

**INSTRUMENTAL METHODS III: SPECTROSCOPY**  
CHEM 4190/6190 (CRN 22733/22734)  
2020 Spring semester

**Instructors**

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**Time and location**

TR 11:30 – 12:20 pm, NSC 218 (Lecture)  
M 9 – 12:15 pm, SA 562 (Laboratory)

**Office Hours**

R10:30 – 11:30 pm, or by appointment

**Prerequisites**

Grade C or above in CHEM 4000/6000 and CHEM4120/6120 or equivalent

**Required text**

*Principles of Instrumental Analysis* by Skoog, Holler and Crouch, 6<sup>th</sup> edition (2007), Cengage Learning, Independence, KY

**Course Description**

Spectroscopy in all its forms is among the most powerful experimental techniques in chemical research. This course provides a theoretical foundation and hands-on opportunities for generate and analyze data from UV/visible absorption, fluorescence, FT-NMR, and FT-IR spectroscopy in probing physical properties of chemicals and their interactions. This course complements the Physical Chemistry sequence (CHEM 4110/4111/4120/4121), Introduction to Biophysical Chemistry (CHEM 4150) and Photon Science (CHEM 4470) by focusing on the instrumental, analytical, and experimental aspects of spectroscopic investigations into chemical systems.

**Learning Outcomes**



**Critical Thinking/Problem Solving**

- analyze visual data
- identify errors in reasoning
- connect valid research to support arguments/claims
- provide useful summaries/precis

**Digital Technology**

- know and apply field-related technology to solve challenges
- use variety of modalities to express meaning
- create audience-appropriate layouts

**Professionalism/Work Ethic**

- ask and respond appropriately to questions
- meet deadlines
- accept responsibility

**Teamwork/Collaboration**

- collaborate in group projects
- prioritize tasks

Upon completion of this course, students will be able to:

1. Describe the physical principles of spectroscopic detection by UV, visible, and IR absorption, fluorescence, NMR;
2. Demonstrate competency in operating contemporary spectroscopic instrumentation and analyzing their output;
3. Solve quantitative problems using spectroscopic data drawn from different techniques;
4. Write ACS-style laboratory reports.

### **Additional course materials**

Lecture slides will be posted on the iCollege course page. Additional handouts will be provided as needed.

### **Attendance policy**

Most of the discussions and problem solving taught in this course cannot be adequately replaced by independent study outside of class. Attendance is therefore a major component of this course and will be assessed for credit (see next section). Attendance means presence in the classroom as well as giving consideration to your learning and that of others, not electronic devices. Please put your phones away. I will politely remind you if you do not.

### **Grading and assessments**

Tests (best 3 out of 4)	3 x 20%
Attendance	10%
Lab reports, lab preparation, and notebook	30%

Please refer to the laboratory syllabus (a separate document from the laboratory Instructor) for specific guidance on the laboratory assessments. Graduate students enrolled in CHEM 6190 have additional requirements over undergraduates enrolled CHEM 4190.

Tests are composed of a mixture of multiple choices and short written questions. Graduate students enrolled in CHEM 6150 will answer extra questions, which are optional (bonus) for undergraduate students, aimed at probing a more advanced level of understanding. The tests are not specifically cumulative in content.

Students can be assured of the following grades by attaining the following scores:

94%	<b>A+</b>	84%	<b>B+</b>	74%	<b>C+</b>	60%	<b>D</b>
90%	<b>A</b>	80%	<b>B</b>	70%	<b>C</b>	Below 50%	<b>F</b>
87%	<b>A-</b>	77%	<b>B-</b>	67%	<b>C-</b>		

### **Dropped test policy**

There are 4 (four) scheduled tests in this course. The best 3 out of the 4 completed tests will be used for calculating your final score (3 x 20%). **Skipped tests that are not excused will count and will not be dropped.**

## **Academic honesty**

The Department of Chemistry follows the University policy on academic honesty published in the “Faculty Affairs Handbook” and the “On Campus: The Undergraduate Co-Curricular Affairs Handbook”. All tests taken must represent the student’s individual, unaided effort. Receiving or offering information on a test is cheating, as is the use of unauthorized supplementary materials or devices. Any suspected offense may be referred to the Department’s Chair for further action. **The consequences of cheating are severe and potentially permanent: don’t do it!**

The University requires that faculty members must, on a date after the mid-point of the course to be set by the Provost (or her designee) give a WF to all students who are on their rolls but are no longer taking the class and report the last day the student attended or turned in an assignment. Students who are withdrawn may petition the Departmental Chair for reinstatement into their classes.

## **Statement of student support**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. Students who wish to request accommodation for a disability may do so via the Access and Accommodations Center (AACE) at <https://access.gsu.edu/>. Students may only be accommodated upon issuance of a signed Accommodation Plan by the AACE Center (see: <https://access.gsu.edu/testing-services/>) and are responsible for providing a copy of that plan to instructors of all classes in which accommodations are sought.

## **Sexual harassment**

In instances of sexual misconduct, the present instructor(s) and teaching assistants, are designated as Responsible Employees who are required to share with administrative officials all reports of sexual misconduct for university review. If you wish to disclose an incident of sexual misconduct confidentially, there are options on campus for you do so. For more information on this policy, please refer to the Sexual Misconduct Policy which is included in the Georgia State University Student Code of Conduct.

## **Basic needs statement**

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. Furthermore, please notify the professor if you are comfortable in doing so. This will enable us to provide resources that we may possess. The Embark program at GSU provides resources for students facing homelessness.

## **Course evaluation**

Your constructive assessment of this course plays an indispensable role in shaping education at Georgia State. Upon completing the course, please take time to fill out the online course evaluation.

## Course Schedule

The course syllabus provides a general plan for the course; deviations may be necessary.

Week	Session	Date	Topic	Chapter
1	1	1/14	Orientation and Introduction	6
	2	1/16		
2	3	1/21	UV/Vis absorption	7
	4	1/23		
3	5	1/28		
	6	1/30		
4	7	2/4	<b>Test 1</b>	
	8	2/6	UV/Vis absorption	13
5	9	2/11		
	10	2/13		
6	11	2/18	Fluorescence	14
	12	2/20		
7	13	2/25		
	14	2/27		
8	15	3/3*	<b>Test 2</b>	
	16	3/5	NMR	19
9	17	3/10		
	18	3/12		
10	19	3/24		
	20	3/26	<b>Test 3</b>	
11	21	3/31	IR absorption	16,17
	22	4/2		
12	23	4/7		
	24	4/9	Light scattering	18,34
13	25	4/14		
	26	4/16	Error analysis	Appendix 1
14	27	4/21	<b>Test 4</b>	
	28	4/23		

\* Last day to withdraw and receive a W