

New Jersey Institute of Technology

## Digital Commons @ NJIT

---

Chemistry, Environmental and Forensic Science  
Syllabi

NJIT Syllabi

---

Spring 2023

### Chem 126-018 & 020: Chemistry, A Molecular Approach

Mieke Peels

Follow this and additional works at: <https://digitalcommons.njit.edu/chem-syllabi>

---

#### Recommended Citation

Peels, Mieke, "Chem 126-018 & 020: Chemistry, A Molecular Approach" (2023). *Chemistry, Environmental and Forensic Science Syllabi*. 454.

<https://digitalcommons.njit.edu/chem-syllabi/454>

This Syllabus is brought to you for free and open access by the NJIT Syllabi at Digital Commons @ NJIT. It has been accepted for inclusion in Chemistry, Environmental and Forensic Science Syllabi by an authorized administrator of Digital Commons @ NJIT. For more information, please contact [digitalcommons@njit.edu](mailto:digitalcommons@njit.edu).

THE DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE

**CHEM 126: 018 & 020 sections**  
**Spring 2023 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 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](mailto:dos@njit.edu)

**COURSE INFORMATION**

**Course Description:** Chem 126

**Number of Credits:** 3

**Pre-requisites:** Chem 125

**Corequisites:** C or higher in Math 110 or equivalent

Course-Section	Meeting Times
Chem 126: 018	Monday (KUPF 207) 8:30AM - 9:50AM, Friday (KUPF 210) 8:30AM - 9:50AM
Chem 126: 020	Tuesday (KUPF 207) 8:30AM - 9:50AM, Friday (KUPF 210) 8:30AM - 9:50AM

**Instructor:** Dr. Mieke Peels (they/them/theirs)

**Office Hours:** Monday 10:30-noon, Tuesday/Wednesday noon-1:30, Friday 3:30-5:00 in Tiernan B006

**Webpage:** The course website is available through Canvas, which can be accessed via [canvas.njit.edu](https://canvas.njit.edu). Please email your instructor immediately if you cannot access the class site. All materials including lecture summaries, any 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 your instructor as soon as possible.

**Required Textbook:**

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

**University-wide Withdrawal Date:** The last day to withdraw with a **W** is Monday, April 3, 2023

**Learning Outcomes:**

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 concept of equilibrium constant and the reaction quotient, Q
6. Use equilibrium constant to determine the direction of reaction and product yield in the context of various chemical reactions
7. Use Le Chatelier's principle to determine direction of reaction
8. Understand different definitions of acids and bases
9. Explain the autoionization of water and the concept of pH to discuss acid/base strength
10. Define and perform calculations relating to acid and base dissociation constant
11. Explain the concept of buffer solution and their importance
12. Perform calculations to show the efficiency of buffer solutions
13. Interpret equilibrium constants  $K_{sp}$  and discuss solubility of sparingly soluble salts
14. Interpret titration curves and calculate the pH of the solution during titration of strong and weak acids versus base
15. Understand and explain energy transformations in chemical reactions
16. Explain entropy, Gibbs free and the second and third law of thermodynamics.
17. Determine whether a reaction is spontaneous
18. Calculate thermodynamic parameters  $\Delta G$ ,  $\Delta S$ ,  $\Delta H$  and relate the equilibrium constant to these parameters
19. Balance redox reaction and write oxidation and reduction half –reaction
20. Calculate the cell potential for a redox reaction in a galvanic cell
21. Relate cell potential to thermodynamic parameters and determine the direction of spontaneity
22. Use Faraday's law to determine the amount of material deposited during electroplating
23. Explain electrolysis and overvoltage
24. Differentiate between chemical reaction and nuclear reaction
25. Balance nuclear equations and describe the particle emitted during the process
26. Predict the type of emission from unstable nuclides
27. Use mass –energy relationship to calculate the energy released during nuclear processes
28. Distinguish between nuclear fission and fusion
29. Describe the applications of nuclear reaction s in energy production
30. Name simple organic compounds and the basic functional groups
31. 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 of course materials on external websites without the approval of the instructor violates intellectual property laws and hence 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:

<b>Homework</b>	150
<b>Class Participation (recitation + lecture)</b>	150
<b>Pre-Exam worksheets (virtual) 25 pts X 4 worksheets =</b>	100
<b>Common Exam I</b>	100
<b>Common Exam II,</b>	100
<b>Common Exam II</b>	100
<b>Final Exam</b>	300
<b>Total points</b>	1000

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

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

You must maintain an **average of 35%, which is 228 points** total for the common exams and final 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 at classes will be recorded and through **iclicker** and **mandatory**. Each class is a learning experience that cannot be replicated through simply “getting the notes.”

**The two class periods are broken into Lecture and Recitation classes.** If multiple sections are merged for 1 class that class is the Lecture and the single section class is the Recitation. If single sections meet twice a week then the instructor either designates one class as Lecture and the other as Recitation or breaks each class into part Lecture and part Recitation

**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 pre-recorded lecture notes available in Canvas. Instruction will be offered in person unless the University mandates virtual instruction, so attendance is required for all the classes. A laptop is required for all classes as instructors will administer online class quizzes. We will be doing a lot of problem -solving, so a paper notebook where you can do problems is highly recommended.

If your computer malfunctions and you are unable to attend class, you are required to inform the instructor, via email the **same day**. Failure to notify the instructor will result in loss of 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 (formerly iClicker Reef) app to their mobile device or laptop and sign up for 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.

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

**COURSE LEARNING RESPONSIBILITY:** COVID-19 pandemic has required that both instructors and students make changes to their normal working protocols for courses. We will still have content and quizzes online. As a result, 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 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. It is important that you aim to get > 90% in all your homework to get the most benefit. Each homework assignment has its due date. In addition, Canvas has a calendar with due dates. **ALL HOMEWORK MUST BE DONE ON TIME. There is no credit for late homework.** 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 WORKSHEET (25 PTS):** A week before each exam, including the Final Exam there will be a Pre-Exam worksheet on Canvas. The purpose of this worksheet is to give students problems that access the student's knowledge of core principles as well as their problem solving skills at a time when the student can still ask for help. These points will be counted as EXAM points!

Common Exams are held on Mondays during the common hour. They start at 4:30P in assigned rooms (TBD)

<b>Common Exam I</b>	<b>February 20</b>
<b>Common Exam II</b>	<b>March 20</b>
<b>Common Exam III</b>	<b>April 17</b>
<b>Reading Days</b>	<b>May 3 and 4</b>
<b>Final Exam Period</b>	<b>May 5 – 11</b>

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 (100% multiple choice) will be administered in person unless University Policies dictate otherwise. Any virtual exam 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, cell phone is placed away from work area, and a 360 degree view of their workspace to confirm no information is posted around the work area. Students may only use scientific (non-programmable, non-graphing) calculators on exams. The student will also be asked to show a photo-ID. The in person final Exam will be a proctored ACS final exam.** 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, iwatches,** 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.**

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. In the event that a student has a legitimate reason for missing a quiz or exam, the student 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. The student must also notify the CES Department Office/Instructor that the exam will be missed. **One cumulative make-up examination** 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. ***Tentative date of the makeup exam is during the the last week in April (23 – 29)***

#### **Using the 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 or exam. If a Canvas quiz or exam requires that LockDown Browser be used, you will not be able to take the assessment with a standard web browser. The LockDown Browser with a webcam (Respondus Monitor) will record you during an online exam.

The webcam can be built into your computer or it can be a separate unit 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.
5. After you enter the course, find the exam and click on it.
6. 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.
7. 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.

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:

1. Time to listen to pre-recorded lectures (before the class) and review the textbook chapter
2. Prepare questions to ask the professor during class
3. Review material and come prepared to do the recitation problems
4. Time to do the online homework and textbook problems
5. Work on the Review Packets

### **ADDITIONAL RESOURCES**

**Chemistry Tutoring Center:** Located in the Central King Building, Lower Level, Rm. 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 between Monday – Friday 10:00 am - 6:00 pm*, either virtually or in-person

**Accommodation of Disabilities:** Office of Accessibility Resources and Services, 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 at [oars@njit.edu](mailto:oars@njit.edu) or contact Scott Janz, the Associate Director at 973-596-5417 or via email at [scott.p.janz@njit.edu](mailto:scott.p.janz@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

For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Accessibility Resources and Services (OARS) website at: <http://www5.njit.edu/studentsuccess/disability-support-services/>

**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 <https://www.njit.edu/registrar/calendars>)

**Spring 2023 Calendar**

Month	date	Day	Event
January	16	Monday	Martin Luther King, Jr. Day
<b>January</b>	<b>17</b>	<b>Tuesday</b>	<b>First Day of Classes</b>
January	21	Saturday	Saturday Classes Begin
January	23	Monday	Last Day to Add/Drop a Class
January	23	Monday	Last Day for 100% Refund, Full or Partial Withdrawal
January	24	Tuesday	W Grades Posted for Course Withdrawals
January	30	Monday	Last Day for 90% Refund, Full or Partial Withdrawal, No Refund for Partial Withdrawal after this date
February	13	Monday	Last Day for 50% Refund, Full Withdrawal
March	6	Monday	Last Day for 25% Refund, Full Withdrawal
<b>March</b>	<b>13</b>	<b>Monday</b>	<b>Spring Recess Begins - No Classes Scheduled - University Open</b>
<b>March</b>	<b>18</b>	<b>Saturday</b>	<b>Spring Recess Ends</b>
<b>April</b>	<b>3</b>	<b>Monday</b>	<b>Last Day to Withdraw</b>
<b>April</b>	<b>7</b>	<b>Friday</b>	<b>Good Friday - No Classes Scheduled - University Closed</b>
<b>April</b>	<b>9</b>	<b>Sunday</b>	<b>Easter Sunday - No Classes Scheduled - University Closed</b>
<b>May</b>	<b>2</b>	<b>Tuesday</b>	<b>Friday Classes Meet</b>
<b>May</b>	<b>2</b>	<b>Tuesday</b>	<b>Last Day of Classes</b>
May	3	Wednesday	Reading Day 1
May	4	Thursday	Reading Day 2
<b>May</b>	<b>5</b>	<b>Friday</b>	<b>Final Exams Begin</b>
<b>May</b>	<b>11</b>	<b>Thursday</b>	<b>Final Exams End</b>
May	13	Saturday	Final Grades Due
TBA			Commencement



## Chem126 Course Outline

This is a second part in a 2 course Chemistry sequence. This course builds on content from Chem 125. So, it is expected that the student will have reviewed Chapters 1-14 before starting this course.

Week	Outcomes	Topic	Homework
1	1,2	Chapter 15: Chemical Kinetics	Warm up Basic HW Chapter 15 HW-part 1
2	1,2,3	Chapter 15: Chemical Kinetics	Chapter 15 HW-part 2
3	4,5	Chapter 16: Chemical Equilibrium	Chapter 16 HW- part 1
4	4,5,6,7	Chapter 16: Chemical Equilibrium	Chapter 16 HW- part 2
5	8, 9	Chapter 17: Acids and Bases	Chapter 17 HW- part 1
<b>EXAM 1: Chapters 15 and 16 (Feb 20)</b>			
6	8,9, 10	Chapter 17: Acids and Bases	Chapter 17 HW - part 2
7	11, 12	Chapter 18: Aqueous Ionic Equilibrium	Chapter 18 HW-part 1
8	13,14	Chapter 18: Aqueous Ionic Equilibrium; Review Chapter 6: Thermochemistry	Chapter 18 HW- part 2
9		SPRING BREAK	
<b>EXAM 2: Chapters -17, 18 (Mar 20)</b>			
10	15,16	Chapter 19: Free Energy and Thermodynamics	Chapter 19 HW - part 1
11	17,18	Chapter 19: Free Energy and Thermodynamics	Chapter 19 HW – part 2
12	19,20,21	Chapter 20: Electrochemistry	Chapter 20 HW – part 1
13	21, 22, 23	Chapter 20: Electrochemistry	Chapter 20 HW – part 2
<b>EXAM 3: Chapters 19 and 20 (April 17)</b>			
14	18, 19,20	Chapter 21: Radioactivity and Nuclear Chemistry	Chapter 21 HW
15	21	Chapter 22: Organic Chemistry	Chapter 22 HW
16*	1 - 21	FINAL EXAM Review	Basic: Chapters 1-8 Basic Chapters 9-12 ACS reviews: I and II

\*week 16 is also the last week of classes; only Monday and Friday classes will meet.