Instrumental Analysis lab will be meeting in SSMB 321. You will need to bring 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, 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. You can keep a pair in your lab drawer if you choose.
- Footwear must provide adequate protection to the entire foot. Sandals, open toe shoes, mesh top shoes and shoes with extremely 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 the instrument and incorporate it into writing that effectively communicates the results.
- 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.

Your laboratory instructor 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. We will often be annotating this data by hand in pencil or pen, this should be done neatly and be clear to others. Spectra, chromatograms, voltammograms, etc will be cross-referenced with the pertinent lab notebook pages. This process will be described in lab.

CHEM 421L Experiments
Throughout this semester you will work in small groups to perform the experiments listed below. All of the handouts and the experimental rotation are available on the OAKS page for each lab section. You should consult the OAKS page to see when your group is performing each lab and to give you plenty of time to read the handout(s) before the lab period.

Experiments: subject to change depending on sample and instrument availability
- Basic Electronic Components
- GC-MS
- HPLC
- MALDI-TOF-MS
- ESI-MS
- FT-IR Spectrometry
- UV/Vis Spectroscopy
- Raman Spectroscopy
- ICP-MS
- Cyclic Voltammetry
- More TBA depending on instrument availability

Report Section Submission
You and your partner(s) will be responsible for writing sections of a lab report for these experiments. These will be assigned with each lab experiment. Report sections are due at the beginning of the lab the week following the experiment. Slipping it under an office door after lab, or turning it in the next day, results in 10 points deducted from your grade. Twenty points will be deducted for every week that the report is late.

Safety and Participation
Due to the limited numbers of some departmental instrumentation, some experiments will be done with partners or groups of three. Each student in your group must follow safety protocols and participate equally in every experiment and, especially, spend hands-on time with the instrument. 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 participation during each lab period and assign a grade to each student for participation. If lack of participation becomes a problem, additional points will be lost on the report sheets that are turned in. 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 you observe in your notebook are the main goals during time spent in lab.

During this lab class, you have an opportunity to learn how to use very expensive instrumentation that not all schools have access to. You will learn skills that employers are looking for. For example, having experience in ESI-MS and MALDI-TOF-MS is something that you can put on your resume or grad school application 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 make it work to solve a problem. The main goal that Dr. Cory and Dr. Forsythe have for this class is to give as many students as possible access to and training in as many instrumental analysis techniques as possible, because these are the techniques used every day by chemists in research and industry settings.

Disability Services: If you are a student with a documented disability registered with the SNAP office and will require accommodations in this course, please provide the proper documentation in the form of a
Professor Notification Letter (PNL) to your instructor during the first week of class.

**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, not copies of the procedures). 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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<td>Report Sections</td>
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<td>Safety and Participation</td>
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**Letter Number**

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**Attendance Policy**

You are expected to attend all laboratory 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 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. In all cases, 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](http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php)