

# CHEM457-01-03-CX-FALL2021

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## CHEM 457 Instrumental Methods of Chemical Analysis

Spring 2021 (9 AM #20869; 12 PM #20870; 4 PM 25940)

### Course Information

Class Days: Tue and Thu

Class Times: 9:00-11:40 AM, 12:00-2:40 PM, or 16:00-18:40 PM

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

Mode of Delivery: In-person

Instructors:

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(office hours: M/W 12-1pm <https://SDSU.zoom.us/j/84041469326>  
(<https://SDSU.zoom.us/j/84041469326>))

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

**TAs:** James Supurapto (electronics and microscopy modules) and Yuan Li (molecular spectroscopy and separation modules). TAs can be reached out 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,

- 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,
- Use a combination of instrumental methods to determine chemical structures of organic compounds, and
- 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: Principles of Instrumental Analysis, Skoog, Holler and Crouch, 7th Ed., Thomson, 2018;  
Instrumental Analysis: Granger, Robert M., Yochum, Hank M., Granger, Jill N., Sienerth, Karl D., 1st Ed., Oxford, 2017.

**Lab Manuals:** Available in Canvas

**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.

**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. In the table below you will find the point values for each course component.

Table 1. Grade scheme for CHEM 457 components with allotted marks in brackets

| Component  | Assignment & Homework  | Lab reports                                       | Quiz  | Subtotal |
|--|------------------------|---|---|----------|
| <b>Electronics, Logic Gates and laser optics</b> |                        | Electronics (150), Logic Gates (100), Laser (100) | Q1 (30), Q2 (40), Q3 (25)   | 445      |
| <b>Optical Microscopy</b>                        | Particle Tracking (30) | BF (70), DF (70), FM (100)                        | Self-assessment quizzes (30), Pre-lab quizzes (10), Theory & Lab Quiz (100) | 410      |
| <b>Chromatography</b>                            |                        | HPLC1 (50), HPLC2A (65), HPLC2B (65), GC1         | HPLC (50), GC (50)  | 480      |

|                               |                   |                            |                            |             |
|-------------------------------|-------------------|----------------------------|----------------------------|-------------|
|                               |                   | (50), GC2A (65), GC2B (65) |                            |             |
| <b>Molecular Spectroscopy</b> | MS (50), NMR (50) | Oral Presentation (200)    | IR (10), MS (50), NMR (50) | 410         |
| <b>Participation</b>          |                   |                            |                            | 5           |
|                               |                   |                            | <b>Total</b>               | <b>1750</b> |

All deadlines are firm and extensions will not be provided on an individual basis. In any late submission, a 10% per day late penalty will be applied with the max penalty of 50%. Assignments will receive a grade of zero after five days late. 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.

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):

[See the lab schedule.](#)

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