

CHEM 548- 01W: Advanced Instrumental Analysis II

Instructor: Dr. Laurence Angel
Email: Laurence.Angel@tamuc.edu

Office: Science 341
Phone: 903-886-5391

Class Meetings: August 25th – Dec 12th 2014: Web Based Class.

Office Hours: Mon-Fri 4:00 – 5:00 pm

Course Material: *Exploring Chemical Analysis, 4th Ed., Daniel C. Harris, Freeman.*

Selected laboratory articles from *The American Chemical Society's Journal of Chemical Education*. These articles are available via the website and logging into the university library.

eCollege Course Material: The course is supplemented by online class material, weekly reading and homework assignments, and online quizzes, tests and a final comprehensive exam found at the Advanced Instrumental Analysis II, eCollege website. There is a quiz to be completed at the end of each week and each quiz is worth 2% of your final grade. In addition, there are four midterm tests and a final comprehensive exam (see class schedule for details). 3 Course Credits

Student Learning Outcomes Students will gain a broad and in-depth knowledge of a range of instrumental techniques for accurately measuring the quantity or other important chemical parameters 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) Amperometry, voltammetry and polarography.
- 2) Ultraviolet and visible spectroscopy.
- 3) Attenuated total reflectance Fourier transform infra-red spectroscopy.
- 4) Fluorescence spectroscopy.
- 5) Graphite furnace and flame atomic absorption spectroscopy.
- 6) Electropray ionization mass spectrometry.
- 7) High performance liquid chromatography.
- 8) Gas chromatography.
- 9) Ion exchange and molecular chromatography.
- 10) Capillary 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.

Student Conduct Policy: All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment (see Student's Guidebook, Policies and Procedures, Conduct).

Cheating and other Breaches of Academic Conduct: Academic cheating, plagiarism, and other forms of academic misconduct may result in removal of the student from the course with a failing grade or may in extreme cases result in suspension or expulsion from the University.

Students with Disabilities: If you have a disability requiring an accommodation, please contact: **Office of Student Disability Resources and Services, Texas A&M University-Commerce, Halladay Student Services Building, Room 303 A/D. Phone (903) 886-5150 or (903) 886-5835. Fax (903) 468-8148. StudentDisabilityServices@tamuc.edu**

Fall 2014 Schedules will be dropped for students who have not paid the balance due on their accounts. Check the drop date and the status of your account on MyLeo. It is available 24/7 at <https://leo.tamuc.edu/login.aspx>. If you need assistance to pay the balance, please contact the Bursar's Office (903-886-5051).

Student Evaluation: All quizzes, tests and exams are open notes and books.

Quizzes: 15 online quizzes due at the end of each week worth 2% each. (30% total)

Midterm tests: 4 midterm tests held during the semester 10% each (40% total)

Final comprehensive exam: 2-hour comprehensive exam held in finals week (30% total)

Grading: General grade range of A: > 86%, B: 75-86%, C: 64-74%, D: 50-63%, F: <50

Class Schedule and Reading Assignments from "Exploring Chemical Analysis"

Week Starting	Chapter and Topics
Aug 25	Chapter 14: Electrode potentials and electricity
Sept 1	Chapters 16: Redox titrations
Sept 8	Chapter 17: Amperometry, voltammetry and polarography Test 1
Sept 15	Chapter 18: UV absorption spectroscopy
Sept 22	Chapters 18/19: Spectrophotometry: instruments and application
Sept 29	Chapters 19/4: FT-IR and fluorescence / Statistics Test 2
Oct 6	Chapter 20: Atomic absorption and emission spectroscopy
Oct 13	Chapters 20/5: Flame and graphite furnace
Oct 20	Chapter 5: Analytical procedure and calibration methods Test 3
Oct 27	Chapter 21: Chromatography and mass spectrometry
Nov 3	Chapter 21: ESI-mass spectrometry
Nov 10	Chapter 22: Gas chromatography
Nov 17	Chapter 22: High performance liquid chromatography Test 4
Nov 24	Chapter 23: Ion exchange and molecular chromatography
Dec 1	Chapter 23: Capillary electrophoresis
Dec 8	Finals week: Final Comprehensive Exam

Reading Assignments from "Journal of Chemical Education"

Week Starting	Article
Sept 21	T. H. Huang, G. Salter, S. L. Kahn, and Y. M. Gindt, "Redox Titration of Ferricyanide to Ferrocyanide with Ascorbic Acid: Illustrating the Nernst Equation and the Beer-Lambert Law," <i>J. Chem. Ed.</i> 2007 , <i>84</i> , 1180.
Sept 8	M. Bertotti, J. M. Vaz, and R. Telles, "Ascorbic Acid Determination in Natural Orange Juice as a Teaching Tool of Coulometry and Polarography," <i>J. Chem. Ed.</i> 1985 , <i>62</i> , 445.
Sept 15	K. M. Maloney, E. M. Quiazon, and R. Indralingam, "Measurement of Iron in Egg Yolk: An Instrumental Analysis Experiment Using Biochemical Principles," <i>J. Chem. Ed.</i> 2008 , <i>85</i> , 399.
Sept 22	E. B. Walker, D. R. Davies, and M. Campbell, "Quantitative Measurement of Trans-Fats by Infrared Spectroscopy," <i>J. Chem. Ed.</i> 2007 , <i>84</i> , 1162.
Sept 29	K. R. Williams, B. Adhyaru, R. Pierce, and S. G. Schulman, "Binding Constants for Complexation of Bilirubin to Bovine Serum Albumin," <i>J. Chem. Ed.</i> 2002 , <i>79</i> , 115.
Oct 6 - 13	P. R. M. Correia and P. V. Oliveira, "Simultaneous Atomic Absorption Spectrometry for Cadmium and Lead Determination in Wastewater," <i>J. Chem. Ed.</i> 2004 , <i>81</i> , 1174.
Oct 20	V. J. Porter, P. M. Sanft, J. C. Dempich, D. D. Dettmer, A. E. Erickson, N. A. Dubauskie, S.T. Myster, E. H. Matts, and E. T. Smith, "Elemental Analysis of Wisdom Teeth by Atomic Spectroscopy Using Standard Additions," <i>J. Chem. Ed.</i> 2002 , <i>79</i> , 1114.
Oct 27	A. Weinecke and V. Ryzhov, "Fundamentals of Biomolecule Analysis by Electrospray Ionization Mass Spectrometry," <i>J. Chem. Ed.</i> 2005 , <i>82</i> , 99.
Nov 3	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," <i>J. Chem. Ed.</i> 2005 , <i>82</i> , 1071.
Nov 10	L. T. Alty, "Analysis of Fatty Acid Methyl Esters in Egg Yolk Using GC-MS," <i>J. Chem. Ed.</i> 2009 , <i>86</i> , 963.
Nov 17	J. D. Freeman and E. D. Niemeyer, "Quantification of Tea Flavonoids by High Performance Liquid Chromatography," <i>J. Chem. Ed.</i> 2008 , <i>85</i> , 951.
Dec 1	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," <i>J. Chem. Ed.</i> 1998 , <i>75</i> , 1588.