Texas A&M-Commerce Spring 2014

CHEM 441: Instrumental Analysis

Class meetings: Dr. Laurence Angel
Office: Science 341
Email: Laurence.Angel@tamuc.edu
Phone: 903-886-5391
Office Hours: Mon- Fri: 4:00 -5:00 pm or by appointment.
Class: 9:30 – 10:45am Science 313 and chemistry student lounge
Laboratory: Science 313/309/354 Tue 2:00 – 5.50 pm
Lab Instructor: Dr. Xingzhong Yan
Office: Science 334
Email: Xingzhong.Yan@tamuc.edu

Course Description: The course will cover a detailed examination of the principles and practical applications of ultraviolet and visible spectroscopy, infrared spectroscopy, laser spectroscopy, atomic absorption spectroscopy, mass spectrometry, high performance liquid chromatography, gas chromatography and electrophoresis.

Student Learning Outcomes: Students will gain a broad and in-depth knowledge of a range of instrumental techniques for accurately measuring the quantity and identity of atomic and molecular species in a sample.

1. The student will understand the theory and practical application of these instrumental techniques and be able to explain the concepts to their peers.
2. Students will demonstrate broad knowledge of and successful problem solving skills in instrumental analysis as examined by lab work, lab reports and exams.
3. Students will demonstrate knowledge for choosing a method, or combination of methods, that can be applied to solve a specific analytical chemistry problem.

Credits: 4 credit hours for class and laboratory.

Class course Material:
Exploring Chemical Analysis, 4th edition, Daniel C. Harris, Freeman.
or
Quantitative Chemical Analysis, 8th edition, Daniel C. Harris, Freeman.
Supplementary material will be handed out for the special topic sections.

Laboratory Experiments: I will be giving out handouts throughout the semester for the laboratory procedures you will be conducting. You will also need a proper laboratory notebook, safety goggles, and a hand calculator. The experiments will closely correlate with the class material.

Prerequisite: The student must have completed CHEM 112 in order to enroll in CHEM 441. Having completed CHEM 211, CHEM 212 and CHEM 340 is also desirable.

Attendance Policy: All students are expected to attend classes on a regular basis. The Department of Chemistry adheres to the attendance policy set by the University as stated in the Undergraduate Catalog. **According to the TAMU-Commerce Procedure A13.02, if a student has excessive absences, the instructor may drop the student from the course**. The instructor will only excuse an absence if the student provides, with appropriate document, an excusable reason allowed by the TAMU-Commerce Procedure A13.02. Good class attendance will be necessary in order to pass this course.

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. Any student engaging in disruptive behavior will be dismissed from class on the first offence. A second offence may constitute dismissal from the course with a failing grade.

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

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
Halladay Student Services Building
Room 303 A/D
Phone (903) 886-5150 or (903) 886-5835
Fax (903) 468-8148
StudentDisabilityServices@tamu-commerce.edu

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

Evaluation:
Mid-term exams: 4 exams will be held during the semester (40%)
10-Laboratory reports: Graded laboratory reports (4% each)
Final American Chemical Society Exam: 2-hour comprehensive final exam (20%)
Grading: General grade range of A: > 85%, B: 73-85%, C: 60-72%, D: 45-59%, F: <45%
Laboratory Procedures and Requirements: We shall go over laboratory safety, lab books and report writing in the first week of the scheduled laboratory sections at 2 pm in Science 309. The laboratory experiments will follow the theory of the instrumentation covered in class. For the laboratory report, the correct identification of the unknown sample or quantity is worth 75% of the final grade and the laboratory report, computer analysis and performance in the laboratory worth 25%.

Tentative Class Schedule Topics:

Week	Topics
1	Introduction to Spectrophotometry
2	Spectrophotometry Instrumentation and Applications
3	Spectrophotometers and Lasers
4	Luminescence and Calibration Methods
5	Introduction to Atomic Absorption Spectroscopy **Exam 1**
6	Methods of Atomic Spectroscopy
7	Inductively Coupled Plasma Mass Spectrometry
8	Introduction to Mass Spectrometry **Exam 2**
9	Spring Break
10	Mass Spectrometry Instrumentation and Techniques
11	Introduction to Analytical Separations
12	Introduction to Analytical Separations **Exam 3**
13	High Performance Liquid Chromatography
14	Gas Chromatography
15	Chromatographic Methods/Capillary Electrophoresis **Exam 4**
16	Review
17	**Final Exam**

Tentative Laboratory Schedule

Week	Laboratory
1	Lab safety and equipment check
2	Colorimetric Determination of Iron
3	Spectrophotometric Analysis of a Mixture: Caffeine and Benzoic Acid in a Soft Drink
4	Spectrophotometric Measurement of an Equilibrium Constant: The Scatchard Plot
5	Mn^{2+} Standardization by EDTA
6	Measuring Manganese in Steel by Spectrophotometry with Standard Addition
7	Measuring Manganese in Steel by Atomic Absorption Using a Calibration Curve
8	Determination of Lead in Brass by Atomic Absorption Spectroscopy
9	Spring Break
10	Introduction to Mass Spectrometry and Analytical Separations
11	Mass Spectrometry of Proteins
12	Mass Spectrometry Collision-Induced Dissociation Analysis of Oligopeptides
13	High Performance Liquid Chromatography Analysis of Oligopeptides
14	Analysis of Analgesic Tablets by High Performance Liquid Chromatography
15	Lab clean-up and sign-out