
Analytical Chemistry

CHEM 210 Syllabus, Spring 2021

Instructors: Dr. Shannon Stitzel & Dr. Beth Kautzman

Office Hours:

Drs. Stitzel and Kautzman will be available for general questions during regularly scheduled class meeting times. For individual meetings, please request an appointment by emailing the appropriate instructor, including at least three appointment windows (days and times) that work for you.

Communication:

- For all lecture questions, email Dr. Stitzel (ssitzel@towson.edu).
- For all lab questions, email Dr. Kautzman (kkautzman@towson.edu).
- All email communication will be sent to university email accounts; students are responsible for checking that account frequently. Emails are typically answered within one business day.

On-line Resources:

Announcements, videos, homework sets, reading assignments, and other useful information will be posted on the course Blackboard site. Students are encouraged to check Blackboard multiple times per week.

Lecture Meeting Times:

Tuesday and Thursday: 9:30 AM – 10:45 AM (You need to be available for every class time)

Lab Meeting Times: Required synchronous weekly lab meetings

Section 001 (Tues): 12:30 PM – 4:20 PM

Section 003 (Wed): 1:00 PM – 4:50 PM

Section 002 (Thurs): 12:30 PM – 4:20 PM

Required Materials:

- Reliable internet access and a device with a working microphone and camera for participation in required synchronous class meetings.
- Textbook: Daniel C. Harris, *Quantitative Chemical Analysis*, 9th Ed. (ISBN: 978-1-4641-3538-5)
- Scientific calculator: **Graphing calculators are permitted.**

Course Description

In this course we will examine the fundamental concepts and methods needed to perform quantitative chemical analyses. Topics will comprise statistical analysis and effective communication of scientific data, solution equilibria including activity effects and polyprotic acid-base chemistry, and an introduction to chemical instrumentation.

Course Prerequisites:

Grade of "C" or better in General Chemistry II lecture and laboratory (CHEM 132 and 132L, or equivalent). This course assumes that students have mastered key concepts from general chemistry, including concentrations, unit conversions, stoichiometry, chemical equilibria (e.g. strong and weak monoprotic acid/base reactions), redox (e.g. oxidation numbers and balanced equations), and data analysis using Microsoft Excel. To gauge your understanding of these concepts, students are encouraged to review: Chapter 1 (all sections), Chapter 6 (excluding section 6.4), Chapter 9 (sections 1-4), and Appendix D in the course textbook. These concepts *will not* be formally reviewed in this course. If this material is not familiar, you should start reviewing these concepts immediately!

Topics Covered:

Topics	Textbook Chapter*
Calculating, Propagating, and Reporting Uncertainty	Chapter 3
Statistics for Analytical Measurements	Chapter 4
Quality Assurance and Calibration Methods	Chapter 5
Ionic Strength and Activity Effects	Chapter 8
Buffers	Chapter 9 (primarily section 9.5)
Polyprotic Acids and Bases	Chapter 10
Acid-Base Titrations	Chapter 11
Electrochemistry	Chapter 14
Spectrophotometry	Chapter 18
Analytical Separations and Chromatography	Chapter 23

*Correspond to Harris 9th edition

Learning Objectives:

After completing this course, students should be able to:

- apply the analytical process to solve quantitative chemical problems
- describe safe, precise, and accurate quantitative chemical analyses using appropriate standards and methods
- analyze data using appropriate statistical methods, significant figures, and error propagation
- calculate the concentrations of chemical species under equilibrium conditions in aqueous solutions, including corrections for activity effects
- write and balance equations describing complex solution equilibria
- explain the main principles behind spectroscopic and chromatographic analysis methods
- prepare professional-quality figures and tables from experimental data
- demonstrate mastery of course material through effective written communication skills

Course Policies

Attendance:

This course depends upon synchronous online meetings, and you are expected to be “virtually” present and ready to participate for these meetings, just as if you were meeting in a regular classroom. You must have a working computer, microphone, webcam, and internet connection. The instructors make it a priority to begin and end each class on time. Please demonstrate mutual respect for your classmates and the instructors by logging into synchronous class meetings and remaining for the duration of each class. Please inform the appropriate instructor in advance if an unavoidable circumstance requires that you arrive late or leave early.

- In the event of technical difficulty for a **student**: Email your professor as soon as you are able. Do your best to resolve the issue before class.
- In the event of technical difficulty for an **instructor**: Please wait 10 minutes before logging off. The instructor will be trying to reestablish the connection and/or may be trying to reach an alternate internet connection. If the professor does not return within 10 minutes, see Blackboard for instructions, which will be posted as soon as possible.
- In the event of a snowstorm, hurricane, or any widespread loss of power and/or internet connections that disrupts many participants, alternate materials will be posted on Blackboard. Make sure to check as soon as you are able to connect to the internet.

Academic Integrity:

Please review the Towson University Student Academic Integrity Policy, available at: <http://www.towson.edu/studentaffairs/policies/> Examples of academic integrity violations include (but are not limited to) cheating, plagiarism, lying, unauthorized collaboration (including tutoring websites), and facilitating an integrity violation. The instructor takes academic integrity very seriously and students in this course are expected to do the same.

Any violation of the university’s academic integrity policy will be penalized, up to and including a grade of *F for the course* for each student involved. Letters detailing the specifics of any occurrence will be kept on file by the University for seven years. Repeated violation may result in suspension or expulsion from the university.

Accommodations for Students with Disabilities:

Students with approved accommodations should submit their memos to the instructor during the first week of class, or as soon as possible thereafter. It is the student’s responsibility to present this paperwork in a timely fashion and to follow up regarding accommodations that require instructor participation (*e.g.* testing accommodations). If you think you need accommodations but do not have them, please contact Accessibility and Disability Services (410-704-2638 or tuads@towson.edu).

Chemistry Department Statement on Classroom Diversity and Inclusion:

The students, faculty, and staff at Towson University represent a diverse and vibrant community of learners and scholars. As a community, we value the unique contributions of each individual and promote active participation in all aspects of the learning process by each community member. Your instructor supports Towson University's goal of fostering a diverse and inclusive educational setting. Your instructor strives to create a classroom environment built upon the principles of mutual respect and support. Toward this end, all members participating in this course are expected to demonstrate respect for all other members of the class. If you feel these expectations have not been met, please speak with your instructor or the designated diversity liaison, Dr. Cindy Zeller (czeller@towson.edu).

For further information regarding the diversity and inclusion policies of Towson University, please see the [Towson University Commitment to Diversity](#), the [Fisher College of Science and Mathematics Diversity Action Website](#), and the [Chemistry Department Diversity Action Plan](#).

Intellectual Property:

All documents, tests, quizzes, lectures, slides, and written material associated with this course are the intellectual property of the instructors. Drs. Stitzel and Kautzman maintain the implicit copyright on all such materials. You may not distribute or sell any of the materials associated with this course. *You may take notes and make copies of course materials for your own use; however, you may not, nor may you allow others to, reproduce or distribute notes and course materials publicly, whether or not a fee is charged, without the express written consent of the instructors.*

Syllabus Subject to Change:

Although the instructors strive to adhere to the syllabus in its current form, all information, schedules, and policies outline above are subject to change. Any changes will be announced via email and/or Blackboard.

Evaluation and Grading: The course has 1000 pts, split between lecture and lab as outlined below.

Lecture Portion (700 pts)

Homework (130 pts)

Approximately ten graded homework assignments will be delivered via Blackboard during the semester. Each problem set will be graded for completion and a subset of problems will be graded for accuracy. All homework assignments will be due by 6 pm on each designated date. No late homework will be accepted without prior written approval from Dr. Stitzel, nor will makeup assignments be available. Early submission of assignments is encouraged. Individual technological/connectivity issues are not valid reasons for missing submission deadlines. Homework assignments will be submitted via the link provided on Blackboard, and submitted as pdf file.

Group Problem Solving Sessions (105 pts)

You will be required to participate in synchronous online problem solving sessions (schedule will be posted on Bb). During these sessions, you will work in small groups to complete guided practice problems. Students should also be prepared to answer questions individually at the end of each session. Students will be required to submit their work at the end of each session, including all notes taken during the session. No makeup assignments will be available for unexcused absences from these sessions.

Online tests (330 pts)

There will be six online tests (55 pts each), scheduled on **Thursdays at 9:30 AM** as follows:

- Test 1: Feb. 11th
- Test 2: Feb. 25th
- Test 3: March 11th
- Test 4: April 1st
- Test 5: April 15th
- Test 6: April 29th

All tests are cumulative, although most test questions will focus on new material. No make-up tests will be given. One test that is missed due to an unavoidable and legitimate reason (*see policies below*) may be replaced with the percentage score from the cumulative final exam.

Final Exam (135 pts)

The final exam is cumulative and will be given in two parts:

Oral Interview (55 pts): Appointments scheduled during lab times May 4th, 5th and 6th

Online Exam (80 pts): May 18th at 8 AM

Policies

Any grading concerns on individual assignments must be brought to the attention of the instructor within three days of grades being posted for the assignment.

Any student who has a university-sanctioned event or religious observance that will conflict with a class assignment or exam must provide documentation to the instructor a minimum of two weeks in advance of the event/observance (or sooner if possible). Alternate due dates will be arranged as appropriate. If written notification is not provided prior to the event/observance, the student may receive a zero for any missed work.

Lab Portion (300 pts)

Each student must complete all lab assignments listed below. Unless indicated otherwise, assignments are due at the start of your scheduled lab time (T/Th 12:30 PM, W 1:00 PM). Early submission of assignments is encouraged. Individual technological/connectivity issues are not valid reasons for missing submission deadlines. Lab assignments up to 24 hours late will be penalized 20% of the total possible points. Assignments more than 24 hours late will not be accepted.

Lab Meeting Week of:	Topic	Lab Assessment	Due Date	Points
1/26/21	Introduction	No assignment	NA	NA
2/2/21	Excel Use	Worksheet	2/9/21	25
2/9/21	UV-Vis Week 1	Protocol	2/16/21	30
2/16/21	UV-Vis Week 2	Group Exercise	During lab meeting	10
2/23/21	UV-Vis Week 3	Worksheet	3/2/21	45
3/2/21	Caffeine Week 1	No assignment	NA	NA
3/9/21	Caffeine Week 2	Oral Defense	During lab meeting	35
3/16/21	Spring Break			
3/23/21	Caffeine Week 3	Worksheet	3/29/21	45
3/30/21	Required Check In	NA	NA	NA
4/6/21	Solver Week 1	Worksheet	4/13/21	45
4/13/21	Solver Week 2	Worksheet	4/20/21	45
4/20/21	Literature Week 1	Discussion board	24 hours before start of lab meeting	10
4/27/21	Literature Week 2	Discussion board	24 hours before start of lab meeting	10

Final Course Grade:

There is no curve for this course, and no extra credit assignments will be offered. The course grade is assigned based on the following scale (the values below are percentages of the total points available to earn in the course):

100 A 93 A- 90 B+ 87 B 83 B- 80 C+ 77 C 70 D+ 67 D 60 F 0