

CHEM 5570.002  
Advanced Analytical Chemistry  
Fall 2022 Course Syllabus

CHEM 5570 Graduate Analytical Core: 3 hours. The goal of this course is to emphasize the instrumental and theory of instrumentation within the field of analytical chemistry. The topics of the course include statistical treatment of data, electronics, chemical equilibrium, mass spectrometry, spectroscopy, and general instrumental analysis. (*Notice: CHEM 5570 requires extensive calculations, and requires the background to perform such calculations*)

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Class Schedule: MWF 9:00-9:50, Chemistry 253  
Office Hours: Monday, Wednesday, Friday: 8:00-9:00am HH 004

Introduction to Instrumentation

|           |     |                                                      |
|-----------|-----|------------------------------------------------------|
| August    | 29- | Introduction to Analytical Instrumentation           |
| September | 5-  | Design and Fabrication/ Basic Electronics and Vacuum |
|           | 12- | Basic Stats/ Advanced Stats and Data Collection      |

Spectroscopy

|           |     |                                                               |
|-----------|-----|---------------------------------------------------------------|
| September | 19- | Introduction to Optics; Optics and Symmetry                   |
|           | 26- | Symmetry and Introduction to Spectroscopy                     |
| October   | 3-  | Rotational Spectroscopy; Vibrational Spectroscopy             |
|           | 10- | Electronic Spectroscopy; Photoelectron and Laser Spectroscopy |

Separations

|          |    |                                           |
|----------|----|-------------------------------------------|
| October  | 17 | Introduction to Separations               |
|          | 24 | Ion Exchange Chromatography               |
|          | 31 | Gas Chromatography/ Liquid Chromatography |
| November | 7- | Electrophoresis/ Microfluidics            |

Mass Spectrometry

|          |     |                                                      |
|----------|-----|------------------------------------------------------|
| November | 14- | Introduction to Mass Spectrometry and Ion Optics     |
|          | 21- | Time-of-Flight; Sector and Quadrupole Mass Selectors |
|          | 28- | Penning and Paul Ion Traps                           |
| December | 5-  | Ion Sources (MALDI, FAB, ESI, EI,CI) and Detector    |

Final Exam

|          |     |                      |
|----------|-----|----------------------|
| December | 14- | 8:00AM-10AM CHEM 253 |
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Required Readings:

1. Moore, Davis, Coplan, Building Scientific Apparatus, Perseus Books.
2. Hollas, Modern Spectroscopy, John Wiley and Sons Publishing

Suggested Readings \*\*

1. Skoog, Holler, and Nieman, Principles of Instrumental Analysis, Saunders College Publishing.
2. Hecht, Optics, Addison Wesley.
3. McLafferty and Turecek, Interpretation of Mass Spectra, University Science Books.

\*\*Note: The Suggested Readings will be on hold at the library and in my office.

Tests and Quizzes:

4 Tests will be given at announced times for 100 pts. each. Each Test will be an Out-of-Class Exam, due at the beginning of class exactly one week after delivery. Late exams will not be accepted!

Grading:

The course grade is the sum of the exams out of 400 total points.

Grading Scale:

| Final percent Average | Letter Grade |
|-----------------------|--------------|
| 90.0 – 100.0 %        | A            |
| 80.0 - 89.0 %         | B            |
| 70.0 - 79.0 %         | C            |
| 60.0 - 69.0 %         | D            |
| Below 60.0 %          | F            |

Attendance Policy:

Class attendance is highly recommended and will be monitored periodically. Students who miss the class are responsible for all the missed class materials that may not be addressed by the instructor in a subsequent class.

***Note:***

***I reserve the right to make changes/modifications of the syllabus if needed.***

Additional Information:

1. According to University policy, the grade of I (incomplete) cannot be given as a substitute for a failing grade in a course.
2. Statement of ADA Compliance: The chemistry department cooperates with the Office of Disability Accommodations to make reasonable accommodations for qualified students with disabilities. If applicable, please present your request along with an official written verification from the ODA before the end of the first week of classes.