EAST TEXAS A&M UNIVERSITY

## CHEM 548-01W: Advanced Instrumental Analysis II

**Instructor: Dr. Laurence Angel**
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**Office:** Science 341
**Phone:** 903-886-5391

**Class Meetings:** 1/13/2025 – 5/9/2025, Web Classes
**Office Hours:** Mon-Fri 4:00 – 5:00 pm or by appointment.

**Course Material:** ***Quantitative Chemical Analysis****, 8th Ed., Daniel C. Harris, Freeman.*
Selected articles: ***The American Chemical Society's Journal of Chemical Education.***
These articles are available via the course website.

**eCollege Course Material:** The course is delivered online where online lectures, course material, weekly reading assignments, homework assignments and online tests can be found at the Advanced Instrumental Analysis II, D2L website. There will be presentations of research articles and ten exams. (see class schedule for details).

**Student Learning Outcomes** Students will gain a broad and in-depth knowledge of a range of instrumental techniques for accurately measuring the quantity or chemical properties of atomic and molecular species in a sample. The student will understand the theory and application of these instrumental techniques and be able to explain the concepts to their peers. The instrumental techniques covered will include:

1) Electrospray ionization mass spectrometry.
2) High performance liquid chromatography.
3) Gas chromatography – mass spectrometry.
4) Ultraviolet and visible spectroscopy.
5) Fluorescence spectroscopy.
6) Attenuated total reflectance Fourier transform infra-red spectroscopy.
7) Atomic Spectroscopy
8) Electrophoresis

By the end of the course, the student will be able to choose an instrumental technique to solve a specific chemical problem. Instrumental analysis is essential for a wide range of potential employment positions in industry, government and academia.

# GRADING

**Presentations Scoring Rubric (100%)**

| | Far Exceeds Standards | Exceeds Standards | Below Standards | Fails to Meet Standards |
|---|---|---|---|---|
| **Completeness of presentation: introduction, experimental, results, discussion, references. (40%)** | Superior completeness; student's presentation of the article was extraordinarily thorough **(40)** | Complete; student's presentation of the article covered mostly all aspects **(36)** | Mostly complete but with gaps in some areas; student's presentation was missing some key points **(32)** | Incomplete in most respects **(25)** |
| **Focus and detail on instrumental techniques (30%)** | Instrumental techniques were described in extraordinarily specific detail **(30)** | Instrumental techniques were described in almost complete detail **(25)** | Instrumental techniques description was mostly complete but there were gaps **(22)** | Instrumental techniques description was inadequate **(18)** |
| **Presentation quality (30%)** | Presentation was extraordinarily clear and insightful **(30)** | Presentation was clear and effective **(25)** | Presentation was unfocused **(22)** | Presentation failed to communicate in an adequate manner **(18)** |

**Course Grade**

**Presentation of J. Chemical Education article:** (30%)
**10 exams:** 2-hour exams held throughout the semester. (7.0% each, 70% total)

**Grading:** General range of A: > 90%, B: 80-90%, C: 70-79.9%, D: 60-69.9%, F: <60

# COURSE OUTLINE / CALENDAR

**Reading Assignments and Exam Schedule**

| Weeks | Chapter and Topics |
|---|---|
| 1-3 | Chapter 21: Mass spectrometry (Sections 21-1, 2, 3)<br>L. S. Sunderlin, V. Ryzhov, L. M. M. Keller, and E. R. Gaillard, "Measuring Gas-Phase Basicities of Amino Acids Using an Ion Trap Mass Spectrometer," J. Chem. Ed. 2005, 82, 1071. **Exam 1** |
| 4-5 | Chapter 21: Chromatography-mass spectrometry (Section 21-4)<br>A. Weinecke and V. Ryzhov, "Fundamentals of Biomolecule Analysis by Electrospray Ionization Mass Spectrometry," *J. Chem. Ed.* **2005**, *82*, 99. **Exam 2** |

The *syllabus/schedule are subject to change.*

| | |
|---|---|
| 6-7 | Chapter 24: High performance liquid chromatography<br>J. D. Freeman and E. D. Niemeyer, "Quantification of Tea Flavonoids by High Performance Liquid Chromatography," J. Chem. Ed. 2008, 85, 951. **Exam 3** |
| 8 | Chapter 23: Gas chromatography – mass spectrometry<br>L. T. Alty, "Analysis of Fatty Acid Methyl Esters in Egg Yolk Using GC-MS," J. Chem. Ed. 2009, 86, 963. **Exam 4** |
| 9 | Spring Break |
| 10 | Chapter 17: Applications of spectrophotometry<br>K. R. Williams, B. Adhyaru, R. Pierce, and S. G. Schulman, "Binding Constants for Complexation of Bilirubin to Bovine Serum Albumin," J. Chem. Ed. 2002, 79, 115. **Exam 5** |
| 11 | Chapters 17&18: UV-Vis and Fluorescence<br>K. R. Williams, B. Adhyaru, R. Pierce, and S. G. Schulman, "Binding Constants for Complexation of Bilirubin to Bovine Serum Albumin," J. Chem. Ed. 2002, 79, 115. **Exam 6** |
| 12-13 | Chapters 19/4: Spectrophotometers, FT-IR<br>E. B. Walker, D. R. Davies, and M. Campbell, "Quantitative Measurement of Trans-Fats by Infrared Spectroscopy," J. Chem. Ed. 2007, 84, 1162. **Exam 7** |
| 14-15 | Chapter 20: Atomic absorption, flame and graphite furnace<br>P. R. M. Correia and P. V. Oliveira, "Simultaneous Atomic Absorption Spectrometry for Cadmium and Lead Determination in Wastewater," J. Chem. Ed. 2004, 81, 1174. **Exam 8 & 9** |
| 16 | Chapter 25: Capillary Electrophoresis<br>D. S. Hage, A. Chattopadhyay, C. A. C. Wolfe, J. Grundman, and P. B. Kelter,"Determination of Nitrate and Nitrite in Water by Capillary Electrophoresis," J. Chem.Ed. 1998, 75, 1588.<br>Valerie L. McDevitt, Alejandra Rodríguez, and Kathryn R. Williams "Analysis of Soft Drinks: UV Spectrophotometry, Liquid Chromatography, and Capillary Electrophoresis," J. Chem. Ed. 1998, 75, 625. |
| 17 | Finals week **Exam 10** |

## COURSE AND UNIVERSITY PROCEDURES/POLICIES

### Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

***University Specific Procedures***

**Student Conduct**

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the Student Guidebook .
http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: Netiquette
http://www.albion.com/netiquette/corerules.html

**TAMUC Attendance**

For more information about the attendance policy please visit the Attendance webpage and Procedure 13.99.99.R0.01.
http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf

**Academic Integrity**

Students at Texas A&M University-Commerce are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:
Undergraduate Academic Dishonesty 13.99.99.R0.03
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf
Graduate Student Academic Dishonesty 13.99.99.R0.10
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/graduate/13.99.99.R0.10GraduateStudentAcademicDishonesty.pdf

***ADA Statement***

**Students with Disabilities**

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. If you have a disability requiring an accommodation, please contact:

## Office of Student Disability Resources and Services

Texas A&M University-Commerce
Gee Library- Room 162
Phone (903) 886-5150 or (903) 886-5835
Fax (903) 468-8148
Email: studentdisabilityservices@tamuc.edu

Website: Office of Student Disability Resources and Services
http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/

**The Counseling Center at A&M-Commerce,** located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit www.tamuc.edu/counsel

**Nondiscrimination Notice**
Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

**Campus Concealed Carry Statement**
Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.
For a list of locations, please refer to the Carrying Concealed Handguns On Campus document and/or consult your event organizer.
Web url:
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf
Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

## TECHNOLOGY REQUIREMENTS

### LMS

All course sections offered by Texas A&M University-Commerce have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements
LMS Requirements:
https://community.brightspace.com/s/article/Brightspace-Platform-Requirements
LMS Browser Support:
https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm
YouSeeU Virtual Classroom Requirements:
https://support.youseeu.com/hc/en-us/articles/115007031107-Basic-System-Requirements

## ACCESS AND NAVIGATION

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or helpdesk@tamuc.edu**.**

**Note:** Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

## COMMUNICATION AND SUPPORT

If you have any questions or are having difficulties with the course material, please contact your Instructor.

### Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:
https://community.brightspace.com/support/s/contactsupport

### A&M-Commerce Supports Students' Mental Health

The Counseling Center at A&M-Commerce, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit **www.tamuc.edu/counsel**

### AI use policy [Draft 2, May 25, 2023]

Texas A&M University-Commerce acknowledges that there are legitimate uses of Artificial Intelligence, ChatBots, or other software that has the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors 'guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources.
13.99.99.R0.03 Undergraduate Academic Dishonesty
13.99.99.R0.10 Graduate Student Academic Dishonesty