Course Syllabus

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CHEM 550 Instrumental Methods of Chemical Analysis

Spring 2022 (Schedule #20844)

Course Information
Class Days: Mon and Wed
Class Times: 2:00-2:50 PM
Class Location:
Jan 19-Feb 4: Online via Zoom, Meeting ID 816 2473 6169, Link **https://SDSU.zoom.us/j/81624736169** (https://SDSU.zoom.us/j/81624736169)
Thereafter: P-148
(https://SDSU.zoom.us/j/81624736169) Mode of Delivery: In-person.
Platform: Canvas
Instructor: Prof. Youngkwang Lee
Phone: (619) 594-3167
Email: **youngkwang.lee@sdsu.edu** (mailto:youngkwang.lee@sdsu.edu)
Web: **https://leelab.sdsu.edu** (mailto:youngkwang.lee@sdsu.edu)
Office location: EIS17
Office Hours: Students should contact Prof. Lee in advance for a meeting. Tue 9:30-10:30 via Zoom, Meeting ID 864 4508 0582, Link **https://SDSU.zoom.us/j/86445080582** (https://SDSU.zoom.us/j/86445080582)

Land Acknowledgement
For millennia, the Kumeyaay people have been a part of this land. This land has nourished, healed, protected and embraced them for many generations in a relationship of balance and harmony. As members of the San Diego State University community, we acknowledge this legacy. We promote this balance and harmony. We find inspiration from this land, the land of the Kumeyaay.

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. define a problem where the determination and/or measurement of some chemical species is required,
2. develop sufficient knowledge about the major instrumentations for chemical analysis including general instrumental components and hardware used in chromatography, spectroscopy, and mass spectrometry,
3. explain the type of information that can be obtained from the measurement with instruments commonly used in chemistry labs, including electrochemistry, gas chromatography, liquid chromatography, mass spectrometry, nuclear magnetic resonance, and optical spectroscopic methods, and
4. understand the advantages and features of different analytical methods to choose appropriate instrumentation for solving various analytical problems.

Course Materials
Textbooks: (Required) Instrumental Analysis: Granger, Robert M., Yochum, Hank M., Granger, Jill N., Sienerth, Karl D., 1st Ed., Oxford, 2017. The textbook is $60 for the e-text (180 days), $169.95 to purchase a new copy, $108.80 to purchase used, and $110.50 to rent new, and $66.40 to rent used. Limited pages might be available to view on Canvas, but students are encouraged to purchase the textbook for the best learning outcome. (Optional) Instrumental Methods of Analysis 7th, by Willard. The textbook is only available as used copies and is $44.86, from the SDSU bookstore.
Supplementary readings (Required): Supplementary reading materials are free to download from Canvas.
Lecture Notes (Required): PPT slides with figures and equations are available for download in Canvas after each lecture. This file may contain only “selected” figures/equations covered in class and it may not contain the complete lecture notes and all the figures covered in the lecture.

Course Design
Examinations: There will be two mid-term exams (100 points each) and a non-comprehensive final exam (100 points). Each exam will cover new materials after the previous exam. Exams will contain a mixture of true-false questions, multiple-choice questions, short questions for brief answers, short calculations, and problems similar to those in homework assignments. You are responsible for the topics presented in the PowerPoint slides and written on the whiteboard during the lecture. Lecture attendance is important since there will be material discussed in the lecture that is not in the PPT slides. The exam duration might be longer than the regular class. Note that the Final Exam may be scheduled by the university at an unusual time and on an unusual day.
Homework: There will be multiple submissions of homework during the semester. The homework and submission schedule will be provided on Canvas.
Prerequisites: Chemistry 232, 232L, and credit or concurrent registration in Chemistry 410A; credit or concurrent registration in Chemistry 457 for undergraduate students only. Chemistry majors in the teaching credential program (BA in Applied Arts and Sciences) can replace the Chemistry 457 corequisite with credit or concurrent registration in Chemistry 417. Chemical Physics majors can replace the Chemistry 457 corequisite with credit or concurrent registration in Physics 311.

How to succeed in this course
The course includes lectures, discussion, and homework. Students need to participate in all class activities. In addition to regular in-class activities, students are expected to spend about 3-5 hours per week for out-of-class study (e.g. reading textbooks, solving practice questions, and homework). Reading the textbook and supplemental documents is critical for success in this course. Homework problems need to be studied in a timely manner. Homework and exam questions often ask the ability to put multiple pieces of information together to access a high level of understanding. You will be asked about your thought processes rather than individual pieces of knowledge. You need to be able to not only use the equations but also understand them. For example, what parameters are included and how do outcomes change as a particular parameter varies? This course will cover some interpretations of molecular spectra (IR, MS, NMR), but not extensively. Those will be covered mainly in CHEM457. Instead, we focus on the theories behind the instrumental analysis.

Grading Policies
Table 1. Grade scheme for CHEM 550 components. Note that the homework mark may vary depending on the amount of homework and the level of students' understanding.

Component	Midterm I	Midterm II	Final	Homework	Total
Mark	100	100	100	80-100	380-400

All deadlines are firm and extensions will not be provided on an individual basis. Technology failures (e.g. webpages not loading, dog ate my computer, 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. There will be a 50% penalty for the late submission.

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 that particularly high or low class averages may shift the grade distribution.

Letter	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
% Cutoff	92	88	84	77	73	69	62	58	53	45	40	<40

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.

Essential Student Information

- Compliance with **CSU / SDSU vaccination and facial covering policies** (https://newscenter.sdsu.edu/student_affairs/srr/covid-policies.aspx?) is required.

  All are encouraged to carry a facial covering at all times and use it. It is also recommended to wear surgical or medical (N95, KF94, KN95, or similar) masks or a medical mask covered by a cloth mask, especially as these options are shown to be the most effective coverage in protecting against COVID-19 transmission.

  Cloth masks, alone, have not been shown to be as highly effective in protecting against transmission and are increasingly being recommended to be combined with surgical masks. Fleece facial covering (e.g. neck gaiter) is even worse. **Research** (https://www.science.org/doi/10.1126/sciadv.abd3083) showed that fleece disperses large droplets into a multitude of smaller droplets.

- Your **SDSU email address** (https://gsuite.sdsu.edu/) will be used for all course-related communications.
- The **Student Conduct Code** (https://newscenter.sdsu.edu/student_affairs/srr/conduct.aspx) prohibits conduct disruptive to instruction, including academic dishonesty and the unauthorized recording, dissemination, or publication (including on websites or social media) of lectures or other course materials.
- SDSU provides disability-related accommodations via the Student Ability Success Center (sascinfo@sdsu.edu | **edu/sasc** (http://sdsu.edu/sasc)). Please allow 10-14 business days for this process.
- The **Family Educational Rights and Privacy Act** (http://bfa.sdsu.edu/hr/oerc/students/ferpa.aspx) (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. 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.
- As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I am required to share information regarding sexual violence on SDSU's campus with the **Title IX** (http://titleix.sdsu.edu/) coordinator, Gail Mendez (619-594-6464), who will contact you to let you know about support services at SDSU and possibilities for holding accountable the person who harmed you. If you do not want the Title IX Officer notified, you can speak confidentially SDSU's Sexual Violence Victim Advocate (619-594-0210) or Counseling and Psychological Services (619-594-5220, **psycserv@sdsu.edu** (mailto:psycserv@sdsu.edu)).
- Class rosters are provided to the instructor with the student's legal name. Please let me know if you would prefer an alternate name and/or gender pronoun.
- Need help finding an advisor, tutor, counselor, emergency economic assistance, or other support? Contact the **SDSU Student Success Help Desk** (https://studentsuccess.sdsu.edu/) Monday through Friday, 9:00 AM to 4:30 PM.
- For technical or computing assistance, contact the **Library Computing Hub** (https://virtual-academic-help.sdsu.edu/technology) .

Absence

- If you plan to be absent for a religious observance or holiday, notify me by the end of the second week of classes.
- If you are absent more than five days due to illness or injury, you may contact **Student Health Services** (http://shs.sdsu.edu/index.asp) for help in communicating your absence.
- If you miss class because you have been diagnosed with or are required to quarantine due to exposure to COVID-19, contact vpsafrontdesk@sdsu.edu to notify the university.

Academic Honesty

The University adheres to a strict **policy prohibiting cheating and plagiarism** (http://go.sdsu.edu/student_affairs/srr/cheating-plagiarism.aspx) , including

- Copying, in part or in whole, from another's test or other examination.
- Obtaining copies of a test, an examination, or other course material

  without the permission of the instructor.
- Collaborating with another or others in coursework without the permission of the instructor.
- Falsifying records, laboratory work, or other course data.
- Submitting work previously presented in another course, if contrary to the policies of the course.
- Altering or interfering with grading procedures.
- Assisting another student in any of the above.
- Using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work).
- Copying and pasting work from an online or offline source directly and calling it one's own.
- Using information found from an online or offline source without giving the author credit.
- Replacing words or phrases from another source and inserting one's own words or phrases.

Under CSU policy, instructors must report instances of academic misconduct to the Center for Student Rights and Responsibilities for disciplinary review by the University, which may lead to probation, suspension, or expulsion. Instructors may also, at their discretion, penalize student grades on any assignment or assessment discovered to have been produced in an academically dishonest manner.

If using webcams during exams: During this course, I may require students to use Respondus Lockdown Browser, or to require web-cam use during course sessions. I will notify students in advance of examinations requiring web-cam use. Students who wish to participate in a recorded course session shall be allowed to turn off their webcam.

Diversity and Inclusion
Consider adding a statement reflecting your commitment to diversity and inclusion. See the CIE's resource page on **Diversity and Inclusion Syllabus Statements** (https://sacd.sdsu.edu/cie/cie-resources/syllabus-statements) for ideas.

Course Schedule (tentative)

1	1/19	Wed	Introduction/Instrumental Electronics		
2	1/24	Mon	Instrumental Electronics		
3	1/26	Wed	Instrumental Electronics		1/25 last day of wait list auto-enrollment; 1/28 last day for faculty to drop students
4	1/31	Mon	Signals and Noise		

5	2/2	Wed	Signals and Noise		2/1 schedule adjustment deadline
6	2/7	Mon	NMR		
7	2/9	Wed	NMR		
8	2/14	Mon	Midterm I		
9	2/16	Wed	NMR		
10	2/21	Mon	NMR		
11	2/23	Wed	Liquid Chromatography		
12	2/28	Mon	Liquid Chromatography		
13	3/2	Wed	Gas Chromatography		
14	3/7	Mon	Gas Chromatography		
15	3/9	Wed	Mass Spectrometry		
16	3/14	Mon	Mass Spectrometry		
17	3/16	Wed	Mass Spectrometry (or Buffer Class)		
18	3/21	Mon	Midterm II		ACS meeting at San Diego
19	3/23	Wed	To be determined		ACS meeting at San Diego
20	3/28	Mon	Spring Recess		
21	3/30	Wed	Spring Recess		
22	4/4	Mon	Introduction to Optics		
23	4/6	Wed	Introduction to Optics		
24	4/11	Mon	Molecular UV Spectroscopy		
25	4/13	Wed	Molecular UV Spectroscopy		
26	4/18	Mon	Atomic Absoprtion Spectroscopy		
27	4/20	Wed	Luminescence Spectroscopy		
28	4/25	Mon	IR Spectroscopy		
29	4/27	Wed	Raman Spectroscopy		
30	5/2	Mon	Electrochemistry (if time is allowed)		
31	5/4	Wed	Electrochemistry (if time is allowed)		
	5/9	Mon	Final		

Course