

Course Title/Number	<b>Modern Instrumental Methods / CHM 411/511</b>
Semester/Year	Spring 2018
Lectures	Tuesday & Thursday 12:30-1:45 PM, S 405
Labs	Monday 1:00-4:00 PM, BBSC 234 / S 128 / S 481 / S 405A / S 410
Instructor	Dr. Bin Wang
Office	241L Byrd Biotechnology Science Center
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Email	<a href="mailto:wangb@marshall.edu">wangb@marshall.edu</a>
Office Hours	Wednesday 1:30-4:30 PM or by appointment
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to <a href="http://www.marshall.edu/academic-affairs/policies/">http://www.marshall.edu/academic-affairs/policies/</a> Academic Dishonesty / Academic Dismissal / Academic Forgiveness / Academic Probation and Suspension / Affirmative Action / Dead Week / D/F Repeat Rule / Excused Absences / Inclement Weather / Sexual Harassment / Students with Disabilities / University Computing Services' Acceptable Use

### Course Description

Instrumental analysis is a field of analytical chemistry that investigates samples using scientific instruments. This course covers the design, operating principles, and practical application of modern instruments used in chemical analysis. 4.00 credits. Prerequisite: grade of C or better in CHM 307 or CHM 357.

### Course Objectives

1. To learn how to analyze results through statistical methods.
2. To learn the design and operating principles of modern instruments including atomic absorption and emission spectrometry, ultraviolet-visible spectrometry, luminescence spectrometry, infrared spectrometry, Raman spectroscopy, nuclear magnetic resonance spectroscopy, mass spectrometry, gas chromatography, liquid chromatography, capillary electrophoresis, lab-on-a-chip, surface characterization, and electroanalytical methods.
3. To acquire the ability to operate advanced instrumentation and to interpret results through modern theory.
4. To learn how to design experiments using these modern instrumental methods to solve problems in chemical analysis.

### Required Texts, Additional Reading, and Other Materials

1. *Principles of Instrumental Analysis*, 6<sup>th</sup> edition by Skoog, Holler, and Crouch; Thomson Brooks/Cole, 2007
2. Lab notebook and scientific calculator
3. Access to MUOnline and a Marshall email account

### Grading Policies

tests (7 during the semester)	35	points
labs (10 during the semester)	50	points
project proposal & presentation	15	points
	<b>100</b>	<b>TOTAL POINTS</b>

**Grading Scale:** A: 90-100, B: 80-89, C: 70-79, D: 60-69, F: < 60

### Attendance Policy

Attendance for this class is highly recommended. In general, missed tests may not be made up except in the case of an excused absence, according to university policy. In the case that class is cancelled due to inclement weather or an emergency on the day of a scheduled test, the test will be given in the next scheduled class period. If student tardiness becomes a significant distraction during lecture, the instructor reserves the right to refuse admission to tardy students.

### Miscellaneous Policies

Please silence cell phone ringers during class or tests. The instructor reserves the right to answer any ringing cell phones during lecture, or to dismiss the offending student. Use of cell phones / PDAs / MP3 players and similar devices during tests will be considered academic dishonesty. Recording of lectures without the instructor's permission is prohibited. Class announcements may occasionally be made via email to your university email address. Please check it on a regular basis. Lecture slides and lab handouts will be posted at MUOnline.

### Suggested Activities for Success

1. Always attend class and take good notes.
2. Try to work through every practice problem no matter how difficult.
3. Seek help from others, some possibilities:
  - a. Take advantage of office hours.
  - b. Work in small groups on studying for tests.
4. Don't miss labs.
5. Exercise regularly and maintain a healthy diet.

## Tentative Schedule

	Monday	Tuesday	Thursday
Week 1 1/8–1/12	–	Syllabus, Calibration Methods	Statistics
Week 2 1/15–1/19	<i>Martin Luther King, Jr. Holiday</i>	Statistics Review for Test 1	Atomic Spectrometry
Week 3 1/22–1/26	Lab: Statistics	<b>TEST 1</b>	Atomic Spectrometry, UV-Vis Spectrometry
Week 4 1/29–2/2	Lab: Statistics	UV-Vis Spectrometry, Review for Test 2	Infrared Spectrometry, Raman Spectroscopy
Week 5 2/5–2/9	Lab: ICP-AES	<b>TEST 2</b>	Luminescence Spectrometry
Week 6 2/12–2/16	Lab: UV-Vis	Luminescence, Review for Test 3	NMR Spectroscopy
Week 7 2/19–2/23	Lab: Infrared	<b>TEST 3</b>	NMR Spectroscopy, Mass Spectrometry
Week 8 2/26–3/2	Lab: Fluorescence	Mass Spectrometry, Review for Test 4	Chromatographic Separations, Gas Chromatography
Week 9 3/5–3/9	Lab: Fluorescence	<b>TEST 4</b>	Gas Chromatography, Review for Test 5
Week 10 3/12–3/16	Lab: NMR	Liquid Chromatography	<b>TEST 5</b>
<i>3/16 is the last day to drop an individual course</i>			
Week 11 3/19–3/23	<i>Spring Break</i>		
Week 12 3/26–3/30	Lab: GC-MS	LC, Supercritical Fluid Chromatography, Capillary Electrophoresis	Capillary Electrophoresis, Review for Test 6
Week 13 4/2–4/6	Lab: HPLC	Lab-on-a-chip, Electrochemistry	<b>TEST 6</b>
Week 14 4/9–4/13	Lab: CE	Electrochemistry	Electrochemistry, Surface Characterization
Week 15 4/16–4/20	Lab: CE	Surface Characterization, Review for Test 7	Review for Proposal & Presentation
Week 16 4/23–4/27	Lab: Electrochemistry /Lab-on-a-chip	<b>TEST 7</b>	Presentation
Week 17 4/30–5/4	Lab: Electrochemistry /Lab-on-a-chip	Project Proposal Due Date: April 29 <sup>th</sup> (Sunday)	