Instrumental Analysis
CHM 311 (4 credits)
FALL 2018

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Office Hours: TBA and by appointment or drop in.

Lecture: MWF 9:35 to 10:25 a.m.

The aim of the course is to introduce you to the main methods of instrumental analysis. You will gain an understanding of the chemical principles behind the instrumental techniques, a working knowledge of instrument operation, and cognizance of the applications of instrumental analysis. Given the rapid growth in the type and complexity of chemical instrumentation, it would be difficult to cover every technique available. However, this course should provide you with the fundamental background on the workings of many important types of instruments that you will likely encounter in the future, including absorption and emission spectroscopy, electrochemical techniques, and chromatographic separation.

REQUIRED TEXT
Harris, Daniel C., *Quantitative Chemical Analysis*, 9th edition (W.H. Freeman, 2016)

ISBN 1-4641-3538.

This text is somewhat unconventional for an instrumental course. You will recognize it as last year's Analytical book. You might recall that during the Analytical course we actually covered less than half of the material contained in this text, the reason being that the second half of the book deals with instrumental techniques. Therefore, it seems reasonable to use what remains for an Instrumental course.

ATTENDENCE: If you are absent from class, you are responsible for learning the material covered. Quizzes and exams are given during class time, and failure to attend a class where a quiz or exam is given will result in a failure on the quiz or exam. If you need to miss a lecture for a valid reason, such as a university sponsored event or severe illness, please contact me immediately and preferably beforehand. You must provide proof of absence, such as a doctor's note for extended absences or absences on quiz or exam days.

ACADEMIC INTEGRITY: All students at La Salle University are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions by me and further possible actions outlined under the La Salle Academic Integrity Violation Procedures. Students

should carefully review La Salle University's Academic Integrity Policy and Student Rights & Responsibilities in the Student Guide for more information.

GRADING POLICY: The course grade will be based on the grading scale given below:

A 90% B 80% C 70% D 60%

For final grades, the +/- system is used (B+, A-, etc.) and breaks between half letter grades will be within the above grade ranges and made at the discretion of the instructor according to University policy.

EXAMINATIONS AND COURSE GRADE

Your overall grade will be determined by computing your numerical grade according to the following:

3 Exams (12 % each)	36%
Final Comprehensive Exam	15%
Weekly Quizzes	10%
Talk(s)	9%
Laboratory	30%

Homework problems will be selected from the end-of-chapter problems that appear in the text. Each examination will be announced at least one week before it is given. Examination questions will be drawn from lecture material, assigned readings, homework problems, and material covered in the laboratory. The final examination will be given during Final Examination Week and will be comprehensive.

Short talks on various techniques/ instrument components will periodically be assigned.

LABORATORY

A very important aspect of this course is the laboratory work. You will use many of the instruments discussed during class. You will work in groups of 2-3 depending on the class size. The first lab covering basic electronics will be performed during the second week of class. Subsequently, each group will carry out a different experiment in a given week due to the large student-to-instrument ratio. You are expected to read the appropriate background material in preparation for the laboratory before coming to class. The laboratory grade will be 30% of your final grade.

In order to pass the course, you must receive a passing grade in both the lecture and laboratory parts of the course.

STUDENTS WITH DISABILITIES:

Students with disabilities should refer to the student handbook for resources that are available to them as well as compliance with the American Disabilities Act.

SYLLABUS CHANGE POLICY:

This syllabus is a guide and every attempt is made to provide an accurate overview of the course. However, circumstances and events may make it necessary for the instructor to modify the syllabus during the semester and may depend, in part, on the progress, needs, and experiences of the students. The instructor will give notice when changes to the syllabus are made.

TENTATIVE COURSE TOPICS OUTLINE and EXAM SCHEDULE

Week	Chapters & Topics	
1-3	Ch 5	Calibration Methods Method Validation Standard Addition Method
	Ch. 18	Fundamentals of Spectrophotometry Properties of light and it's interactions with matter Beer's Laws What Happens When a Molecule Absorbs Light? Luminescence
4	Ch. 19	Applications of Spectrophotometry Analysis of mixtures Measuring the Equilibrium Constant

Examination I **- September 29th**

5-6	Ch. 20	Spectrophotometers Components Dealing with Noise FT Infrared Spectroscopy
7	Ch. 21	Atomic Spectrophotometry Atomization Flame Temperature Instrumentation Interference

Examination II **– October 27th**

8	Ch. 22	Mass Spectrometry Instrumentation Interpretation of results
9-10	Ch. 23	Introduction to Separation Methods Theory of chromatography processes Plate and Rate Theory
11	Ch. 24	Gas Chromatography Injection Detectors

Examination III **– December 1st**

12	Ch. 25	High-Performance Liquid Chromatography Introduction Elution methods Injection and Detection Reverse Phase and Gradient Elution
13	Ch 17	Magnetic Resonance Nuclear and Electron Magnetic Resonance Spectroscopy
14		Catch- Up week
15		**Cumulative** Final Examination