

JOHN JAY COLLEGE OF CRIMINAL JUSTICE  
The City University of New York  
524 West 59<sup>th</sup> Street new York NY 10019

Course Syllabus - Fall 2013

Chem 320.01-02  
Instrumental Analyses  
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Office Room - 5.66.09 Lab 4.68.01

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Office Hours By Appointment &  
Tues. 4:40-8:00, Thurs.B4- Class  
Noon to 1:00PM T, Th

Learning Objectives:

The purpose of this course is to introduce the student to the use of chemical instrumentation and spectrophotometric techniques to the analyses of physical evidence materials of forensic import. The course includes lectures and problem sessions and has as a critical portion, hands on laboratory sessions. At the conclusion of the course the successful student will understand the fundamental use and operation of certain types of chemical instrumentation and their application to forensic analytical problems. He will also be able to choose the proper technique to successfully analyze a material, increase his knowledge and understanding of the analytical approach and the interpretation of quantitative data.

The lectures include the descriptions of various instruments including their designs, the theory of operation and the fundamental science on which they are based. Applications of these instruments to forensic samples will be discussed. The accuracy and precision of measurements as well as error analysis will be introduced. This course is concentrated on electronic and vibrational spectra, although other spectrometry methods such as Mass and X-ray will be covered. Other techniques such as X-ray Diffraction, Immuno-assay, and Radio Chemistry may be introduced. Proper calibration checking and instrument performance will be discussed including how each affects quality data and its interpretation.

Issues of quality data, lab accreditation and individual certification will be discussed.

Students are expected to have a cumulative grade point average of better than "C" in science courses and should have successfully completed a course on quantitative analysis.

Topics to be covered, time line, grading and additional information are found below and in the Laboratory Manual. There will be two, one hour plus, midterm and cumulative final, written examinations during the semester.

Outcomes Assessment:

The success of the student in mastering the learning objectives will be assessed by the student's performance on examinations and laboratory work. Laboratory performance will be judged not only by obtaining correct answers for the exercises but is also by the proper keeping of a laboratory notebook, answering of questions in the laboratory exercises and the submission of a quality summary report for the special project.

### College Requirement of Writing-Across-the Curriculum:

The student is reminded that the College Council has established guidelines for minimum writing skill requirements for all courses.

For this course your skills will be assessed in three ways. The first is your clear and correct entries into your lab books including properly written answers to lab questions. This also includes proper documentation of the procedure in a clear written manner. The second is in your essay answers in all exams and quizzes if given. As restated in the exams your organization skills and use of proper English grammar, syntax, and spelling all will be considered in the grading of the essay. In addition legibility counts. The third way is the summary report that must be written concerning the semester special project.

Because the laboratory exercises require extensive preparation that may require library research time and most students require more than the assigned eight hours of laboratory time per week the assignment of extra term papers or writing exercises beyond those defined above will not usually be done.

### College Policy on Plagiarism:

Plagiarism is the presentation of someone else's ideas, words, or artistic, scientific, or technical work as one's own creation. Using the ideas or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source.

Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

It is the student's responsibility to recognize the difference between statements that are common knowledge (which do not require documentation) and restatements of the ideas of others. Paraphrase, summary, and direct quotation are acceptable forms of restatement, as long as the source is cited.

Students who are unsure how and when to provide documentation are advised to consult with their instructors. The Library has free guides designed to help students with problems of documentation. (From John Jay College of Criminal Justice Undergraduate Bulletin p.89)

Examples are:

Copying another person's actual words without the use of quotation marks and footnotes attributing the words to the proper source.

Presenting another's ideas or theories in your own words without acknowledging the source.

Using information that is not common knowledge without acknowledging the source.

Failing to acknowledge collaborators on homework or laboratory assignments.

Internet plagiarism includes submitting downloaded term papers or parts thereof. Paraphrasing or copying information from the Internet without citing the source (including Power Point Presentations) and cutting and pasting without proper attribution.

Students who are unsure of how and when to provide documentation are advised to consult the instructor. The Library has free guides to assist the student with problems.

Students are **REMINDED** that the use of another student's data or results, unless specifically allowed, for laboratory reports is a form of plagiarism at a minimum and may actually be considered to be **CHEATING**. This will result in the assignment of a **ZERO** grade for that laboratory experiment as a minimum and could likely result in failure of the laboratory portion of the course and thereby the entire course itself. Be mindful that the college could impose an even stricter penalty on the transgressor(s).

When data sharing is permitted be sure to have such approved, in advance, in writing, in your notebook by the course instructor.

Course Outline

<u>Period</u>	<u>Topics</u>
1.	Introduction to: Instrumental Analyses, Measurements and Errors, Statistics, Course Goals and Methods, Calibrations, Quality Assurance, Accreditation, Certification..
2.	Spectroscopy: General Introduction, Light and Atomic and Molecular Interactions, Qualitative & Quantitative Analysis. Introduction to Electronics.
3.	Spectroscopy: Instrument Design, Sources, Monochromators, Detectors.
4.	Continued.
5.	Atomic Spectroscopy: Instruments, Methods, Emission & Absorption, Arc Spark, Flame, Plasmas, Furnaces
6.	.Atomic Spectrometry Continued.
7.	Molecular Spectroscopy - UV, Visible
8.	Midterm, On or About week of October 21
9.	Molecular Spectroscopy - Luminescence, Fluorescence, Phosphorescence
10.	Molecular Spectroscopy - cont'd
11.	Eastern Analytical Symposium Field Trip No Class Nov. 18 - 20, 2013
12.	Vibrational Molecular Spectrometry. Introduction to Infrared
13.	Guest Lecture Topic to be announced. Most likely X-ray Methods: Spectrometry and Diffraction.
14.	Continuation of Vibrational Spectrometry

Lecture periods and topics are planned but may be varied due to time restraints and student progress. The Mid Term will likely be in week 7, but this may vary by a week or two either way.

1. Attendance Policy is as per the University and College.

2. Final Grade

Lab 30%

Midterm 35%

Final 35%

3. Failure to hand in assigned homework (adequately done) may lead to grade reduction of one to two levels. (Example C<sup>+</sup> to C is one level)

However, please **NOTE** that a student must have accumulated at least 100 raw points from the exams in order to receive a C and 110 raw points from the exams in order to receive a B for the entire course. That is, there is a minimum point accumulation that you must attain in lecture in order to pass the course or receive a B. Raw points equal the total points accumulated from the Mid Term and Final Exams where each exam is valued at 100 points. If the exam values change the above referenced points will be adjusted proportionately.

Laboratory Grading

See Laboratory Manual

**IMPORTANT NOTE**

Students are hereby put on notice that in order to ensure the safety of students, faculty and visitors all safety rules (Especially Safety Eye ware) will be enforced. Failure to do so will mean ejection from the lab period.

**Additionally** to ensure orderly laboratory operation students will receive the lab operations rules (sign in, clean up, etc.) from the Laboratory Technicians.

Violation of these rules will result in the student being assessed penalty points. Accumulation of 5 points will result in the reduction in grade of one position.

Reading Assignments

Please read the indicated material prior to the lecture period. This is highly recommended.

Textbook:

Principles of Instrumental Analysis 6<sup>th</sup> Ed, Skoog, Holler and Crouch, Saunders College Publishing. (Harcourt Brace Jovanovich) N.Y. 978-0-495-01201-6

Laboratory Manual:

Chemical - Instrumental Analysis for Forensic Scientists: A Laboratory Manual (2012) T.A. Kubic, M.D. Miranda, and N. Petraco, (Kendall Hunt) IA 978-1-4652-0781-4

This is required and will be available in the bookstore or online from the publisher.

Students may use Skoog, Heller, Nieman 5<sup>th</sup> Ed. But it is the student's responsibility to conform the chapter topics between the 6<sup>th</sup> and 5<sup>th</sup> Eds. There is some additional new material in the 6<sup>th</sup> Ed.

Additional assigned reading from Photocopied handouts.

Lecture Period Reading Assignment Chapters

1	Appendix 1, Laboratory Manual especially appendices.
2	Chapter 2, 5, 6
3	Chapter 12
4	Chapter 6, 7
5	Chapter 6, 7
6	Chapter 8, 9, 10
7	Chapter 8, 9, 10
8	Mid Term
9	Chapter 13, 14
10	Chapter 15
11	Field Trip to EAS
12	Chapter 13, 14, 15
13	Chapter TBA
14	Chapter 16
15	Final Exam specific date TBA

Bibliography:

Spectrometric Identification of Organic Compounds, Silverstein and Bassler, John Wiley & Sons, N.Y.

Organic Structures from Spectra, Steinhell and Kalman, John Wiley and Sons, N.Y.

An Introduction to Error Analysis, J. Taylor, University Science Books, Sausalito Ca.

Basic Instrumental Analyses, B. Pease, D. Van Nostrand Co., N.Y.

Statistical Analyses, S.K. Kachigan, Rodues Press, N.Y.

Isolation and Identification of Drugs, E.E.G. Clark, The Pharmaceutical Press, London.

Instrumental Methods of Analysis, Hobart H. Willard, Lynne L. Merritt Jr., John A. Dean, and Frank A Settle Jr., Wadsworth Publishing Co., 1988 7<sup>th</sup> Edition.

The Essential Guide to Analytical Chemistry, G. Schwedt, John Wiley & Sons, New York. 1997

Mass Spectroscopy Principles and Application, E. De Hoffmann, J. Charette and V. Stroobant, John Wiley & Sons, New York. 1996

Modern Infrared Spectroscopy, B. Stuart, B. George and P. McIntyre, John Wiley & Sons, New York. 1996

Chemical Instrumentation, Wayne, R.P., Oxford Science Publications, New York (1994)

And see references contained in the Laboratory Manual.