Course Syllabus
Fall 2018
Chemistry 443
Instrumental Analysis

Course Description: Spectrochemical and electrochemical methods of analysis.

Number of Credit Hours: 4 semester hours - 3 hours lecture

Course Prerequisites and Corequisites: Prerequisite: 231 and 337. Required lab fee.

Program Learning Outcomes:
1. The student will demonstrate knowledge of fundamental content in the basic areas of chemistry: Analytical, Biochemistry, Inorganic, Organic, and Physical.
2. The student will integrate knowledge with critical thinking to solve problems.

General Education Core Curriculum Objectives: There are no specific general education core curriculum objectives in this course. This course is not a general education core curriculum course.

Course Objective: To provide students with a more detailed explanation of the basic concepts, laws, and theories and to apply the knowledge to chemistry problem solving. The student will develop an appreciation for chemistry as it relates to the other disciplines. Furthermore, the student will recognize how chemistry provides solutions to contemporary, historical, technological, and societal issues. In addition, students will get experience in operating the following instruments: Fourier Transform Infrared Spectrometer, Atomic Absorption Spectrometer, Ultraviolet-Visible Spectrophotometer, Liquid Chromatograph, Gas Chromatograph, and Ion Chromatograph. Students will be taught to operate 400 MHz Nuclear Magnetic Resonance Spectrometer and a Gas Chromatograph-Mass Spectrometer. Students will be taught electrochemical techniques such as polarography, cyclic voltammetry, potentiometry, and chrono-amperometry.

Student Learning Outcomes: The student is expected to recognize and apply the fundamental and practical aspects of the following concepts and apply the concepts to problem solving:
- The principles of gas, liquid, ion, and gel permeation chromatography,
- The principles of UV-visible, infrared, nuclear magnetic resonance, Raman, and X-Ray spectroscopy,
- The concepts involved in atomic absorption spectroscopy,
- The fundamentals of how flame and graphite furnace atomic absorption spectroscopy are applied to analytical chemistry,
- The concepts used in electron spin resonance spectroscopy,
- The fundamentals of electrochemistry that relate to half-reactions, Voltaic cells, and electrolytic cells,
- The fundamentals of electrochemical analysis, including polarography, pulse polarography, voltammetry, potentiometry, coulometry, and amperometry.
Class Syllabus
Fall 2018
CHE 443-001/CHE 575
Instrumental Analysis

Instructor: Dr. Darrell R. Fry
Department: Chemistry & Biochemistry
e-mail: frydr@sfasu.edu
Office: Math 120
Phone: TEXT : 936.208.3415
Office Hours: MWF 9:30-11; TR 2:30-3:20 and by appointment
Class meeting time and place: TR 8:00 am – 9:15 Math 132

TEXT AND MATERIALS:
- Scientific Calculator
- Other articles and spectra handouts will be distributed in the course as required reading.

SUPPLEMENTAL TEXTS:
- Quantitative Chemical Analysis, Daniel C Harris any edition
- Instrumental Methods of Analysis, 7th edition; Willard, Merritt, Dean, Settle

Specific Course Learning Objectives Include:
1. Demonstrate knowledge of sampling methods for all states of matter.
2. Assess sources of error in chemical and instrumental analysis and account for errors in data analysis.
3. Recognize interferences in chemical and instrumental analysis.
4. Comprehend the concept of and perform instrument and method calibration.
5. Apply and assess concepts of availability and evaluation of analytical standards and formulate standardization methodology.
6. Integrate a fundamental understanding of the underlining physics principles as they relate to specific instrumentation used for atomic, molecular, and mass spectrometry, magnetic resonance spectrometry and chromatography.
7. Understand and be able to apply the theory and operational principles of analytical instruments.
8. Distinguish between qualitative and quantitative measurements and be able to effectively compare and critically select methods for elemental and molecular analyses.
GRADING:
Grades are based upon performance. Please note, a single letter grade is given for Che 443 and Che 443 Laboratory.

The table below details the points available in the course.

<table>
<thead>
<tr>
<th>Date</th>
<th>Assessment</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday 10/5</td>
<td>Exam I-10/5</td>
<td>50</td>
</tr>
<tr>
<td>Friday 11/9</td>
<td>Exam II -11/9</td>
<td>50</td>
</tr>
<tr>
<td>Friday 12/7</td>
<td>Exam III -12/7 (Friday of Dead Week)</td>
<td>50</td>
</tr>
<tr>
<td>Tuesday Dec 11\textsuperscript{th} 8-10am</td>
<td>Final Exam Comprehensive ACS Final</td>
<td>100</td>
</tr>
<tr>
<td>Tuesday 8:00am sharp</td>
<td>Quizzes (10 @ 20 each; drop the lowest)</td>
<td>200</td>
</tr>
<tr>
<td>Thursday 8:00am sharp</td>
<td>Paragraphs describing instrumentation (10 @ 10 each; drop lowest)</td>
<td>100</td>
</tr>
<tr>
<td>9/28 and 11/2</td>
<td>Full Lab Report (2 @ 50 each)</td>
<td>100</td>
</tr>
<tr>
<td>Wednesdays</td>
<td>Results &amp; Post-Lab 100 points evenly distributed among the activities; drop the lowest</td>
<td>100</td>
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<tr>
<td>11/30</td>
<td>TEAM WORK ASSESSMENT</td>
<td>15</td>
</tr>
</tbody>
</table>

Exams 1-3 will be Friday afternoon—at a time and location to be determined. You will not have lab on exam days!

Exam 3 is the Friday of Dead Week.

Make-ups will not be given for the Quizzes, Paragraphs describing the instrumentation or Results & Post-Lab. Instead the lowest one in each category will be dropped.

Only under rare circumstances (at the decision of the faculty member) will students be allowed to make up an exam or the final exam.

Half of the points in the Results & Post-Lab are for attendance, neatness and working well with others.

Students must score a 43 or better (out of 50) on the two full lab reports. Failure to do so will mean writing additional lab reports over different laboratories.

Grading Scale (percentage of 400 points): A: 100-90% B: 89-80% C: 79-70% D: 69-60% F: below 60

Note: The attached class schedule is tentative. I will attempt to follow it as closely as possible with respect to lecture topics and exam material. However, any changes as to the exact material to be covered in lecture and each exam will be announced in class. It is therefore important for you to attend class regularly.

MAKE-UP POLICY: There will be no make-up exams, quizzes, or labs.

ATTENDANCE POLICY: Attendance of class is mandatory. A total of two unexcused absences will result in the student being dropped from the class with a grade of "F".
ACADEMIC INTEGRITY (A-9.1): Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

Definition of Academic Dishonesty
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Please read the complete policy at http://www.sfasu.edu/policies/academic_integrity.asp

Any student found cheating will be subject to the penalties as stated in the Student Code of Conduct handbook; including but not limited to a score of zero on exam, expulsion from the class or expulsion from the University.

COURSE CALENDER & CONTENT:
Material will be covered in the following section order with approximate class time.
Exam dates are FIXED.

<table>
<thead>
<tr>
<th>Week</th>
<th>T Date</th>
<th>Chapter(s)</th>
<th>Topic</th>
<th>Exam#</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28-Aug</td>
<td>1</td>
<td>Measurement Basics</td>
<td></td>
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<tr>
<td>2</td>
<td>4-Sep</td>
<td>6</td>
<td>An Introduction to Spectrometric Methods</td>
<td></td>
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<tr>
<td>3</td>
<td>11-Sep</td>
<td>7</td>
<td>Components of Optical Instruments</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>18-Sep</td>
<td>9</td>
<td>An Introduction to Optical Spectrometry</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>25-Sep</td>
<td>13,14</td>
<td>Ultraviolet-Visible Spectroscopy</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2-Oct</td>
<td></td>
<td></td>
<td>Exam 1</td>
</tr>
<tr>
<td>7</td>
<td>9-Oct</td>
<td>15</td>
<td>Luminescence Spectroscopy</td>
<td></td>
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<tr>
<td>8</td>
<td>16-Oct</td>
<td>16,17,18</td>
<td>IR and Raman Spectroscopy</td>
<td></td>
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<tr>
<td>9</td>
<td>23-Oct</td>
<td>19</td>
<td>NMR</td>
<td></td>
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<tr>
<td>10</td>
<td>30-Oct</td>
<td>20</td>
<td>MS</td>
<td></td>
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<tr>
<td>11</td>
<td>6-Nov</td>
<td></td>
<td></td>
<td>Exam 2</td>
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<tr>
<td>12</td>
<td>13-Nov</td>
<td>22,23,24,25</td>
<td>Electrochemistry</td>
<td></td>
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<tr>
<td>13</td>
<td>20-Nov</td>
<td></td>
<td>Thanksgiving</td>
<td></td>
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<tr>
<td>14</td>
<td>27-Nov</td>
<td>26</td>
<td>Separations</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>4-Dec</td>
<td>27,28</td>
<td>LC vs. GC</td>
<td>Exam 3</td>
</tr>
</tbody>
</table>

NOTE: This course schedule is tentative

WITHHELD GRADES SEMESTER GRADES POLICY (A-54):
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.

**STUDENTS WITH DISABILITIES:** To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to [http://www.sfasu.edu/disabilityservices/](http://www.sfasu.edu/disabilityservices/).

**SEMESTER WITHDRAWALS:** Last day to withdraw from the course without obtaining WP or WF grade is October 23.
Specific Expectations for Dr. Fry’s courses/laboratories

1. Refer to Dr. Fry as Dr. Fry—not Mr. Fry.
   a. Since 2001, Dr. Fry has found that every student who call him Mr. Fry, has utterly failed the course. It is not that I fail them for this—rather the students do not understand that they are in college. Students who do not recognize that I understand chemistry a lot better than their high school teacher do not recognize that they have to study—and they fail.

2. Pay attention DURING class!
   a. Dr. Fry has found that those students who pay attention in class tend to do their best. He has reached this same conclusion at the end of each semester since 2001—when he began teaching.
   b. Dr. Fry looks for understanding among the students as he presents the material. If you do not understand something often he is able to read your expression. As time allows, he can then explain the topic further. However, if you are not paying attention, Dr. Fry cannot do this.
   c. Do not have your cell phone out.
   d. Computers, tablets and other electronic devices are not allowed to be out during class time.
   e. Remember, that paying attention makes a difference. For most students (and everyone else) the cell phone represents the largest avoidable distraction. Exercise your self-control and do not look at your cell phone during class.
   f. Do not use your cell phone to take pictures of material in class including due dates. Instead write it down!

3. Work the homework until you understand it.
   a. Dr. Fry has found that those students who do their homework until they understand it tend to do their best. He has reached this same conclusion at the end of each semester since 2001 when he began teaching.
   b. A lot of students mistake going through the homework with working it until you understand it.

4. Do not talk while others are talking (or lecturing).
   a. Do not distract others (including Dr. Fry) from the course material.

5. Come to class/lab prepared.

6. Do not email Dr. Fry through the d2l system—he will not respond.

7. Students are expected to check their sfa email on a regular basis. Dr. Fry often communicates important items to individual students via email. For instance, if you left your calculator in the classroom.

8. Grades are not discussed immediately before or immediately after class. Instead, grades will be discussed during office hours. This prevents us arguing about a specific item in front of everyone in the class. Moreover, it gives us a chance to understand one another.
   a. After graded work is returned, you have a limited time to review it and find any problems. If you do find a problem, of something that you do not understand, see Dr. Fry in his office. In general, 1-2 class periods after something is handed back is an upper limit on regrading items.

Note: This syllabus is subject to change at the discretion of the instructor.