Instrumental Analysis Lab will meet in SSMB 321. You will need the following supplies:

- Safety glasses or goggles
- Lab coat
- Nitrile gloves (not latex)
- Composition book to serve as laboratory notebook
- Three-ring binder to hold all printed data (will be cross-referenced with relevant notebook pages)
- Ballpoint pen, blue or black preferred, for all lab notebook recording

CHEM 421 lecture is a pre- or co-requisite for this course.

**Always remember, safety first!**

If you do not have the appropriate safety gear, you will not be allowed to work in the lab. No exceptions.

**Safety Gear**

- You must wear your safety glasses or goggles at all times in the lab.
- Long pants are required.
- Footwear must provide adequate protection to the entire foot. Sandals, open toe shoes, mesh top shoes, cloth shoes, or shoes with high or narrow heels are considered inappropriate for laboratory conditions and will not be permitted. No skin should be visible below the knees.
- Socks are required. If you wear leggings and ankle socks to class, you will be asked to leave until you have socks that cover your ankles. No skin should be visible below the knees.
- You are advised to tie back long hair and wear shirts that offer full coverage.
- Lab coats are required to cover your arms and protect your clothes.
- Nitrile gloves must be work when working with solutions and other reagents.

**Student Learning Outcomes**

- To perform instrumental analytical methods including spectroscopic, chromatographic, and electrochemical methods, given instructions for using a particular instrument model, accessories, and software.
- To interpret data from an instrument and incorporate it into writing that communicates results effectively.
- To determine and communicate experimental results appropriately using safe laboratory practices, calculations, significant figures, units, graphs, and laboratory notebook use.

**Lab Procedures**

Handouts outlining the laboratory procedures will be distributed on our course OAKS page. You are expected to read the procedure in advance and be prepared for the experiment each week.

**Lab Notebook and Folder/Binder**

A laboratory notebook should provide a full record of what was performed during the experiment. Most importantly, all data must be recorded in your notebook as soon as it is generated. Calculations should be done as soon as possible and examples of each should be entered into your notebook when applicable.

Dr. Forsythe will check lab notebooks at the end of each lab period to confirm that all information has been entered legibly in a way that can be followed by others. All calculations should be shown in the laboratory.
notebook such that the instructor may follow your logic and check for calculation errors. Each student is expected to observe the College of Charleston Policy on Scientific Integrity.

When recorded data is printed, this must be kept in a lab binder. Spectra, chromatograms, voltammograms, etc. should be cross-referenced with the pertinent lab notebook pages.

Experimental Rotations
In the first half of the course, we will perform round-robin experiments in small groups and short reports / data sheets will be turned in the following week. In the second half of the course, students will be broken into groups and will develop/optimize experiments which may be used in future chemistry lab courses. Towards the end of the semester, each group will write a standard operating procedure (SOP) for their experiment and the other groups will rotate through and replicate their results.

Part I: Tentative List of Round-Robin Experiments *(subject to change)*
- Basic electronic components (all together)
- Protein molecular weight determination by MALDI-TOF-MS and ESI-MS (2-weeks)
- Build-your-own-spectrometer
- Raman spectroscopy of inorganics

Part II: Possible Experiments for Development *(subject to change)*
- Quantitation of caffeine in drinks by HPLC
- Detection of leached plastics from steeped tea bags by FTIR spectroscopy
- Separation of enantiomeric amino acids by chiral HPLC
- Quantitation of acetaminophen in children’s pain medicine by cyclic voltammetry
- Unknown protein digestion and mapping by MALDI-TOF MS

Lab Report Sections
You and your partner(s) will be responsible for independently writing sections of a lab report for Part I experiments. Sections will be assigned at the time of the experiment and may include Introduction, Experimental, Results and Discussion, or Conclusion. Report sections are due at the beginning of the lab the week following the experiment. Late work, including work turned on the same day but after class, will result in a **20 points per day** deduction unless otherwise noted by Dr. Forsythe.

Students with Disabilities
Please contact me and stop by office hours (as early as possible in the semester) if you have been approved to receive accommodations through SNAP Services. Instructors must be informed of any accommodations in advance in accordance with SNAP office policies. Please consult the Student Guide to SNAP Services for more information: [http://disabilitieservices.cofc.edu/policies/index.php](http://disabilitieservices.cofc.edu/policies/index.php).

Safety and Participation
Most experiments will be done in groups of two or three. Each student in your group must follow safety protocols, participate equally, and spend time with the instrument hands-on. In many cases, your instructor or group will assign roles to each person to ensure that each student performs important tasks in the experiment. This is critical for each students’ learning experience. Your instructor will observe student participation during each lab. If lack of participation becomes a problem, additional points will be lost on the report sheets that are turned in. No one should be looking at a phone or doing anything other than participating in the lab experiments during lab time. During down time, it is suggested that you spend time perfecting your laboratory notebook-keeping skills. Lab work should be fun and socializing with your lab partners is part of that, but completing the lab, learning as much as you can about each instrument, and recording everything you do and observe in your notebook are the main goals.

During this lab course, you have an opportunity to use expensive instrumentation which is not common at the undergraduate level. You will learn key skills desired by employers. For example, having experience in HPLC or MALDI-TOF MS is something you can put on your resume that will make you an attractive candidate. Don’t waste this opportunity! Ask questions about what the instrument is doing and how. Learn what is inside the box and how you can use it to solve a problem. The primary goal of this course is to give you as much hands-on training with as many instruments and techniques as possible, because these are used every day by chemists in research and industry.
Lab Final Exam
The lab final will be held during the final lab session of the semester. It will be a written exam based on lab procedures, data, and conclusions. This exam will be open notebook (just your lab notebook, no copies of procedures, past reports, or textbooks). If your printed data is properly cross-referenced with your notebook and organized in a folder or binder, you will be allowed to use it as well.

Grading Policy
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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Lab report sections</td>
<td>35%</td>
</tr>
<tr>
<td>Group SOP / participation</td>
<td>35%</td>
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<tr>
<td>Safety</td>
<td>5%</td>
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<tr>
<td>Lab final exam</td>
<td>10%</td>
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<tr>
<td>Lab notebook</td>
<td>15%</td>
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<td></td>
<td>100%</td>
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</tbody>
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Letter        Score
A             93-100
A-            90-92
B+            88-89
B             83-87
B-            80-82
C+            78-79
C             73-77
C-            70-72
D+            68-69
D             65-67
D-            63-64
F             < 62

Attendance Policy
You are expected to attend all lab meetings. You are responsible for completing all assigned labs, no exceptions. If you miss a lab due to illness or emergency, talk to your instructor immediately about attending the other lab section to make up your work. Otherwise, missed labs will count as a zero. Labs are experiential learning courses that emphasize the scientific method and data interpretation and they provide training in essential technical skills for chemists and other scientists. Furthermore, the technical lab skills presented in one course are assumed to be mastered in subsequent chemistry courses. Thus, attendance in all lab periods is crucial. If a student misses 3 lab periods without making up the lab in another section, whether these absences are excused or unexcused, that student will receive a WA for a final grade. Students should recognize that it is not always possible to make up work in another section, so students should make every effort to minimize absence from lab.

College of Charleston Honor Code and Academic Integrity
Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved. Incidents where the instructor determines the student’s actions are related more to a misunderstanding will handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student’s file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board. Students should be aware that unauthorized collaboration—working together without permission— is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others’ exams, fabricating data, and giving unauthorized assistance. Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor. Students can find the complete Honor Code and all related processes in the Student Handbook at: http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php.