EXPERIMENTAL ANALYTICAL CHEMISTRY 227
Tentative Syllabus, Spring 2021

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Reference book: "Exploring Chemical Analysis" 5th Edition, by Daniel C. Harris, Published by Freeman, NY 2009, ISBN-13: 978-1-4292-7503-3

Lab manuals: Free download and print from Blackboard.

Lectures: Tuesday 10:00 am – 11:20 am (via Blackboard, Collaborate)

Labs: Thursday 8:30 am – 12:30 am (Via Blackboard, Collaborate)

Office Hours: By appointment (Collaborate office hours via Blackboard)

(Note: If you have no or limited access to high-speed internet, please see the resources listed under "Free Internet Access for Students" found at this link: https://coronavirus.rutgers.edu/technology-resources-for-students/

Technology Resources for Students – Universitywide COVID-19 Information
The following webpage outlines technology resources for Rutgers students, including information about web conferencing, learning management systems, and getting help with technology services and systems.
coronavirus.rutgers.edu

Tentative Grading

Lab*	70
Midterm	10
Final Exam (Cumulative)*	20
TOTAL	100

*There will be 10 virtual labs, which take up 70% of the total grade. Each virtual lab is worth of 7 points (100 × 70%).

For each lab:

Lab includes three parts: Prelab QUIZ (20 points) + Prelab report (30 points) + Final Lab report (50 points).

- Prelab QUIZ is worth 20 points. It will be hosted in the beginning (the first 30 mins) of each lab via Blackboard. There will be NO MAKE-UP PRELAB QUIZZES under any circumstances.
- Prelab report is worth 30 points.
- Final Lab report is worth 50 points. Deadline for each lab report submission is **ONE** week after you finish that lab. The lab report should be electronically submitted on the following Thursday (till 11:59 pm) via blackboard assignment. If you can not submit your lab report before this time, you can submit it to the **assigned TA for that lab via Email. While the late submission will result in point deduction (10 points/late day) from this lab report.**

*Midterm exam is scheduled on **March 2, 2021 from 10:00 – 11:20 am.** The midterm exam will count for 10%. (Note: the warning period is 03/01 2021~03/12 2021)

* Final exam will be hosted during the final exam period **Tuesday, May 11, 2021 from 8:30-11:30AM)** and is cumulative. The final will count for 20%. *If the midterm was missed for any reason, the score (**as percentage**) on the final exam can serve as the make-up exam.*

Attendance:

Attendance is MANDATORY for both lectures and virtual labs. A quiz based on that missed lecture content will be provided in an office hour (by appointment). A complete fail or choosing not taking the quiz will result in losing 2 points from the final exam (total 20 points).

Final Letter Grades will be given based on the following scale:

A = 89.5-100
B+ = 84.5-89.49
B = 75.0-84.49
C+ = 70.0-74.99
C = 60.0-69.99
D = 50.0-59.99
F = 0-49.99

Learning goals:

The analytical chemist works to find out how much of a certain analyte is in a sample. How do I find this out, what tools do I use, how can I do this efficiently, how am I assured that the results are both accurate and precise? In this course, you will study and gain hands on experience of some of the important techniques in analytical chemistry and do qualitative and quantitative measurements. By the end of this semester, you should have an improved understanding of:

a) the distinction between qualitative and quantitative measurements.
b) statistical techniques for evaluating and interpreting your data.
c) the sources of error in chemical and instrumental analyses
d) basic concepts of stoichiometry
e) interferences in chemical and instrumental analyses

f) concept of instrument calibration
g) principles of qualitative and quantitative measurements using optical measurements
h) principles of gas and liquid chromatography
i) concept of an electrochemistry in qualitative and quantitative measurements
j) concept of standard addition techniques
k) New concepts including nano-science and nanotechnology for improved analysis.

As an academic community dedicated to the creation, dissemination, and application of knowledge, Rutgers University is committed to fostering an intellectual and ethical environment based on the principles of academic integrity. Academic integrity is essential to the success of the University's educational and research missions, and violations of academic integrity constitute serious offenses against the entire academic community. The entire Academic Integrity Policy can be found here:http://academicintegrity.rutgers.edu/academic-integrity-policy/

Laboratory Safety:

Nothing is more important than your safety when you are working with chemicals. You MUST, at all times, remember that that some of them are extremely dangerous, if handled **Incorrectly**. *Even though we are having a remote online lab course, you are not truly handling chemicals. The safety rules should be learned and grasped. You should understand that knowledge and compliance with the safety rules in all the chemical laboratories are mandatory.*

LABORATORY RULES

1) Eye protection (Goggles) and Lab-coat MUST be worn AT ALL TIMES in the laboratory. It does not matter if you are just cleaning glassware or anything because other students might spill some chemicals on you.
2) No drink, food and gum
3) No contact lenses may be worn!
4) Not shots, No slippers, sandals, or open-toed shoes!
5) No cellphone in the lab even as a calculator (you should bring your real calculator).
6) Long hair must be restrained; use rubber bands or bobby pins.
7) Keep coats, books, book bags, etc., on the side-shelves or in lockers, NOT on benches, above benches, or on reagent shelves.
8) Put all data directly into your laboratory notebook.
9) Make sure that your bench-top area is clean when you leave.
10) Be on time! The labs **START** at 8:30 am and **END** at 12:30 PM. Prelab quiz will be given at the first 30 minutes (8:30-9:00 am) via blackboard. **Explanation of the experiment will be started at 9:00 am. If you are late, you are going to get 10 points of deduction for being late, in addition to the prelab quiz points**.
11) Doing Pre-lab preparation for this virtual lab course is mandatory! After you prepared the pre-lab, you should know the basic concept of the lab and what you would learn from this lab. This would help you on the perception of the online virtual lab, it also essential for you to get ready for the pre-lab quizzes. The questions in the pre-lab quizzes are about some key procedures, principle of the designed lab, and/or working principle of the major instruments you will use in that specific lab.

12) Deadline for each lab report submission is **ONE** week after you finish that lab. The lab report should be electronically submitted on the following Thursday (till 11:59 pm) via blackboard assignment. The **late submission will result in point deduction (10 points/late day) from this lab report (note the Blackboard records precisely the time of your submission).**

On-line Virtual Experiments to be done tentatively.

Exp. #

1. Introductory of the virtual lab course: Rules, How to prepare Pre-lab quiz, Pre-lab report, and Final-lab report.
2. Weighing, Solution preparation with a volumetric flask, and Buret cleaning and reading (100 points).
3. Traditional titration vs. semi-modern titration: A Volumetric Acid-Base Titration (100 points).
4. Traditional titration vs. semi-modern titration: Equivalent Weight of an Unknown Weak Acid: pH Titration (100 points).
5. A traditional redox titration: Preparation, purification, and standardization of $KMnO_4$ solution with a primary standard (100 points).
6. Traditional redox titration vs. semi-modern titration: Find the concentration of Fe, FeO, Fe_2O_3 in a rust unknown with the standardized $KMnO_4$(100 points).
7. HPLC: Separation and quantitative measurements (100 points).
8. Analysis of a Multi-Component System by GC/MS for Separation and Identification of Impurities-Similarity and Difference from HPLC (100 points).
9. Analysis of low levels of Cu, Pb, and Cd in solution by Anodic Stripping Voltammetry (ASV) (100 points)
10. Analysis of low levels of Cu, Pb, and Cd in solution by Atomic Absorption Spectroscopy (AAS) (100 points).
11. Simultaneous Determination of Co (II) and Cr (III) (UV-Vis Spectroscopy) (100 points).
12. Virtual Lab Discussion about False positive and False Negative diagnosis (for examples in COVID 19 or other important diseases)

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Attendance Policy:

Rutgers University attendance policy should be followed, which can be found at:

http://policies.rutgers.edu/view-policies/academic-%E2%80%93-section-10#2

Responsible behavior and commitment:

1. Regular attendance (or listening to the recorded lecture videos for students are still abroad) is the minimum demonstration of responsibility and commitment on your part.

2. Absences: Per the University's Course Attendance policy (10.2.7), students are responsible for communicating with their instructors regarding absences. The Division of Student Affairs is available to verify extended absences: (973) 353-5063 or DeanofStudents@newark.rutgers.edu.

3. **In case of inclement weather, students should find out on their own whether the University will be closed. Scheduled exams will NOT be cancelled if the University does not cancel class**.