School of Engineering – Department of Chemistry – Spring 2025

Ch 111 General Chemistry Laboratory Syllabus

Section: 111-F
Meeting times and days: Friday 9:00 – 11:50AM
Instructor: Eli Pines, PhD
Contact information: eli.pines@cooper.edu
Office hours / location: 41 Cooper Square, Lab # 404

To be scheduled via email at: eli.pines@cooper.edu

OR

To be scheduled during the Laboratory Session

Meeting location: 41 Cooper Square, Lab # 404

Course Overview

General Chemistry Laboratory is an introductory chemistry laboratory course which follows Ch 110 (General Chemistry); both courses are taken by all engineering majors at Cooper Union. Its academic focus is primarily on analytical chemistry, but also includes a strong emphasis on lab safety, critical reasoning, and effective written communication of findings. The course presumes a strong understanding of the topics developed in Ch 110. Introductory descriptive statistics is introduced and used in this course. More information is given in the catalog course description below:

> *Methods of quantitative analysis are used to explore chemical reactions and analyze unknowns. Modern chemical instrumentation as well as analytical techniques and "classic" wet chemistry are covered. Statistical analysis of the experimental data is used to analyze results. Chemical laboratory safety and industrial chemical regulations are covered, as are the fundamentals of writing a technical report. Prerequisite: Ch 110.*

Required Texts, Materials, and Equipment

- **SAFETY GOGGLES**. Regular glasses (even with safety lenses) are not acceptable, nor are safety glasses (which do not offer complete side, top and bottom protection). Safety goggles may be purchased at a variety of hardware stores.
- The **Cooper Union General Chemistry Laboratory Guide**. This will be made available to you in printed form. Plan to bring it to every lab session. Make sure to read it very carefully.
- A **laboratory notebook** with sewn-in pages for recording your data. Notebooks are provided in the Chemistry Stockroom from our Stockroom Technician.
- **Textbook**: *Analytical Chemistry 2.1:* (by David T. Harvey; available free at http://dpuadweb.depauw.edu/harvey_web/eTextProject/version_2.1.html)
- **A USB drive for data storage and transfer may be needed for the second half of the course (ask your instructor)**

Course Goals

Students should be able to:

1. Plan their work and function safely and efficiently in a laboratory setting.
2. Work meticulously to achieve a quantitatively accurate result.

3. Interpret reactions and calculations made in the experimental environment.
4. Record data and observations in standard usable format.
5. Be responsible for implementation of personal safety practices.
6. Manipulate physical situations to obtain useful scientific information.
7. Use statistics to describe experimentally obtained results.
8. Estimate the expected error associated with making measurements.
9. Generate professional-quality plots of experimental data and analyses.
10. Produce written long form reports effectively conveying context, methods, results and analysis for each experiment, complete with an abstract and associated statistical analysis.
11. Communicate their findings in a professional and ethical manner.
12. Work in a highly professional, collegial, and responsible manner with other students and their instructor.
13. Perform experiments and analyze data as a member of an efficient and productive team.
14. Use necessary chemicals sparingly and dispose of chemicals in a way which enhances public safety and protects the environment.

Course Policies

Course policies for Ch 111 are developed to support fair and equitable treatment in the classroom, to set rigorous performance standards for achievement of the course goals, to ensure the safest possible working environment, and to foster and encourage professional skills, behavior and demeanor.

For safety reasons, **UNDER NO CIRCUMSTANCES WILL STUDENTS BE ALLOWED TO WORK IN THE LABORATORY WITHOUT DIRECT FACULTY SUPERVISION.**

Students may not work in the laboratory until they have successfully completed the mandatory laboratory safety training and been oriented by their instructor as to the location, operation and procedures of safety equipment and hazardous waste management within the laboratory. Daily lab work not completed due to a failure to complete this training shall be treated as an unexcused absence. See also "pre-lab preparation" under **Grading** for additional safety requirements for each experiment.

Inportant Information on Attendance and Lateness:

In this course, attendance is mandatory. You must <u>personally</u> carry out all the required laboratory work in order to receive a passing grade for the course. Only excused absences will permit you to make up the missed work, and arrangements for the makeup work (if possible) must be made by your professor.

Students are expected to present themselves on time at the start of each laboratory period and stay for the entire period unless excused early by the professor. Attendance will be taken at the start of each period and unexcused absences and lateness will result in grade penalties (see "interaction evaluation" below). If unexcused lateness and/or unexcused absences result in an inability to complete all the required laboratory work, the course grade will be an F (see "Grades"). **You must stay in the lab for the entire period unless permission is given to you to leave early or to take an extended break from lab.** You must notify your instructor whenever you leave lab and when you return to lab so that they are aware of who is in the room at all times.

If an absence will be caused by a planned medical procedure, religious obligation or some other legitimate reason that can reasonably be anticipated, **you must confer with your instructor at least**

one week in advance of the absence to determine how these will be handled, or it will be treated as an unexcused absence.

Some absences or lateness are unanticipated (for example, those due to illness or accident). **In the case of an unanticipated absence or lateness, the student must email the instructor as soon as possible (preferably in advance of lab). You must also contact your lab partner.**

Some absences may require verification by, or corroboration with the Dean of Students and/or the Associate Dean of Engineering at the professor's discretion and/or by providing documentation of the need for absence. You may not present doctor's notes written by a relative.

If you miss a lab session you will still need to do the work and turn in all required reports or data sheets, whether or not the absence is excused. You may need to complete the experiment by yourself without a lab partner in some cases, at your instructor's discretion.

A single exception may be made to this policy at the instructor's discretion for a **single experiment** for which **one day of excused absence** occurs.

You and your partner are expected to do all of your work within your scheduled lab period. A schedule of the experiments to be completed and due dates for laboratory reports for your section will be provided by your instructor; please be prepared in advance for each day's work. Part of the grading for the course involves the ability to be organized enough to get your work done quickly and efficiently. However, if you and your instructor both agree that it is necessary to do some makeup work during another lab period it may be possible to do so in some circumstances. **This is allowed only if BOTH instructors (the regular instructor and the instructor at the makeup time) agree to it in advance, and only on a space-available basis. Your instructor (not you) must contact the instructor of another section to seek permission and will notify you if permission has been granted.** Students may not contact other instructors directly to request permission.

Grading

Assuming all experiments are completed as required and all reports are submitted, letter grades will be determined at the end of the semester using the grading scale below:

90-100	A - superior and comprehensive grasp of the course principles and excellent performance and professionalism
80-89	B - good degree of familiarity with the course principles and good performance and professionalism
70-79	C - average knowledge of the course principles and/or average performance and professionalism
60-69	D - minimum workable knowledge of the course principles and/or minimal performance and professionalism
<60	F - unsatisfactory understanding of the course principles and/or inadequate performance and professionalism

	Reports	**Pre-Lab Preparation**	**Precision and Accuracy**	**Data Sheets**	**Interaction evaluation**	**Notebook evaluation**
% of grade	30%	20%	15%	15%	10%	10%

This grading scheme is modified if you do not turn in all reports and complete all experiments (see below). In this course you will complete three 3-week experiments (each of which requires a report) and three 1-week experiments (each of which requires a data sheet).

Failure to complete any one of the three 3-week experiments will result in an F in the course. Failure to turn in any of the three reports for these experiments will also result in an F in the course. Reports must be submitted within ten (10) days of the due date or they will not be accepted at all and the course grade will be an F. Unexcused absence from a 1-week experiment will result in a proportionate zero penalty within the "Data Sheets," "Pre-Lab" and "Interaction" grades. Students who have not turned in one or more lab reports on time without a preapproved extension, or who have failed to complete a 3-week experiment due to one or more unexcused absences, may not continue lab attendance without the permission of the Department Chair.

No exceptions will be made by any instructor of any section of Ch 111 to these rules.
More information on all of these topics, including a detailed description of what is required in your reports, may be found in the Cooper Union General Chemistry Laboratory Guide.

• 30% of the final grade is based on your three reports for the first three 3-week experiments.
The required format for reports is given in a following section of this Guide; your instructor may have additional requirements which will be communicated to you. The report will generally be no longer than 20 pages. Late penalties will be imposed (-10% for each day late). Unless otherwise specified by your instructor, the reports are due one week after completion of the experiment. **Reports may not be submitted at all if the report is more than 10 days late and failure to submit one or more reports will result in an automatic F in the course.** This is a *departmental policy*, and no exceptions will be made unless you request and receive an extension **in advance, from your instructor**, and for valid reasons. Do your work, turn in all reports, and all will be well.

• 20% of the grade is based on your pre-lab preparation for all experiments.
Pre-lab preparation includes the following preparation:

For all experiments:

1. **Safety, health and handling information must be recorded in the laboratory notebook for *all* reagents to be used throughout the entire duration (3 weeks or 1 week, as appropriate) of the upcoming experiment.** This must be done before entering the laboratory; students who do not complete this portion of the preparation will be required to leave and will not be allowed to start work until the information is recorded in the lab notebook. This is for your safety, and no exceptions will be made under any circumstances. Refer to the Safety Data Sheets (SDS) for all of the compounds you will be working with.
2. **A brief outline of the procedural steps to be completed for the entire duration of the upcoming experiment must also be recorded in the notebook.** This helps you to understand and prepare for what is to be done. Questions about the procedures should be asked before each lab begins. Each one-week experiment can be prepared for one week at a time.
3. **Tables for all data to be collected in the experiment for the entire duration of the upcoming experiment** must be designed and printed in the lab notebook ***on 1-2 pages of your notebook*** before the experiment is started. The reason for this step is to ensure that all necessary data will be taken and properly recorded during the allotted time for each

experiment. Make sure to design your tables well and allow plenty of room for your data as well as for notes.

4. **Completion of any and all preparatory calculations or other pre-lab assignments for each experiment, as described hereafter.**
5. **Training in the use of Excel for professional scientific graphics.** All students will complete one or more introductory training projects designed to prepare you to properly analyze and graphically display data using Microsoft Excel. Due dates are determined by your instructor. Generally these are submitted electronically; this will also be determined by your instructor.

   Items 1-4 will be checked and evaluated at the start of each new experiment.

We strongly recommend that **all calculations leading to the final result(s) should be worked out in advance.** Because you will be analyzing materials whose exact composition is unknown (to you), devising a sample calculation showing all computation necessary to produce the final result will make writing the report a lot easier and, more importantly, ensure that you understand what you are doing and why you are doing it. It will also ensure that you understand what things must be measured with great accuracy and which require less accuracy, which helps you work efficiently.

• 15% of the final grade is based on the accuracy and precision you achieve on your experiments. This reflects your degree of skill and consistency in the safe, effective and efficient performance of the experiment and manipulation of experimental apparatus and data. It also reflects the accurate reporting and analysis of your data.

• 15% of the final grade is based on your Data Sheets for the 1-week experiments. These will be completed jointly with your lab partner during lab and turned in before the end of the lab period. Data sheets may not be taken home and turned in later.

• 10% of the final grade is based on an interaction evaluation.
A student generally receives all of these points if that student is always on time for the start of lab, works conscientiously, safely and efficiently in the lab, cooperates with the instructor, staff, and fellow students (especially lab partners), stays for the entire period but does not stay late, cleans up, follows all course rules and safety rules without being reminded, finishes all laboratory work and reports on time, and has no unexcused absences. These behaviors will be noted and failure to follow all expected behaviors will result in grade penalties.

• 10% of the final grade is based on an evaluation of your notebook (apart from the pre-lab components listed above). This evaluation will either be done by your instructor during the term or your notebook will be collected for that purpose at the end of the semester. Do not forget to turn in your notebook if required or you will be penalized.

All students must adhere to the following basic notebook requirements:

- ✓ **Make sure the notebook has your name on it.**
- ✓ **All of your entries must be handwritten** (for the sole exception to this rule, see the last item).
- ✓ **Use a <u>pen</u>**, not a pencil, to make entries in your lab notebook.
- ✓ **Data is rejected by writing a single line through it and noting the reason(s) for rejection**: never use 'white-out' or other opaquing liquid.
- ✓ **<u>All</u> pages should be numbered.**

- ✓ Leave a few pages at the front and make a **Table of Contents** so that both you and your instructor can find things quickly and easily.
- ✓ **Data is ALWAYS on a separate, dated and numbered page.**
- ✓ **Data is entered directly in the notebook** – it is *never* recorded on a scrap of paper for later transfer to the notebook.
- ✓ **Both lab partners must enter all data in their own notebook** (which will protect you if one of you loses your notebook). This entry must be done during lab.
- ✓ **If data is acquired electronically,** printouts of the data in raw and/or graphical form may/should be neatly taped into the notebook before the next laboratory period.

Resources for Students

Expectations of the lab environment:

Your professor will try to create course policies that support a fair and equitable laboratory learning environment and set high safety and performance standards for all students. The goal of the faculty teaching this course is to create a safe and inclusive learning environment where you feel both challenged but also constantly respected and recognized within the course. It is also our intention to build an environment within which all students respect, challenge, and support one another. Please make an appointment with your professor if you are having any issues related to your instructor, the course, our technicians, or your fellow students. You may also make an appointment with the Department Chair (Prof. Newmark) or the Lab Coordinator (Prof. Topper) to discuss any matters of concern to you.

While we want you to feel comfortable coming to your instructor or other members of the faculty with issues you may be struggling with or concerns you have, please be aware that we have reporting requirements that are part of our responsibilities as a member of the faculty. If you inform your professor of an issue of sexual harassment, sexual assault, or discrimination, they will keep the information as private as they can, but they are also required to report the basic facts of the incident to Cooper's Title IX Coordinator. The Cooper Union Title IX policy on sexual misconduct can be found **here.**

Counseling Services at The Cooper Union are coordinated through the Office of Student Affairs. The Cooper Union **counseling and mental health services website can be found here.**

Accommodations:

Students with disabilities or who need special accommodations for this class are required to notify the Dean of Students and meet with me so that arrangements can be made. The Cooper Union has limited resources and extra lead time is required for such arrangements to be feasible. In order to receive accommodations, you must notify your instructor in writing at least two weeks before the accommodations are needed, and you must also be registered with the Dean of Students. Students will not be afforded any special accommodations retroactively, i.e., for academic work completed prior to disclosure of the disability to your instructor and the Dean. Disability support services for students are described **here.**

Group work and academic integrity policy:

The Cooper Union School of Engineering Policy on Academic Integrity is posted here. We believe group work is important to learning; you will work all semester with a lab partner, and in some cases, you may be required to submit reports jointly with your partner. However, each student MUST submit their own work product for each report, i.e., you must report on work that you personally have completed. Plagiarism or any other kind of academic dishonesty will be reported.

Plagiarism is the presentation of another person's "work product" (ideas, words, equations, computer code, etc.) as one's own. Whether done intentionally or unintentionally, plagiarism will not be tolerated in this class. You are plagiarizing if:

- You present as your own individual work product a submission that includes the work product of your other group members
- You present as your own work product a submission that contains the efforts or work product of other individuals aside from your other group members (i.e. text from the internet)
- You present as your own work product material from previous iterations of this course (old projects, assignments and papers)
- The help and contributions of other individuals are not acknowledged in writing on your submission (by writing their names or citing their published work)
- You copy the work of other students on an in-class examination or communicate with other individuals in any fashion during an exam
- You submit as part of a homework assignment or project material that has been copied from any source (including, but not limited to, a textbook, a periodical, an encyclopedia, an AI system, the internet) without properly citing the source, and/or without using quotation marks. It is also prohibited to submit such materials in a minimally altered form without proper attribution. Improperly copied material might include text, graphics (computer or otherwise), computer source code, etc.

If there is a strong suspicion that you have plagiarized your submission for an assignment or paper, you will be reported to the Dean's Office. In such cases students minimally receive a zero on that assignment or paper, and a record retained in the Dean's office. Other possible penalties include an F in the course and/or review by the Academic Standards Committee for explusion from Cooper Union; please note the online policy.