



**CH 461 Instrumental Analysis II (Spring 2023)**  
**School of Engineering and Science**

**EDUCATIONAL AIMS**

- To deliver a course that will provide an intellectually challenging learning experience.
- To encourage student enthusiasm and curiosity.
- To develop in students a range of general laboratory skills that will help them to find gainful employment in chemistry-based industry.
- To educate students to critically evaluate the material they learn.

**INSTRUCTORS**

**Lecturer:** Dr. A. B. Attygalle, McLean 312. Phone: 201 216 5575.

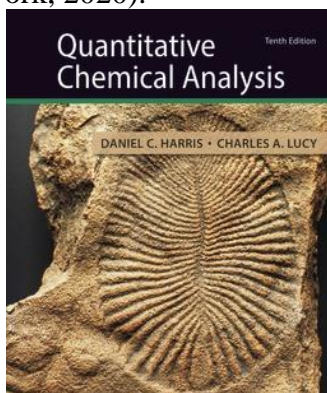
Office hours: Wednesday 11.00 am -12.00 Noon or by appointment.

**Teaching and Course Assistants:** Connor Mills. Email: [cmills1@stevens.edu](mailto:cmills1@stevens.edu), Office hours: Tuesdays 1.30-2.00 PM or by appointment.

Thompson Hui. Email: [thui@stevens.edu](mailto:thui@stevens.edu). Office hours: Mondays 1.30-2.00 PM or by appointment.

Yaksha Vijay Jain, [yjain5@stevens.edu](mailto:yjain5@stevens.edu). Office hours: Mondays 1.30-2.00 PM or by appointment.

**Recommended Textbook:** *Quantitative Chemical Analysis*, Tenth Edition, Daniel C. Harris and Charles A. Lucy (W. H. Freeman and Company, New York, 2020).



**Course Format:** 3 lectures/week. Mondays, Wednesdays, and Fridays (10.00 to 10:50 am). One laboratory session/week [Mondays 2.00-5.50 PM (LA); Tuesdays 2.00-5.50 PM (LB)]. A pre-laboratory report required two days before each laboratory session. A final lab report should be submitted a week after the experiment. Expect several spot prelab and post-lab quiz sessions.

**Oral Presentation:** One 15-min oral presentation using PowerPoint.

**Attendance:** Mandatory for all laboratory and lecture sessions. An excused absence will require documentation, such as a note from a doctor or clearance in advance (e.g., for a professional interview). **(Unexcused absences can result in a lowered final grade; all laboratory experiments must be completed in person).**

## MEETING TIMES

Lecture Schedule, MWF

Session: Normal Academic Term, January 18, 2023 -May 16, 2023

Lectures for Section A: Mondays, Wednesdays, and Fridays 10:00-10:50 a.m. Gateway South room 24 (GS 024).

Laboratory sessions for Section A: Mondays 2:00-5:50 p.m.

Laboratory sessions for Section B: Tuesdays 2:00-5:50 p.m.

There will be no lab sessions during first two weeks. In person lab sessions in Room 429 will start in February.

**Final examination:** Written examination

## GRADING

**Grading procedure:** A letter grade will be assigned based on the overall class average, which will be curved for a “B” grade based on the total lecture and laboratory cumulative score.

**CANVAS:** A website for this course is available on <https://mystevens.stevens.edu/>. Log on to mystevens by entering your NetID and password and then click on the courses tab and click on CH 461. You can upload your prelabs and assignments at this site.

## ACADEMIC INTEGRITY

### Undergraduate Honor System

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with

and to uphold the ideals set forth in the [Honor System Constitution](#). More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at <http://web.stevens.edu/honor/>

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

*"I pledge my honor that I have abided by the Stevens Honor System."*

#### Reporting Honor System Violations

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at [www.stevens.edu/honor](http://www.stevens.edu/honor).

## INCLUSIVITY

### *Name and Pronoun Usage*

As this course includes group work and class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

### INCLUSIVITY STATEMENT

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in education and innovation. Our community represents a rich variety of backgrounds, experiences, demographics and perspectives and Stevens is committed to fostering a learning environment where every individual is respected and engaged. To facilitate a dynamic and inclusive educational experience, we ask all members of the community to:

- be open to the perspectives of others.
- appreciate the uniqueness their colleagues.
- take advantage of the opportunity to learn from each other.
- exchange experiences, values and beliefs.
- communicate in a respectful manner.
- be aware of individuals who are marginalized and involve them.
- keep confidential discussions private.

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements. You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

## **LEARNING ACCOMMODATIONS**

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit <https://www.stevens.edu/office-disability-services> (Links to an external site.). If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at [pgehman@stevens.edu](mailto:pgehman@stevens.edu) or by phone 201-216-3748.

### *Disability Services Confidentiality Policy*

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

## **MENTAL HEALTH RESOURCES**

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression). Appointments can be made by phone (201-216-5177).

## **EMERGENCY INFORMATION**

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or

on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text “Home” to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is *not* urgent or time sensitive, please email the CARE Team at [care@stevens.edu](mailto:care@stevens.edu). A member of the CARE Team will respond to your concern as soon as possible.

### **Ch 461 Instrumental Analysis II (Spring 2023) – Tentative Lecture Schedule And Syllabus.**

Any changes to the schedule will be announced in the class and posted on Canvas

	Date	Topic(s)	Chap.	Reading homework Harris 10 <sup>th</sup> Edition
1	01/18	Introduction on analytical procedures. Safety. Maintenance of a Laboratory Notebook, Significant Figures	1, 2, 7	1-2, 1-3, 2-1, 2-2, 2-3.  3-1, 3-2
2	01/20	Electric charge, electric current	14	14-1, 14-2
3	01/23	Electrochemical cells, electrical work, voltage, and free energy	14	14-1, 14-2
4	01/25	Standard potentials, Galvanic cells	14	14-2, 14-3, 14-4
5	01/27	Strong base and weak acid titration (Gran's method)	11	11-1, 11-2, 11-3, 11-5 (Gran Plot)
6	01/30	pH revisited	6, 7	6-6, 8-1, 8-2, 8-3, 15-5
7	02/01	Activity and concentration	8	8-1, 8-2, 8-3, 15-1, 15-2
8	02/03	Ionic strength	8	8-2, 8-3,

9	02/06	Debye-Hückel Equation	8	8-2
10	02/08	Quiz 1		Outcomes: 1) Definition of electric charge and its measurement. 2) Definition of electric current and its measurement 3) Faraday Constant 4) Coulomb 5) Electrical Work, Joule 6) Ohm's Law 7) Power, Watt 8) Galvanic cells 9) Standard Potentials
11	02/10	Non-standard potentials	14	14-4, 14-5
12	02/13	Nernst Equation	14	14-4, 14-5
13	02/15	Nernst Equation	14	14-4, 14-5
14	02/17	Electrodes and Potentiometry. Potentiometric titrations	15, 16	15-1, 15-2, 16-1, 16-2
	02/20	Presidents' Day – No Classes		
15	02/22 Monday schedule	Redox systems	16	16-1, 16-2, 16-3, 16-4, 16-5, 16-6, 16-7
16	02/24	Redox systems	16	16-1, 16-2, 16-3, 16-4, 16-5, 16-6, 16-7
17	02/27	Quiz 2		Outcomes: 1) What is pH? 2) What are strong acids and weak acids? 3) Activity and concentration. 4) Debye-Hückel Equation 5) Ionic strength 6) Activity coefficients
18	03/01	Ion-selective electrodes	15	15-3, 15-4, 15-5, 15-6, 15-7
19	03/03	Ion-selective electrodes	15	15-3, 15-4, 15-5, 15-6, 15-7
20	03/06	Conductance		Lecture notes
21	03/08	Conductance		Lecture notes

22	03/10	Quiz 3		Outcomes: redox reactions
		Spring Recess		
23	03/20	NMR Theory		Lecture notes
24	03/22	NMR techniques		Lecture notes
25	03/24	NMR techniques		Lecture notes
26	03/27	NMR techniques		Lecture notes
27	03/29	Preliminary Exam		
28	03/31	Mass spectrometry	22	22-1, 22-2, 22-3
29	04/03	Ionization and mass analysis	22	22-1, 22-2, 22-3
30	04/05	Interpretation of MS data	22	22-3
	04./07	Good Friday; No Classes		
31	04/10	Interpretation of data	22	22-3
32	04/12	Types of instruments	22	22-3
33	04/14	GC-MS/ LC-MS	22	22-4, 22-5
34	04/17	Electrospray	22	22-4
35	04/19	Electrospray	22	22-5
36	04/21	Interpretation		Lecture notes
37	04/24	Interpretation		Lecture notes
38	04/26	Quiz 4		Outcomes: MS and NMR understanding
39	04/28	Review		Lecture notes
40	05/01	Review		Lecture notes
42	05/03			
43	05/04	Last Day		
44	05/?	Final Exam		

\*Reading assignments from Harris 10<sup>th</sup> Edition.

<b>GRADING FOR LECTURES</b>
-----------------------------

Lectures: Grading Scheme (Total 750 pts)

(Four scheduled quizzes, one midterm and a final written examination. Lowest graded quiz score will be dropped. 3-5 random quizzes will be given during the class; the worst random quiz score will be dropped, and the rest will be summed for the final grading; no make-ups for spot quizzes)

Quiz # 1	100
Quiz # 2	100
Quiz # 3	100
Quiz # 4	100
Spot Quizzes and homework	100
Prelim	150
Final Exam	200
Total	850-100 = 750

Laboratory work: Grading Scheme (Total 750 pts). Nine Units.

**Grading (per unit)**

	<b>Points</b>
Pre-Lab Report submitted on time. (Due two days before the experiment)	3
Pre-Lab Report contents	12
Final Lab Report. (Due ONE week after the experiment)	50
Spot quizzes	5
No Excel sheet	Minus 5
<b>Late Submissions</b> <ul style="list-style-type: none"> <li>• Late submissions of Pre-Lab Reports and Final Lab Reports will not be accepted under any circumstances.</li> <li>• All Lab Reports must be submitted online.</li> <li>• Missing sections, such as Abstract or Excel Sheets will not be accepted at a later date. The Reports will be graded as received.</li> </ul>	
<b>Total per unit</b>	<b>70</b>

**Final Grading for Lab Work**

<b>Nine Units (70 x 9)</b>	<b>630</b>
<b>Oral Presentation</b>	<b>100</b>
<b>Laboratory Notebook</b>	<b>20</b>
<b>Total</b>	<b>750</b>

**Last day for your final lab report is May 04, 2023**



