

Instrumental Analysis
CHEM 3420
Fall Semester 2023
08/29/23 – 12/7/23
3414 Ingersoll Hall (lecture) / 447 New Ingersoll (laboratory)

Instructor: Professor Brian R. Gibney 2411 Ingersoll Hall

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Please contact me via email using the address above.
I will respond within one business day.
The subject line of your email must be, as follows:

Chem3420W_Last_Name_subject of email

Recommended Text: *Principles of Instrumental Analysis*, 6th edition, Skoog, Holler, Crouch Brooks/Cole, New York, 2007

Scheduled Lectures: T/Th 6:30 – 7:20 pm (3413 NE)
Scheduled Labs: T/Th 7:30 – 10:20 pm (443 NE)

Office Hours: M 4:00 – 5:00 pm (Zoom)
Th 5:00 – 6:00 pm (in person)
and by appointment on Zoom

Chair Office Hours: Th 3:30 – 4:30 pm (in person, 359 NE)

Required Items: Internet connected device
CUNYFirst & Blackboard accounts to access course materials
[Blackboard access instructions are given here](#)
Access to MS Word & Excel ([free access for CUNY students](#))
Non-programmable scientific calculator

Blackboard Access The Blackboard on-line course management system will be used to provide students access to course readings, lectures, assignments and videos. Students can access Blackboard via <https://bbhosted.cuny.edu> and Chem 3420 should be listed under 'My Courses' in the left column as **2023 Fall Term (1) Instrumental Analysis CHEM. 3420 ET6L[14867] (Brooklyn College)**

Please refer to the [Brooklyn College Blackboard FAQ](#) for assistance with navigating Blackboard.

Course Delivery This course will be delivered via in person face-to-face learning supplemented with online content via Blackboard and Zoom. Weekly content videos, supplemental content and online discussions will be delivered asynchronously. There will also be synchronous online discussions and office hours.

Synchronous

T/Th 6:20 – 7:30 pm : Lecture

Each week's lecture content will be presented synchronously in class. Students are encouraged to view the online content prior to class and to ask questions during the class times. Questions regarding the laboratory exercises can also be asked during class meetings.

M 4:00 – 5:00 pm : Zoom Office Hours

Office hours will also be delivered synchronously on Monday afternoon from 4:00 – 5:00 pm using Zoom. Please email in advance the specific problems to be solved during the Office Hour.

Th 5:00 – 6:00 pm : In-person Office Hours

In person office hours will be held weekly (except Oct 12 / Nov 2) in person.

You may also request an appointment for a Zoom meeting at other times.

T/Th 7:30 pm – 10:20 pm : Laboratory

Weekly laboratory exercises will focus on developing practical skills involving a variety of analytical methods and instrumentation.

Asynchronous

Course content will also be made available as YouTube videos and links on the course website on Blackboard. These include, the following:

Lecture videos

Problem sets and solving videos

Primary literature readings

Course Goals:

Scientists from all disciplines rely on increasingly sophisticated instrumentation to perform detailed chemical analyses of samples. This course will provide you with both theoretical and practical instruction on the fundamental principles behind most of the common instrumentation used for chemical analyses. Through both lecture and laboratory instruction, you will become proficient in how each instrument is designed, how each collects and processes analytical signals, and how to evaluate the quality and reliability of the data collected. This knowledge will aid you in assessing experimental data, make you more adept at designing critical experiments, and will serve as your foundation for future work involving instrumental techniques.

Learning Outcomes: Upon successful completion of this course, you will be able to:

- list multiple electrochemical, spectroscopic and chromatographic methods used to measure chemical samples
- recognize the critical components of modern analytical instrumentation

- construct calibration curves to interpret electrical signals from instrumentals as chemical properties
- demonstrate competent application of multiple analytical techniques
- evaluate the quality and reliability of the data collected
- recognize the limitations of each instrumental method used
- choose the optimal instrumental technique to use in solving a specific problem
- accurately perform experiments using modern instrumentation
- interpret the results, draw valid conclusions and document experiments in scientific reports in the American Chemical Society style.

Assignments: Homework exercises from the text will be given and the solutions posted the following week. Homework is not collected or graded, however professionalism demands that you keep current with the homework and reading assignments. I am not here to spoon feed you exam information. The homework will serve as an indication as to the type and level of difficulty of the questions/problems that you will find on the exams.

Grading: There will be two one-hour exams and one two-hour final examination. Each hour exam is worth 20% of your grade, the cumulative final is worth 25% of your grade and the remaining 35% is made up from your laboratory reports. You must pass the lecture portion of the course to pass the course. The final grade will be curved.

- 90 -100% A
- 80 -89% B
- 70 -79% C
- 60 -69% D
- below 60% F

As per department policy, any request for an examination regrade must be made in writing using the form available on the Department website.

Exam Regrades: Tabulation errors in the total exam percentage should be brought to the instructor's attention upon return of the exam. Requests for the regrading of exam questions shall be submitted in writing within one week to return of the exam.

Academic Honesty: **ACADEMIC DISHONESTY WILL NOT BE TOLERATED IN ANY FORM.** The CUNY Academic Integrity Policy is available:

[Academic Integrity Policy](#)

Evidence of cheating on exams, or copying of lab reports will result in a failing grade for the course, without exception.

Student Disability Services:

In order to receive disability-related academic accommodations students must first be registered with the Center for Student Disability Services. Students who have a documented disability or suspect they may have a disability are invited to set up an appointment with the Director of the Center for Student Disability Services, Ms. Valerie Stewart-Lovell at 718-951-5538. If you have already registered with the Center for Student Disability Services please provide your

Non-Attendance Due to Religious Beliefs:

Students who are unable to attend class due to religious observations should consult the Brooklyn College Undergraduate Bulletin for the campus's policy, and contact the lecturer to discuss the issue. Students must come forward with the issue in a timely manner.

Laboratory:

SAFETY GOGGLES MUST BE WORN IN THE LABORATORY AT ALL TIMES!

By State Law, the goggles must be indirectly-vented to offer splash protection. If you violate the eye-protection policy, or any other safety policy, your instructor may remove you from the laboratory and affix *at least* a 10% penalty to your lab report grade.

You are required to keep a **Scientific notebook** in the laboratory. This must be a **BOUND** notebook; data is to be recorded in blue or black, non-erasable ink. All data is to be recorded **DIRECTLY** into the notebook, immediately after the measurement is made: **No scrap paper**.

Try to be neat when recording data; however, it is more important to record your data directly into the notebook than having it "picture perfect". Mistakes should be crossed out with a single line; do not use white-out.

Altering or copying data outside of the laboratory represents academic dishonesty and will be dealt with as such.

Course Topics:

Chapters 1-5 Measurement Basics

DC Electronics
AC Electronics
Signals and Noise

Chapters 22-25 Electrochemical Methods

Potentiometry
Coulometry
Voltammetry

Exam I : October 3rd

Chapters 6-10 Spectroscopic Methods

Atomic Absorption
Atomic Emission

Chapters 13-16, 18

UV-visible Absorption Spectrometry
Luminescence Spectrometry
Infrared Spectrometry
Raman Spectrometry

Exam II : November 9th

Chapters 19-20

Nuclear Magnetic Resonance Spectrometry
Mass Spectrometry

Chapters 26-28, 30 Separation Techniques

Gas Chromatography
Liquid Chromatography
Immobilized metal-ion chromatography
Size-exclusion chromatography

*Cumulative Final Exam : December 19th
8:30 – 10:30PM*