NJIT New Jersey Institute of Technology

THE COLLEGE OF SCIENCE AND LIBERAL ARTS

THE DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE

CHEM 126

Spring 2025 Course Syllabus

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 to achieve. 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 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*

This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance.

In the event of a shift to remote and converged teaching, both instructors and students must make changes to their normal working protocols for courses. Students are asked to practice extra care and attention in regard to academic honesty, with the understanding that all cases of plagiarism, cheating, multiple submission, and unauthorized collaboration are subject to penalty. Students must properly cite and attribute all sources used for papers and assignments. Students may not collaborate on exams or assignments, directly or through virtual consultation, unless the instructor gives specific permission to do so. Posting an exam, assignment, or answers to them on an online forum (before, during, or after the due date), in addition to consulting posted materials, constitutes a violation of the university's Honesty policy. Likewise, unauthorized use of live assistance websites, including seeking "expert" help for specific questions during an exam, can be construed as a violation of the honesty policy.

COURSE INFORMATION

Course Description: Chem 126 The second semester of a two-semester sequence in chemistry. Introduces the basic concepts of chemistry, including equilibrium, chemical kinetics, thermodynamics, and electrochemistry.
Number of Credits: 3
Pre-requisites: Chem 125
Corequisites: C or higher in Math 110 or equivalent

Course-Section	Instructor	Meeting Times		
Chem 126-012	Dr. Peels	Lecture: Wednesday Recitation: Wednesday	8:30 – 9:50 AM 10 – 11:20 AM	KUPF 210 KUPF 105
Chem 126-014	Dr. Peels	Lecture: Wednesday Recitation: Friday	8:30 – 9:50 AM 1 – 2:20 PM	KUPF 210 KUPF 202

Office Hours: ***Tuesdays and Fridays 3:30-5:30 PM and Wednesdays 12-2 PM in Tiernan 006;*** **or by appointment**
Zoom meeting room: https://njit-edu.zoom.us/my/**mp2227**

Webpage: The course website is available through Canvas, which can be accessed via canvas.njit.edu. Please email me immediately if you cannot access the class site. All materials including lecture summaries, PowerPoint slides, and other documents will be posted on the class site. Please check the site frequently for new materials and announcements. All grades

for this course will be posted to Canvas on a regular basis. You are responsible for all updates posted to Canvas, and if you find any mistakes in content or grading, or you need help accessing these materials, please contact me as soon as possible.

Required Textbook:

Title	Chemistry, A Molecular Approach
Author	Nivaldo J. Tro
Edition	Fifth/Sixth
Publisher	Pearson
ISBN #	ISBN-13: 978-0134874371

Suggested Material: Free Resources: Chemistry 2e on Openstax. Free textbook and solution manuals can be found using this url: openstax.org Paperback: ISBN-13: 978-1-59399-578-2, Digital: ISBN-13: 978-1-947172-61-6. Has free student solution manual

University-wide withdrawal date: The last day to withdraw with a **W** is Monday, Monday, April 7th, 2025.

Learning Outcomes—You should be able to:

1. Define reaction rate, relate reaction rate to stoichiometry, and determine order of a reaction.
2. Describe the factors affecting reaction rate.
3. Use kinetic data to write reasonable reaction mechanisms.
4. Explain equilibrium and equilibrium constants.
5. Understand the difference between the equilibrium constant (K) and the reaction quotient (Q).
6. Determine the direction a reaction will proceed, and the product yield based on the equilibrium constant.
7. Use Le Chatelier's principle to determine direction of reaction.
8. Describe differences in basic crystalline shapes
9. Determine edge length and density of simple crystalline shapes.
10. Predict changes in freezing point, elevation in boiling point and osmotic pressure when a solute dissolves in a pure solvent
11. Understand different definitions of acids and bases.
12. Explain the autoionization of water, the concept of pH, and what determines the strength of acids/bases.
13. Memorize and know how to perform calculations relating to acid and base dissociation constants.
14. Explain what a buffer solution is and understand the importance of buffer solutions.
15. Calculate the efficiency of buffer solutions.
16. Interpret equilibrium constants (Ksp) and discuss solubility of sparingly soluble salts.
17. Interpret titration curves and calculate the pH of a solution during any number of titration points.
18. Understand and explain energy transformations in chemical reactions.
19. Explain entropy, Gibbs free energy, and the second and third laws of thermodynamics.
20. Determine whether a reaction is spontaneous.
21. Calculate the thermodynamic parameters ΔG, ΔS, and ΔH, and understand how the equilibrium constant relates to these parameters.
22. Balance redox reactions and write oxidation and reduction half–reactions.
23. Calculate the cell potential for a redox reaction in a galvanic cell.
24. Relate cell potential to thermodynamic parameters and determine the direction of spontaneity.
25. Use Faraday's law to determine the amount of material deposited during electroplating.
26. Explain electrolysis and overvoltage.
27. Know the difference between chemical reaction and nuclear reaction.
28. Balance nuclear equations and describe the particle emitted during the process.
29. Predict the type of emission from unstable nuclides.
30. Use the mass–energy relationship to calculate the energy released during nuclear processes.
31. Distinguish the difference between nuclear fission and fusion.
32. Describe the applications of nuclear reactions in energy production.
33. Name simple organic compounds and recognize (and name) the basic functional groups.
34. Write reactions of alkanes, alkenes, and alkynes.

POLICIES

All CES students must familiarize themselves with, and adhere to, all official university-wide student policies. CES takes these policies very seriously and enforces them strictly. In addition, obtaining course materials such as past exams or solutions to homework and/or class assignments from external sources constitutes as cheating. The official Student's Solutions Guide is exempt. Posting course materials on external websites without the approval of the instructor violates intellectual property laws and is therefore **strictly forbidden.** Any student caught cheating on homework will be assessed a penalty of 20 points, in addition to a grade of zero for the given homework assignment. **Students are encouraged to seek help from their instructors during office hours**.

Grading Policy: The final grade in this course will be determined by a point total based on the following:

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Homework	150
Class Participation (recitation 140 points + 30 points class Participation + 5 points syllabus quiz)	175
Pre Exam Quizzes with Respondus (4 x 25 pts)	100
Exam I	75
Exam II	100
Exam III	100
Final Exam	300
Total points	**1000**

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

A	> 835	**C**	600-659
B+	775-834	**D**	550-599
B	710-774	**F**	< 550
C+	660-709		

You must maintain an average of 35%, which is 236 points in the common exams, quizzes, and finals to be considered for a grade of D or higher. You will receive an F even if you have adequate point total without this requirement.

ATTENDANCE POLICY: Attendance to both lecture and recitation classes will be recorded through **iClicker** and is **mandatory**. Each class is a learning experience that cannot be replicated through simply "getting the notes." This is also a highly compacted course and even one absence may cause a steep drop in course performance. Absences for unavoidable legitimate reasons will be permitted upon presentation of appropriate supporting documentation to the Dean of Students.

LECTURE (IN PERSON): A computer and scientific (non-graphing, non-programmable) calculator are required for all lectures. Students are expected to come to lecture after having reviewed the lecture notes available in Canvas. Instruction will be offered *in person* unless the University mandates virtual instruction so assume *in person attendance is required* for all the classes. A laptop/tablet/phone with internet capability is required for all classes as instructors will take attendance using iClicker polling (see below). A lot of problem -solving is done during class, so a notebook where you can do problems by hand is highly recommended.
If your technology malfunctions and you are unable to participate in iClicker polling, then approach your instructor in-person immediately after class. Failure to notify the instructor properly or in a timely manner will result in loss of participation points for that day.

iCLICKER IN CLASSROOM: In order to gauge student comprehension, encourage participation, and track attendance we will use using iClicker Cloud. Each student must download the iClicker Student app (formerly iClicker Reef app) to their mobile device or laptop and sign up for at least the 6-month license. Students must create an account in the application or, if they

have an account already, simply sign in. When creating your profile, please use your name and NJIT email as it appears on the class roster. Instructors will be using this app to assign grades so having the correct name and email is vital to getting the points you earned! Once in the app, simply select the "add a class" button (top right, appears as a plus sign), search for New Jersey Institute of Technology, and select the course with the name your instructor provides.

CLASS RECORDINGS: Class sessions may be recorded by the instructor. These recordings shall only be used as an educational resource and are not to be distributed or used outside of this class. Information on how to access recorded lectures will be made available by your instructor. Any recordings that contain identifiable information about students will not be used beyond this semester.

CLASS RECORDING ETIQUETTE*:* Students are expected to respect their fellow students' privacy and freedom to learn without disruption. Students are not allowed to capture or reproduce anyone's name, image, or voice without permission. They must be polite and respectful in the online chat. Informal chat is okay, but typing is restricted to things that one would say out loud in front of the entire class. Students must always conduct themselves on their webcam video as they would in person in a classroom.

RECITATION (SECOND LECTURE PERIOD) IN PERSON: For recitation, the students will be given a worksheet to solve. You will be given adequate time to complete the worksheets and upload your work and enter your answers in Canvas. These worksheets are essential for helping you learn and are worth points. So please take the time to do the work neatly and upload them in the space provided in CANVAS. Students who miss a recitation for a valid reason must still make up the worksheet to get credit.

COURSE LEARNING RESPONSIBILITY: The COVID-19 pandemic has required that both instructors and students make changes to their normal working protocols for courses. Students are asked to practice extra care and attention regarding academic honesty, with the understanding that all cases of plagiarism, cheating, multiple submission, and unauthorized collaboration are subject to penalty. Students may not collaborate on exams or assignments, directly or through virtual consultation, unless the instructor gives specific permission to do so. Posting an exam, assignment, or answers to them on an online forum (before, during, or after the due date), in addition to consulting posted materials, constitutes a violation of the university's Honesty policy. Likewise, unauthorized use of live assistance websites, including seeking "expert" help for specific questions during an exam, can be construed as a violation of the honesty policy. All students should be familiar with the NJIT integrity code:

http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

In addition to adhering to the NJIT Integrity statement, learning in the current environment also places a significant amount of responsibility on you. Please utilize all the resources that are available to you to be successful in the courses. Examples include paying full attention in class, copying notes, accessing the tutoring center, going to instructor office hours for help.

HOMEWORK POLICY: Homework is 100% online and accessed via CANVAS. The homework is to test your understanding of the material being taught. This homework will build on the classroom content and enhance your understanding of the material. This homework will also be good preparation for the common exams. To maximize your ability to learn through the homework each assignment allows multiple attempts. It is important that you aim to get > 90% in all your homework to get the most benefit.

Each homework assignment has it due date. In addition, Canvas has a calendar with due dates. **ALL HOMEWORK MUST BE DONE ON TIME. Once the due date has passed the assignment is locked and there is no way to access the homework questions. There is no credit for late homework.** Also, it is advisable to take screenshots of your completed assignment so you can use them to study for the exam. DO NOT WAIT TO THE LAST MINUTE TO DO YOUR HOMEWORK. ONLINE SYSTEMS ARE NOT 100% RELIABLE. UNEXPECTED EVENTS, like Canvas being down, MAY OCCUR but they are not considered valid excuses for missing a due date. PLAN TO FINISH YOUR HOMEWORK AT LEAST ONE DAY BEFORE IT IS DUE.

PRE-EXAM QUIZ: There will be three take home quizzes worth 25 exam points each prior to each common exam. The quiz will run under the RESPONDUS lockdown browser and webcam (see below) and it is to be *taken outside of class time*. Once open, the entire quiz must be completed in one sitting, and you only have one attempt. You will be able to go back and forth between questions during the quiz but once you leave the RESPONDUS environment you will not be able to get back in. If you leave the RESPONDUS environment due to an emergency or your connection is severed due to internet instability, try to state what is happening while you are still in the Respondus environment then after getting out of Respondus notify your instructor as soon as possible. If you are unable to take it due to an emergency, please contact the Dean of Students. **Pre-Exam quizzes count towards your overall exam points. Pre-Exam quizzes must be completed in the allotted time frame on Canvas. There will be no extensions for the quiz. If the quiz is missed and a Dean's note is provided, there will a cumulative make-up pre-exam quiz at the end of the semester.**

EXAMS: There will be three midterm (Common) exams and one comprehensive final exam.
Common Exams are held on Mondays during the common hour. They start at 4:15PM in assigned rooms (TBD). Plan to be in your seats by 4:00PM

Common Exam I	**2/10/25**
Common Exam II	**3/24/25**
Common Exam III	**4/21/25**
Final Exam Period	**TBD**

The Final Exam will test your knowledge of *all the course material* taught *in both this entire course as well as chem125*.

ADMINISTRATION OF EXAMS: The Common and Final Exams will be administered in person unless University Policies dictate otherwise. The virtual pre-exam quizzes will use the RESPONDUS browser with Webcam. **This browser is available in Canvas. Students must complete a proper environment check before starting the exam in the exam video by showing their calculator, blank scratch paper, their work surface and ensure cell phone is placed away from work area and is inaccessible during the course of the exam. Students may only use scientific (non-programmable, non-graphing) calculators on exams and #2 pencil. The student will also be asked to show a photo-ID**. **No cell phones**, **tablets**, **other computers**, **smartwatches**, or anything else which can access the internet should be anywhere near the exam-- any indication of cell phone, headphones or smart device presence (a ring tone, vibration, music, or a visible phone) will result in a point penalty or a zero on the exam. Talking to anyone during the exam is not permitted.

If University policies dictate a virtual final exam it will be administered using the RESPONDUS browser with Webcam.

During the exam, you have to adopt the following behaviors:

1. **No cell phones, tablets, other computers, headphones, smartwatches,** or anything else which can access the internet besides the machine you are running Respondus on should be anywhere near the exam-- any indication of cell phone presence (a ring tone, vibration, music, or a phone visible to the camera) will result in a point penalty.
2. Not talking to anyone.
3. No covering of face (either with clothing or hand) unless the student is in a public space (like the library)
4. No moving out of frame.
5. No listening to music or having headphones/earbuds on.
6. No setting up the camera so that the camera's view is not completely on student and workspace.

To protect the test's integrity, anyone found to violate any of the rules (2-6) of an exam or have facial recognition for less than 50% of the exam time will be docked 10 points for each violation from their exam score or be given a zero.
We understand these are difficult times and it is natural to move around when taking an exam in the comfort of your home. We must remind you that this is a high stakes exam and must be treated as such. Please observe all exam rules as if you were taking the exam in person.

TEST GRADING ERROR: Test scores will be available in Canvas roughly 2 weeks after the test. If you wish to go over your exam, arrange to meet your instructor during office hours. If you believe there is an error, you have one week after scores are posted to discuss the error with your instructor during office hours.
ALL ERRORS NEED TO BE BROUGHT TO THE INSTRUCTOR'S ATTENTION WHEN THEY OCCUR. DO NOT WAIT UNTIL THE END OF THE SEMESTER.

MAKEUP EXAM POLICY: There will normally be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. If you have a legitimate reason for missing a quiz or exam, you should contact the Dean of Students office and present written, verifiable proof of the reason for missing the exam (e.g., a doctor's note, police report, court notice, etc.), clearly stating the date AND time of the mitigating problem. You must also notify the CES Department Office/Instructor that the exam will be missed. **One *cumulative make-up examination and quiz*** will be permitted at the end of the semester if there is an acceptable and substantial reason. A grade of zero will be given for a second missed examination independent of reason.

Using Respondus LockDown Browser and a Webcam for Online Exams

Respondus LockDown Browser is a locked browser that prevents you from printing, copying, going to another URL, or accessing other applications during a quiz. If a Canvas quiz requires that LockDown Browser be used, you will not be able to take the assessment or quiz with a standard web browser. You may be required to use LockDown Browser with a webcam

(Respondus Monitor), which will record you during an online exam. The webcam can be built into your computer or can be the type that plugs in with a USB cable. Watch this short video to get a basic understanding of LockDown Browser and the webcam feature. A student Quick Start Guide (PDF) is also available.

1. Download and install LockDown Browser from this link:
   http://www.respondus.com/lockdown/download.php?id=264548414
2. Once your download has finished, locate the "LockDown Browser" shortcut on the desktop and double-click it. (For Mac users, launch "LockDown Browser" from the Applications folder.)
3. You will be brought to the Canvas or Moodle login page within the LockDown Browser. If you are in Moodle, click "Login with your UCID" to log in with your NJIT UCID and password and then click Login.
4. Under "My courses," click on the course in which you have to take the exam that requires the LockDown Browser. After you enter the course, find the exam and click on it.
5. A confirmation prompt will appear. Click the "Start attempt" button. Once a quiz has been started with LockDown Browser, you cannot exit until the Submit all and finish button is clicked.
6. If you are required to use a webcam (Respondus Monitor), you will be prompted to complete a Webcam Check and other Startup Sequence steps.

HOW TO SUCCEED IN THIS COURSE:

You are responsible for utilizing the resources provided, like pre-recorded lectures, to help yourself learn. You will benefit from the lecture and recitation only if you come prepared to class. Please plan to spend at least 6-9 hours each week outside the lecture/recitation period for this class. **Spend a little time on chemistry and problem-solving every day!** All instructors will provide their availability for office hours where you can go for extra help. In addition, the Chemistry Tutoring Center will be a useful resource where you can get help from peers. On a weekly basis you need to plan for:

a) Time to listen to pre-recorded lectures (before the class) and review the textbook chapter
b) Prepare questions to ask the professor during class
c) Review material and come prepared to do the recitation problems
d) Time to do the online homework and textbook problems
e) Work on the Review Packets

ADDITIONAL RESOURCES

Chemistry Tutoring Center: Located in the Central King Building, Lower Level, Room G12. Students can get help from peer tutors on a "walk-in" basis. There is no private tutoring available, however if the center is not too busy, you may be able to get more personal attention. In this peer tutoring model, tutors are taught to encourage interaction among students to promote learning. In addition, there will be limited tutoring available online as well. *Hours of operation are from Monday—Friday 10:00 am—6:00 pm*, either virtually or in-person.

Accommodation of Disabilities: **O**ffice of **A**ccessibility **R**esources and **S**ervices (**OARS**, *formerly known as Disability Support Services*) offers long term and temporary accommodations for undergraduate, graduate, and visiting students at NJIT. See https://www.njit.edu/studentsuccess/node/5 to learn more about their services.

If you are in need of accommodations due to a documented disability, please contact the Office of Accessibility Resources and Services 973-596-5417 or via email oars@njit.edu

The office is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Office of Accessibility Resources Services office authorizing your accommodations is required to receive accommodations on assignments or exams. Eligible students requiring special conditions for exams must fill out an OARS forms stating the date and time of the exam. It is advisable for eligible students to fill out forms for the two common exams the first week of classes

Please request all exams that must be administered by OARS by the end of the first week of class. If accommodations are not requested in a timely manner, your request will be denied.

Mental Health and Well-being: NJIT is committed to the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Center for Counseling and Psychological Services (c-CAPS) at https://www.njit.edu/counseling/ or by calling the c CAPS office at 973-596-3414. If you need support and information about options and resources, please also reach out to the Office of the Dean of Students at https://www.njit.edu/dos/

IMPORTANT DATES: (See Spring 2025 Academic Calendar)

January	20	Monday	Martin Luther King, Jr. Day
January	21	Tuesday	First Day of Classes
January	25	Saturday	Saturday Classes Begin
January	27	Monday	Last Day to Add/Drop a Class
January	27	Monday	Last Day for 100% Refund, Full or Partial Withdrawal
January	28	Tuesday	W Grades Posted for Course Withdrawals
February	3	Monday	Last Day for 90% Refund, Full or Partial Withdrawal, No Refund for Partial Withdrawal after this date
February	17	Monday	Last Day for 50% Refund, Full Withdrawal
March	10	Monday	Last Day for 25% Refund, Full Withdrawal
March	16	Sunday	Spring Recess Begins - No Classes Scheduled - University Open
March	22	Saturday	Spring Recess Ends
April	3	Thursday	Wellness Day - No Classes Scheduled - University Open
April	7	Monday	Last Day to Withdraw
April	18	Friday	Good Friday - No Classes Scheduled - University Closed
April	20	Sunday	Easter Sunday - No Classes Scheduled - University Closed
May	6	Tuesday	Thursday Classes Meet
May	7	Wednesday	Friday Classes Meet
May	7	Wednesday	Last Day of Classes
May	8	Thursday	Reading Day 1
May	9	Friday	Reading Day 2
May	10	Saturday	Final Exams Begin
May	16	Friday	Final Exams End
May	18	Sunday	Final Grades Due
May	19	Monday	Master's and PhD Candidate Commencement - Bloom Wellness and Events Center
May	21	Wednesday	Undergraduate Candidate Commencement - Prudential Center

Course Outline

This is the second part of a two-course Chemistry sequence. This course builds on content from Chem 125. So, it is expected that the student will have reviewed Chapters 1-12 before starting this course.

Week	Outcomes	Topic	Homework
1 1/21 – 1/27	1, 2	Chapter 15: Chemical Kinetics	Warm up Basic HW, Chapter 15 HW – part 1 Recitation #1
2 1/28 – 2/3	1, 2, 3	Chapter 15: Chemical Kinetics	Chapter 15 HW – part 2 Recitation #2
3 2/4 – 2/10	4, 5	Chapter 16: Chemical Equilibrium	Chapter 16 HW – part 1 Recitation #3
2/10		**EXAM 1: Chapter 15**	
4 2/11 – 2/17	4, 5, 6, 7	Chapter 16: Chemical Equilibrium	Chapter 16 HW – part 2 Recitation #4
5 2/18 – 2/24	8, 9, 10	Chapter 13: Solids Chapter 14: Solutions	Chapter 13 HW, Chapter 14 HW Recitation #5
6 2/25 – 3/3	11, 12	Chapter 17: Acids and Bases	Chapter 17 HW – part 1 Recitation #6
7 3/4 – 3/10	12, 13	Chapter 17: Acids and Bases	Chapter 17 HW – part 2 Recitation #7
8 3/11 – 3/17	14, 15	Chapter 18: Aqueous Ionic Equilibrium	Chapter 18 HW – part 1 Recitation #8
9 3/18 – 3/24	16, 17	Chapter 18: Aqueous Ionic Equilibrium	Chapter 18 HW – part 2 Recitation #9
3/24		**EXAM 2: Chapters 16, 14, 17**	
10 3/25 – 3/31	18, 19, 20, 21	Chapter 19: Free Energy and Thermodynamics	Chapter 19 HW Recitation #10
11 4/1 – 4/7	22, 23	Chapter 20: Electrochemistry	Chapter 20 HW – part 1 Recitation #11
12 4/8 – 4/14	24, 25, 26	Chapter 20: Electrochemistry	Chapter 20 HW – part 2 Recitation #12
13 4/15 – 4/21	27 – 32	Chapter 21: Radioactivity and Nuclear Chemistry	Chapter 21 HW Recitation #13
4/21		**EXAM 3: Chapter 18, 19, 20**	
14 4/22 – 4/28	33, 34	Chapter 22: Organic Chemistry	Chapter 22 HW Recitation #14
15 4/29 – 5/5		Final Exam Review	Basic: Chapters 1-8 Basic Chapters 9-12 ACS reviews: I and II