled for the same date, students should be directed to e-mail a petition to Adam Patricoski, Assistant Dean for Student Academic Affairs, CAS Dean’s Office ([apatricoski@luc.edu](mailto:apatricoski@luc.edu)).

### Pass/Fail Conversion Deadlines and Audit Policy

A student may request to convert a course into or out of the “Pass/No-Pass” or “Audit” status only within the first two weeks of the semester. For the Spring 2025 semester, students are able to convert a class to “Pass/No-Pass” or “Audit” through Monday, January 27th. Students must submit a request for Pass/No-Pass or Audit to their Academic Advisor.

## Department Course Repeat Rule

Effective with the Fall 2017 semester, students are allowed up to 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, than to withdraw from a course.

After the second attempt, the student must secure Department approval for a third attempt. Students must fill out the [Permission to Register Form](https://www.luc.edu/media/lucedu/chemistry/pdfs/Permission%20to%20Register%20Chemistry.pdf), and arrange a meeting with the Undergraduate Program Director, Assistant Chairperson, or Chairperson in Chemistry. If approved, a signed copy of this form is then sent to the student's Advising office to secure final permission for the attempt.

## Additional course material and recording statements

In general lecture, meetings may be recorded. The following is a mandatory statement for all courses in the College of Arts & Sciences (CAS). We will discuss class norms and standards during the first week and continue the discussion as needed throughout the semester

### Recording of online class meetings

In this class software will be used to record live class discussions. As a student in this class, your participation in live class discussions will be recorded. These recordings will be made available only to students enrolled in the class, to assist those who cannot attend the live session or to serve as a resource for those who would like to review content that was presented. All recordings will become unavailable to students in the class when the Sakai course is unpublished (i.e. shortly after the course ends, per the [Sakai administrative schedule](https://www.luc.edu/its/learningtechnologies/learningtechnologies/sakai/administrativeschedule/)). Students who prefer to participate via audio only will be allowed to disable their video camera so only audio will be captured. Please discuss this option with your instructor.

### 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.

### Additional Content, Copyright & Intellectual Property Statement

By default, students may not share any course content outside the class without the informed written consent of the owner of that content. This includes any additional recordings posted by students, materials provided by the instructor, and publisher-provided materials. For example, lectures, quiz/exam questions, book figures/slides, and videos may not be shared online outside the class. In some cases, copyright/IP violations may overlap with breaches of academic integrity. Remember that obtaining consent to share materials is an active process.

## Evaluation and Grading

### Course Grading System Design

### Performance Evaluation will be based on the students ability to apply topics covered in lecture, then demonstrated in discussion problems to very similar applications in free response exams.

Standards/Graded Components/Policies

**Final Grade will be based upon 3 components: Participation, Discussion, and Exams:**

**Participation:** Students will be given 3/5 points unless they show above average involvement in lectures and discussions. This is intended to motivate interaction and questioning during class, which is imperative to a productive upper-level class.

**Discussions:** Groups will work through problem sets and a single collective answer sheet will be submitted for grading.

**Exams:**

Problems will be largely variants of problems done in class or problems done in discussion period! Plus there also may be a few conceptual questions on each Exam**. There will be no make-up quizzes, or make-up exams given unless extreme and documented circumstances might occur.**

Exams will be graded and returned as soon as possible, usually the next class period. ALL grading questions, points of clarification and grading errors must be brought to the instructor’s attention during office hours **no later than one week after exam is returned.** There will be no exceptions to this rule! Each returned exam must be copied with original being returned to instructor with a handwritten note **stapled** to exam addressing concern(s).

**Tentative Exam Dates. 2/13, 3/20, 4/15, final 4/29 (9am)**

All exams must be signed in the front, upper right hand corner. This signature will be taken as a statement of honest and completely independent work. There will be no tolerance whatsoever for cheating or plagiarism. Simply, ***any*** *instance of dishonesty (including those detailed on the website provided below or in this syllabus) during exams will result in a* ***failing grade*** *for the course*.

**Final Grade** will be determined by:

* Class Comparative Participation during Lecture **(5%)**
* Discussion Group Problem Sets (**15%**)
* Plus Exam Grade (**80%** total): Top 2 of 3 in class exams (**30% each**) plus final exam (**20%**)

***Note: Your Final Grade cannot be greater than the highest in class exam grade!!***

**Final Grading Scale:**

|  |  |  |
| --- | --- | --- |
| **A** 100-93; | **B** 84-81; | **C** 72-69; |
| **A-** 92-89; | **B-** 80-77; | **C-** 68-65; |
| **B+** 88-85; | **C+** 76-73; | **D** 64-55; |
|  |  | **F**<55 |

### Universal Absence Accommodation Policy

### The purpose of a universal absence accommodation policy is to account for emergency circumstances (e.g., serious illness, caring for a family member, car accident) that require you to be absent from class, while maintaining fairness in grading for students who attend and complete all in-class graded assignments. We believe that class attendance and participation are essential for your success in this class, and that your health is important to us and our shared community. Please use good judgement and stay home if necessary/prudent for your circumstances. You may provide documentation for an absence, but it is not required. These accommodations are automatically available to all students.

**MISSED QUIZZES OR EXAMS.** If you miss a quiz or midterm exam, contact your instructor as soon as possible via email, but not later than 48 hours after the missed quiz or exam and state the reason for your absence. Accommodation will be provided at the discretion of the instructor on a case-by-case basis for emergency circumstances (e.g. serious illness, accidents, caring for a child or other family member). No accommodation will be provided for the final exam unless you can prove you have a valid, serious reason for your absence (e.g. a police report or a doctor’s note).

### Posting of Grades

Final course grades at the end of the semester are posted only on LOCUS. Final grades are never sent via email. Each student will see an estimated midterm grade in LOCUS before the withdraw deadline.

## Changes to Syllabus

There may be changes to the syllabus during the semester. ***You are responsible for all syllabus changes made in class whether or not you attend***