

Syllabus for CHEM 309 Principles of Instrumental Analysis

Fall 2018

MWF 10:00-10:50 am, ISC 1127

Thursdays 6:00-6:50 pm, ISC 1221

<http://blackboard.wm.edu>

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Office hours TBA or by appointment

Course overview:

- Explore the design and components for modern instruments used for chemical analysis including optical spectroscopy, electroanalytical techniques, mass spectrometry, separations, and surface analyses.
- Gain understanding in the application of these techniques to evaluate data to answer qualitative and quantitative questions about a chemical sample.

Textbook

A. Skoog, F. J. Holler, and S. R. Crouch, Principles of Instrumental Analysis, 7th Edition.

Grading

Problem sets	(7 x 20 points)
1 page literature review	(6 x 10 points)
Exams	(3 x 100 points)
Final	(200 points)

-Problem sets: Six graded problem sets will be assigned, each is worth 20 points. Working together is fine, but everyone must hand in their own problem set. Problem sets are due in class at the start of the class period.

-Literature summaries: You will be provided with current literature (one per section, excluding the Introduction section of the course) that utilizes the techniques we are learning about in class. Answers to a critical reading quiz will be due in class a week after the completion of each section (reminders on due dates will be given in class).

-Exams: There will be three exams given in class on September 26th, October 31st, and November 30th.

-Final exam: The final will be December 11th, 2-5 pm, location TBA.

The add/drop deadline is September 7th and the withdraw deadline is October 26th.

-Grading policy: Standard ranges for grades will be used to start. These thresholds may be lowered if needed but they will not be raised.

Percentage Score	Grade
93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
67-69	D+
60-66	D
<60	F

Lecture Topics

1. INTRODUCTION (Chapter 5)
 - a. Statistics
 - b. Signals and Noise

2. ATOMIC SPECTROSCOPY (Chapters 6-10)
 - a. Properties of Light, Instrumentation, and Sources
 - b. Absorption
 - c. Emission

3. MOLECULAR SPECTROSCOPY (Chapters 13, 14, 16, 17, 19)
 - a. UV/VIS
 - b. IR
 - c. NMR

4. ELECTROCHEMICAL METHODS (Chapters 22-25)
 - a. Electrochemical concepts
 - b. Potentiometry
 - c. Coulometry
 - d. Voltametry

5. MASS SPECTROMETRY (Chapter 20)
 - a. Instrumentation

- b. **Elemental**
 - c. **Molecular**
 - d. **Ionization methods**
- 6. SEPARATIONS (Chapters 26-30)**
- a. **Basic principles**
 - b. **Chromatography (GC, LC)**
 - c. **Electrophoresis**
 - d. **Instrumentation**
- 7. X-RAYS AND SURFACE TECHNIQUES (Chapters 12, 21)**
- a. **X-ray sources/detectors**
 - b. **X-ray fluorescence**
 - c. **X-ray photoelectron spectroscopy**
 - d. **SEM/TEM, microscopy**

Honor Code:

The College of William & Mary has had an honor code since at least 1779. Academic integrity is at the heart of the university, and we all are responsible for upholding the ideals of honor and integrity. The student-led honor system is responsible for resolving any suspected violations of the Honor Code, and I will report all suspected instances of academic dishonesty to the honor system. The *Student Handbook* (www.wm.edu/studenthandbook) includes your responsibilities as a student and the full Code. Your full participation and observance of the Honor Code is expected. To read the Honor Code, see www.wm.edu/honor