

Spring 2020

CHEM 480-102: Instrumental Analysis

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CHEM 480-102: INSTRUMENTATION ANALYSIS LABORATORY

Spring 2020 Course Syllabus

CHEM 480. INSTRUMENTAL ANALYSIS. 2 CREDITS, 4 CONTACT HOURS (0; 4; 0).

Prerequisite: CHEM 221, CHEM 222 or equivalent with a grade of C or better. Laboratory exploring the principles of operation of modern instruments for chemical analysis. Ultra-violet and infrared spectroscopy, mass spectrometry, gas chromatography, high performance liquid chromatography, voltametry, and potentiometry are among the instruments utilized. Apply calibration methods, statistical data treatment, and sample preparation techniques are applied.

Number of Credits: 2

Prerequisite: CHEM 221, CHEM 222 or equivalent with a grade of C or better

Instructor: Dr. Chaudhery Mustansar Hussain
Office: Tiernan Hall (TIER) 151D
Email: chaudhery.m.hussain@njit.edu

Laboratory time: Wednesdays; 05:45 PM - 09:50 PM
Tiernan Hall (TIER) 205

Office Hours: Thursday, 12:00 PM – 01: 30 PM
If you are unable to make these schedules times, send an email to schedule an appointment.

	LABORATORY EXPERIMENTS	INSTRUMENTATION REQUIRED	REPORTS
Week One	CHECK-IN & Safety Lecture		
Exp. 1	Spectrophotometric analysis of a soft drink	Shimadzu -1800 UV-VIS Spectrophotometer	
Exp. 2	Simultaneous determination of dichromate and permanganate	Shimadzu 1800 UV-VIS Spectrophotometer	Report (Exp 1)
Exp. 3	Determination of zinc in cooked beans	Shimadzu AA-7000	Report (Exp 2)
Exp. 4	Analysis of commercial analgesic tablets by HPLC	Shimadzu HPLC-20AT	Report (Exp 3)
Exp. 5	Gas chromatographic separations	Varian GC 3900 FID	Report (Exp 4)
Exp. 6	Determination of water content in paint	Shimadzu GC -TCD- 8A	Report (Exp 5)
Exp. 7	Confirming the Molecular Mass and Structure of a Reaction Product GCMS Demonstration	Shimadzu GCMS-QP2010	Report (Exp 6)
	Presentation		Report (Exp 7)

Lab reports are due one week after the experiment is scheduled to be completed. Late points will be taken off for each day of late submission.

Required textbook: CHEM 480: Instrumentation Analysis Lab Laboratory Manual, available from the Department of Chemistry and Environmental Science main office (Tiernan 151) for \$20.

*Textbook "Principles of Instrumental Analysis", 6th ed, by Douglas A. Skoog, F. James Holler, Stanley R. Crouch

REQUIRED MATERIALS

- Safety goggles (available at the NJIT Bookstore or Homedepot). Provided/sometime not Provided
- Disposable nitrile gloves (available at amazon.com or Homedepot). Provided
- Disposable lab coat or you can buy cloth lab coat (available at amazon.com). Not provided
- Lab notebook: (available at the NJIT Bookstore or Homedepot). Not provided

LAB REPORT FORMAT

Reports handed in later than the scheduled due date will lose 25% of available pts, 2 weeks after scheduled due date will lose 50% of available pts. If you are having difficulty writing up a lab, please make arrangements with the instructor.

- 1. Title:** Title of the experiment, submitted to, Instructor name, submitted by your name, the date the report is submitted.
- 2. Introduction/ Theory:** Describe the nature and objective of the experimental investigation and the method(s) used.
- 3. Objective and purpose:** What is the objective of the experiment? , What was measured and how was the data obtained?
- 4. Chemicals and Apparatus:** List all the chemicals used in the experiment, and record the exact amount. Prepare a schematic diagram of the apparatus and identify components.
- 5. Procedures:** Cite the reference that describes the details of the experimental procedure. Describe any procedure you used that differs from the cited reference. Specify the precision of the instruments used in the measurements. Identify and define all variables and constants. Specify the quantities that are measured and those that are calculated.
- 6. Results and discussion:** State the phenomena observed during the experiment. State the experimental measurements that were made, and what was calculated. Give the equations used for the calculations. Present the experimental data collected and the calculated results in tables and graphs where appropriate.
- 7. Conclusions:** What were the results and how do they compare with the literature? Provide approximately two or three concise sentences for each answer.
- 8. References:** List all the literature sources used to prepare the report.

POLICIES

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

Grading Policy: The final grade in this course will be determined as follows:

Individual grades	
Safety and cleanliness	10%
Quizzes	30%

Group grades	
Laboratory reports	50%
Oral presentation	10%

Your final letter grade in this course will be based on the following tentative curve:

A	100-90%	C	74-70%
B+	89-85%	D	69-65%
B	84-80%	F	Below 65%
C+	79-75%		

The experiments will be conducted as a group of 3-4 students, as chosen by the instructor. Laboratory reports will be a group assignment, and each group will do an oral presentation on one of the experiments at the end of the semester. Each student is however required to attend and participate in the laboratory, by recording their own notes in their laboratory notebook and helping in keeping the lab safe and clean. In addition, quizzes will be given to each student.

LEARNING OUTCOMES

After completing this course, students will be able to:

- Comply with safety rules in the setting of instrumental analysis laboratory.
- Identify and mitigate potential safety hazards.
- Conduct instrumental analysis chemistry experiments in a safe and clean environment, and properly manage the waste generated.
- Use a laboratory notebook to record scientific experiments, from the planning stage to the observations;
- Demonstrate the ability to use instrumental analysis glassware to perform techniques
- Demonstrate the ability to use analytical equipment such as GC, HPLC, AA and UV etc.
- Apply their knowledge of analytical chemistry principles to solve problems in the laboratory.
- Analyze data and prepare high-quality laboratory reports.
- Present the results of their experiments in a professional and engaging way.
- Learn how to establish an instrumental analysis lab in any industry

SAFETY RULES IN THE LABORATORY

(SAFETY GLASSES MUST BE WORN AT ALL TIMES)

- **If the fire alarm sounds, leave the building immediately.**
- **Always conduct yourself in a professional manner. Have fun while working in the laboratory, but refrain from activities that might be dangerous to you or your neighbor.**
- **You must learn where the safety equipment is and how to use each item during the first day in class. In the event of an emergency, you should use whatever you need to address the emergency. Again, you do not need to ask for permission to respond to an emergency. Usually, your response will be to advise your TA and instructor and then follow his/her instructions. As a general rule, and if time permits, students should not attempt to provide first aid but should concentrate on contacting a professional (x3111 for emergency) in that area.**
- **No consumption of food (including gum) or beverages will be allowed.**
- **You are not to perform any unassigned experiments.**
- **Do not use your mouth to fill pipettes.**

- If something is spilled on you, wash it off immediately with lots and lots and lots of water, and then report to the TA. Clean up the spill later according to instructions from the TA.
- Uncontrolled long hair or clothing (loose sleeves, ties, jewelry) that might come in contact with a flame or become entangled in mechanical equipment will not be permitted. You will not be permitted to work in the lab without protection for your feet (no sandals, for example).
- Never heat a closed system. It may result in an explosion.
- Never heat flammable materials with an open flame or near an ignition source.
- Do not heat or mix anything near your face (or anyone's face).
- Review the hazards of all reagents for an experiment before you start, so you know how to respond to an emergency. The SAFETY DATA SHEETS (SDS) for each reagent we use are available on the Internet (Consult Fischer Scientific Website www.fischersci.com). You are encouraged to review any MSDS any time you have a question. You should also note that a considerable amount of safety information is on the reagent labels. Read them before you use the reagent.
- Do not rub your eyes with your hands. Your hands are frequently contaminated.
- Protective clothing (lab coat) is not required, but highly recommended. You will not be permitted to work in the lab in shorts and without protection for your legs and feet.
- You cannot tell when glass and other objects are hot by looking at them. Be careful and don't get burned by trying to pick up something that is hot.
- Do not store reagents near a sink or leave them near the balance where they will be in the way and get knocked over. Return all reagents to their proper location as soon as possible after you have finished with them. Be sure everything is returned to its original location before you leave and that you have left nothing in the balance room, in a fume hood or at some other location.
- Be sure you know where the safety equipment is located so you can find and use each item in an emergency (if the power fails, and the lab is dark, for example).
- Be sure that, in an emergency, you know how to turn off all of the utilities (gas, water, electricity) you have been using.
- Never attempt to identify an unknown by smelling or tasting it as recommended in some (especially old) textbooks.
- Use the appropriate safety equipment (safety shield, gloves, fume hood, shower, eye wash, etc.) and supplies as needed. Be sure any supplies you use are promptly replaced so they are available for the next emergency. It may be you again.
- Read all chemical labels prior to use. Be sure you know what you are using.
- Do not store chemicals near non-compatible chemicals (acids with bases or oxidizers with fuels, for example) even for short periods of time. 23. Transport and dispose of all chemicals properly. If you are not sure how to do so, ask your TA.
- Do not use chipped or broken glassware. Broken glassware will not be accepted at the end of the course and should be replaced during check-in or as soon as it is broken.

- **Do not operate electrical equipment with wet hands.**
- **Do not wear contact lens to the laboratory.**
- **The EMERGENCY telephone number is 9-1-1 for university security/safety, x3568 for the department office.**

THE NJIT HONOR CODE WILL BE UPHELD, AND THAT ANY VIOLATIONS WILL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE DEAN OF STUDENTS. STUDENTS WILL BE CONSULTED WITH BY THE INSTRUCTOR AND MUST AGREE TO ANY MODIFICATIONS OR DEVIATIONS FROM THE SYLLABUS THROUGHOUT THE COURSE OF THE SEMESTER.