

# Course Syllabus

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## Course Information

Class Days: Mon and Wed

Class Times: 9:00-11:40 AM or 3:00-5:40 PM

Class Location: CSL 222 or GMCS 245 as indicated in Syllabus

Mode of Delivery: In-person

Instructors:

Dr. Greg Elliott, CSL 229A, (619) 594-5264, [gelliott@sdsu.edu](mailto:gelliott@sdsu.edu)

Dr. David Onofrei, NMR Lab, [chem-nmr@sdsu.edu](mailto:chem-nmr@sdsu.edu)

Dr. Young Kwang Lee, EIS 17, (619) 594-3167, Highly recommends using Canvas to email Dr. Lee, or Your email may be buried in a long queue of emails. [youngkwang.lee@sdsu.edu](mailto:youngkwang.lee@sdsu.edu). <https://leelab.sdsu.edu>. (office hours: Need appointment via email. Tue 09:00-10:00 am, <https://SDSU.zoom.us/j/86445080582>)

TAs: Julian Grim and Ellen Kuang. TAs can be reached via Canvas email.

## Prerequisites:

Chemistry 251, 432, 432L and credit or concurrent registration in Chemistry 410B; concurrent registration in Chemistry 550.

## Student Learning Objectives:

In this laboratory course, students will study instrumental methods of chemical separations and analysis frequently used in all disciplines of chemistry. The student successfully completing the course will be able to:

1. Design and carry out chemical experiments for analyte identification and quantification with instruments commonly used in chemistry labs,
2. Learn sample preparation, calibration curve development, standard dilutions, operation of instrumentation, troubleshooting instrumentation,
3. Use instrument software and Excel spreadsheets for graphing, data analysis, and interpretation,
4. Understand the advantages and features of different analytical methods including electronics, laser optics, fluorescence microscopy, gas chromatography, liquid chromatography, mass spectrometry, nuclear magnetic resonance, and optical spectroscopic methods,
5. Use a combination of instrumental methods to determine chemical structures of organic compounds, and
6. Prepare presentations describing experimental results obtained in the lab.

## Textbooks (same as those for Chem 550):

Textbooks are not required but you are encouraged to read the relevant chapters to further build your knowledge.

Optional: Instrumental Analysis: Granger, Robert M., Yochum, Hank M., Granger, Jill N., Sienerth, Karl D., 1st Ed., Oxford, 2017; Principles of Instrumental Analysis, Skoog, Holler and Crouch, 7th Ed., Thomson, 2018.

**Lab Manuals:** Available in Canvas

**Required Materials:** proper laboratory PPE, bound laboratory notebook, black Sharpie pen, a scientific calculator, flash drive for data storage, access to MS Excel and a MS Word, and means to upload graphics onto Canvas.

### **Student Information**

- The class size is limited to 18 and you will work in groups of three.
- Every member of a group is expected to work together as a team, participate in all aspects of the experiments, write their own lab reports and upload all work to Canvas.
- Prelab Quizzes may be given promptly when class time begins. There will be no Quiz makeups for late arrivals.
- You will need to properly maintain a laboratory notebook and keep it up to date.
- You must sign a safety release form that states you will comply with all safety requirements of the Chemistry Department and to conduct yourself in a professional manner at all times.
- You will have to complete an online training course on Laboratory Safety to continue in this class.
- PPE will be required for some but not necessarily all lab activities.
- No food or open drink containers are allowed in the labs (a space in lab will be provided for storage).
- Everyone will receive two organic compounds as unknowns that you will analyze by multiple analytical techniques. You will prepare a 15 minute oral presentation of each compound to be presented to your class at the end of the semester.
- Lab attendance is mandatory and exceptions, other than health-related, are allowed only in rare cases. Please inform the instructors by email if any unplanned absences have occurred.
- If you have any symptoms of COVID-19, please follow current university guidelines. Guidelines are found at: <https://sacd.sdsu.edu/student-health-services/covid-19>

**Course Design:** The course is consisting of three major components: 1) electronics and computer interface, 2) optical microscopy, 3) chromatography and 4) molecular spectroscopy. Each module contains lectures and laboratory works, spanning multiple days. Students are expected to complete quizzes, homework, and laboratory reports of each component. Different groups have different lab schedules and due dates. Carefully review the class schedule table. The group assignment will be announced via Canvas. The class materials presented in the co-requisite course, Chemistry 550, do not stay in synchronous with this lab content, so reading assignments will be provided as needed.

Specific experiments in this course:

- Some Basics on Common Laboratory Techniques
- Spectrophotometric Determination of Copper
- Brightfield Microscopy Calibration and Size Measurements
- Imaging and Spectroscopic Analysis of Plasmonic Nanoparticles
- Configuring Optical components in Fluorescent Microscopy
- Diffusion Analysis of Fluorescence Microspheres
- Gas Chromatographic Analysis of Cooking Oils as Fatty Acid Methyl Ester Derivatives
- The HPLC Analysis of Water-Soluble Vitamin Tablets
- Proton and Carbon NMR Data Collection and Techniques
- IR, MS and Other Methods of Sample Identification

In addition to these experiments, there will be in-class discussions on the interpretation of data from NMR, IR and MS analyses, and how to make an oral and written presentation on the structural analysis of organic compounds using these and other techniques.

### **Awarding of Points**

As a laboratory course, there will be an emphasis on grading on the lab experiments. The distribution of points for lab activities is shown on the following table. To pass the course, you must turn in all experiments and have completed the Oral/Written presentation- no exceptions. There is no Final Exam given for this class. Note that you are expected to keep and maintain a Laboratory Notebook. In addition, you are expected to be a team player and keep the laboratory and your work stations, analytical balances, etc. clean. Glassware and equipment you have used must be cleaned and properly put away before you leave the lab for the day. Just to make certain that you have completed the assignment, always check with your Lab Instructor before you leave for the day. To determine your standing in the class at any time, divide the points you have earned by the total possible points attempted.

<b>Lab Activity</b>	<b>Points</b>
<b>Total Points</b>	<b>1165</b>
Excel basics	10
Pipetting, weighing and concentration preparation	25
Spectroscopic Determination of Copper	25
Image Analysis and nonlinear fitting	30
Brightfield microscopy	40
Darkfield microscopy	40
Fluorescence microscopy I	80
Fluorescence microscopy II	40
GC	125
HPLC	125
NMR	125
Other Methods	75
Oral/Written Presentations	200
Introductory Materials Hwk	25
Microscopy and Spectroscopy Theory Hwk	25
NMR Hwk	25

MS Hwk	25
IR Hwk	25
NMR Quiz	25
IR Quiz	25
MS Quiz	25
Participation including Lab etiquette, housekeeping, and Notebook Upkeep	25

### Grading Policies:

No exams are given in this laboratory course. Your letter grade for the course will be based on all the grades from your lab reports and quizzes.

All assignments will have set deadlines, and in general, all reports are due one week after the completion of the laboratory work. Deadlines are firm and extensions will not be provided on an individual basis except for illness or in rare cases. In any late submission, a 5% per day late penalty will be applied and no reports will be accepted that are more than three weeks late. Technology failures (e.g. webpages not loading, dog ate my flash drive, internet being down...) are likely to occur. Do not leave the submission of homework or labs to the last minute. No extensions will be provided for such occurrences.

The final letter grade will be determined based upon the total number of points you have earned throughout the course.

A **tentative** grade distribution (in percentages) is tabulated below. Note particularly high or low class averages may shift the grade distribution.

<b>Letter</b>	A	A-	B+	B	B-	C+	C	C-	D	F
<b>Cutoff</b>	94	90	87	84	81	77	74	70	60	<60

Note: The grading scale above is only an example. You are NOT guaranteed the corresponding letter grade for achieving a given percentage grade. Your final grade will be influenced by the overall class grade distribution to reflect your rank in comparison with your classmates.

### Course Schedule (tentative):

### Statement for Students with Disabilities:

- If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact SDSU Student Ability Success Center at (619) 594-6473
- To avoid any delay in the receipt of your accommodations, you should contact SDSU Student Ability Success Center as soon as possible.

- Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from SDSU Student Ability Success Center. Your cooperation is appreciated.

**Student Privacy and Intellectual Property:**

The Family Educational Rights and Privacy Act (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. I will use [Canvas / Blackboard] to communicate with you, and I will not post grades or leave graded assignments in public places. Students will be notified at the time of an assignment if copies of student work will be retained beyond the end of the semester or used as examples for future students or the wider public. Students maintain intellectual property rights to work products they create as part of this course unless they are formally notified otherwise.

**Religious observances:**

According to the University Policy File, students should notify the instructors of affected courses of planned absences for religious observances by the end of the second week of classes.

**Academic Dishonesty:**

There is zero tolerance for academic dishonesty. Incidents of plagiarism and/or cheating will be reported and a zero grade assigned for all persons involved.