CHEM 3216 Syllabus

Instrumental Analysis, (3 Credit Hours)

Fall 2026

Lecture: MWF 9:30 – 10:20 AM | Location: MoSE 1201A

Instructor Information

Instructor: Dr. Facundo Fernandez

Office: ES&T L1-244

Email: Facundo.fernandez@chemistry.gatech.edu

Note: *When emailing, please include "CHEM 3216" in the subject line to ensure a prompt response.*

Office Hours: By appointment

General Course Information

Description

CHEM 3216 introduces students to the principles and practice of modern instrumental analysis. The course provides the theoretical foundations underlying contemporary analytical techniques, explores the essential components and operating principles of analytical instrumentation, and develops an understanding of how sampling, statistics, separation, and spectroscopic and electroanalytical methods are applied to determine the composition of complex chemical systems. This course prepares students for advanced work in analytical chemistry, materials science, biochemistry, and related fields.

Course Learning Outcomes

Upon successful completion of this course, you should be able to:

- Explain the theoretical principles underlying modern methods of chemical analysis, including spectroscopic, electroanalytical, chromatographic, and mass spectrometric techniques.
- Describe the essential components and operating principles of major analytical instruments and evaluate their capabilities and limitations.
- Apply concepts of sampling, statistics, and figures of merit to assess the quality and reliability of analytical measurements.
- Analyze and interpret data obtained from instrumental methods to determine the composition of complex chemical samples.
- Compare and select appropriate analytical techniques for specific measurement challenges based on sensitivity, selectivity, and other performance criteria.

Pre- and Co-Requisites

A grade of D or higher in CHEM 2214 (or equivalent) is required.

Required Course Materials

Textbook: Skoog, Holler, and Crouch, *Principles of Instrumental Analysis*, 7th edition (6th edition also acceptable), Cengage Learning.

Canvas: All lecture materials, announcements, and grades are posted on the course Canvas site. You are responsible for all information posted in Canvas announcements. Ensure your notification settings are configured to receive announcements by email or check Canvas daily.

Grading Policy

Your final grade in this course will be determined as follows. A passing grade in both the lecture and laboratory components is required.

Weight	Component
18%	Midterm Exam 1
18%	Midterm Exam 2
18%	Midterm Exam 3
10%	Attendance and Quizzes
36%	Final Exam (Cumulative)

Final letter grades are assigned on the following scale (no +/– grades are used at Georgia Tech):

Letter Grade	Percentage Range
A	80–100%
B	70–79%
C	60–69%
D	50–59%
F	Below 50%

Description of Graded Components

Midterm Exams

Three closed-book midterm exams will be administered during the semester on the dates indicated in the course schedule. Each exam will be held during the regular 50-minute class period and will consist of short-answer, long-answer, and calculation questions. Partial credit may be awarded. Exam content (in terms of textbook chapters and lecture topics) will be announced via Canvas the Friday before each exam.

Final Exam

A cumulative final exam of approximately two hours and fifty minutes will be given at the time and location determined by the Georgia Tech Registrar. The final exam will include multiple-choice, short-answer, long-answer, and calculation questions. Partial credit may be awarded.

Attendance and Quizzes

Points toward your course grade can be earned through attendance and participation in lecture as well as through periodic in-class quizzes. Quizzes are unannounced and cannot be made up if you are absent without an excused absence.

Grade Disputes

Requests for re-grading of midterm exams must be submitted in writing within one week of the date that graded exams are returned to students.

Course Policies

Attendance and Participation

Attendance at all lectures is strongly encouraged. In-class activities, discussions, and quizzes contribute to your learning and to your course grade. If you must miss class due to illness, notify the instructor as soon as possible and refer to the missed-exam policy below for guidance on excused absences.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review the Georgia Tech Honor Code and the Student Code of Conduct.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

If you have questions about the Academic Honor Code at any time during the semester, please contact your instructor.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your needs and to obtain an accommodations letter. Please also email the instructor within the first week of the course (or as soon as possible after receiving your letter) so that we can work together to honor your accommodations.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of the instructor and that the instructor has of you. Simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. I encourage you to remain committed to the ideals of Georgia Tech while in this class.

I expect students to arrive prepared for class, to participate in class activities and discussions, and to utilize office hours for additional help when needed. In return, you should expect me to arrive prepared for class, to engage you in activities and discussions that further your understanding of course material, and to be available during office hours.

Collaboration, Group Work, and Use of Generative AI

You are encouraged to work with classmates on in-class problem solving and to study with others outside of class. Collaboration on homework assignments is acceptable; however, remember that the effort you invest in these assignments directly impacts what you gain from them.

The use of generative AI tools (e.g., ChatGPT, Copilot) is not permitted on exams or quizzes. If you have questions about the appropriate use of AI tools for other coursework, please ask the instructor.

Extensions, Late Assignments, and Missed Exams

Comprehensive guidelines regarding class attendance and excused absences can be found in the Georgia Tech Catalog. Please review these policies in their entirety. Key points include:

- Institute-approved absences (e.g., varsity athletics): Notify the instructor as soon as you have your travel schedule so that alternate exam arrangements can be made.
- Illness: Submit medical documentation to the Office of the Dean of Students, who will contact the instructor. Also, email the instructor directly as soon as you know you will miss or have missed an exam. Do not provide details about the illness.
- Personal emergencies: Provide documentation to the Office of the Dean of Students. Also, email the instructor as soon as possible.
- Religious observances: Inform the instructor in writing within the first two weeks of the semester. You will be permitted to make up missed work without penalty within a timeframe established by the instructor.

Important: You must contact the instructor immediately if you miss an exam without an excused absence. Make-up exams or grade replacements may not be permitted in such cases.

Inclement Weather and Digital Learning Days

If a weather-related event affects campus operations, the instructor may cancel class or pivot to digital instruction. In such an event, students should monitor Canvas announcements for instructions. Course materials and any synchronous sessions will be accessible remotely.

Student Use of Mobile Devices in the Classroom

Laptops and tablets may be used in class for note-taking and course-related activities only. Please silence and put away cell phones during class. Excessive use of devices for non-course purposes is distracting to your peers and may impact your participation grade.

Campus Resources for Students

In your time at Georgia Tech, you may find yourself in need of support. Below you will find resources to support you both as a student and as a person.

Undergraduate Student Academic Success Resources

A list of resources for undergraduate academic success and advising information can be found at Success at Tech.

- Academic Support: Academic Success and Advising provides free support for your courses, including scheduled supplemental review (PLUS) sessions, Drop-In Tutoring, and one-on-one appointments through Knack. Visit success.gatech.edu/tutoring, email tutoring@gatech.edu, or visit Clough Undergraduate Learning Commons, Suite 283.
- Communication Center (communicationcenter.gatech.edu): Individualized help with writing and multimedia projects.
- Academic advisors for your major: advising.gatech.edu

Student Well-Being

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness-related resources is maintained by the Office of the Vice President for Student Engagement and Well-being.

- Counseling Center (counseling.gatech.edu; 404-894-2575): Short-term individual counseling, group counseling, crisis intervention, and referral services. Students in crisis may walk in during business hours (8 AM – 5 PM, Monday – Friday) or contact the counselor on call after hours at 404-894-2204.
- Stamps Health Services (health.gatech.edu; 404-894-1420): Primary care, pharmacy, psychiatry, immunization, and health promotion.
- STAR Services (Students' Temporary Assistance and Resources): Assistance with food, housing, and other essential needs.
- Office of the Dean of Students (studentlife.gatech.edu; 404-894-6367): General support and care reports.

Statement of Intent for Inclusivity

As members of the Georgia Tech community, we are committed to creating a learning environment in which all students feel safe and included. Because we are individuals with varying needs, we are reliant on your feedback to achieve this goal. We invite you to enter into dialogue with us about the things we can stop, start, and continue doing to make our classroom an environment in which you feel safe to participate in learning.

Course Schedule

The following schedule is tentative and subject to change. Any modifications will be announced via Canvas. Reading assignments refer to chapters in Skoog, Holler, and Crouch unless otherwise noted.

Week	Dates	Topics	Notes
1	Aug 24–28	Introduction to Instrumental Analysis; Basic Statistics and Figures of Merit (Appendix 1)	
2	Aug 31–Sep 4	Statistics (cont.); Signal-to-Noise Enhancement Techniques (Ch. 5)	
3	Sep 7–11	Introduction to Spectroscopic Methods (Ch. 6)	Labor Day – No Class Mon Sep 7
4	Sep 14–18	Components of Optical Spectrometers (Ch. 7)	
5	Sep 21–25	Atomic Absorption and Emission Spectroscopy (Ch. 8–9)	Exam 1: Fri Sep 25
6	Sep 28–Oct 2	Atomic Emission (Ch. 10A); Atomic Mass Spectrometry (Ch. 11A–C)	Prof. Fernandez Traveling Sept 28th.
7	Oct 5–9	Fall Break Mon–Tue; UV-Vis Molecular Spectroscopy (Ch. 13–14)	Fall Break Oct. 5-6
8	Oct 12–16	UV-Vis Applications (Ch. 14–15)	
9	Oct 19–23	Vibrational Spectroscopy – IR (Ch. 16)	
10	Oct 26–30	Vibrational Spectroscopy – Raman, Near-IR (Ch. 17–18)	Exam 2: Fri Oct 30
11	Nov 2–6	Intro to Electroanalytical Chemistry (Ch. 22); Potentiometry (Ch. 23)	
12	Nov 9–13	Potentiometry (cont.); Voltammetry (Ch. 25A–B, D–E)	
13	Nov 16–20	Chromatographic Theory (Ch. 26); Gas Chromatography Instruments (Ch. 27)	Exam 3: Fri Nov 20
14	Nov 23–27	Liquid Chromatography (Ch. 28, Mon–Tue only)	Thanksgiving – No Class Wed–Fri
15	Nov 30–Dec 4	SFC & Extraction (Ch. 29); Capillary Electrophoresis (Ch. 30A–C)	
16	Dec 7–8	Molecular Mass Spectrometry (Ch. 20); Course Review	Final Instructional Days
Final	TBD	Cumulative Final Exam	Dec 10–17 (per GT Registrar)

Note: *Specific exam dates and topic boundaries are subject to adjustment. All changes will be communicated via Canvas announcements at least one week in advance.*