

**General Chemistry for Engineering Sciences**  
**CAS CH131 A1**  
**Lecture Course Syllabus – Fall 2024**

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**Email:** alicini@bu.edu  
**Office Hours:** See Lab syllabus folder on course Blackboard site for lab office hours

**CH131: Lecture Time and Location:** Tuesday/Thursday, 9:30 am – 10:45 am  
602 Commonwealth Ave, MOR 101

Class Website: A course website is maintained on which will be posted notes, handouts, and original articles of interest. You can access the site by going to <http://learn.bu.edu/>, then choosing ‘fall 2024’, ‘College of Arts and Sciences’, and finally CH131 A1 General Chemistry for Engineering Sciences

E-mail Correspondence: Periodic e-mails will be sent to the entire class using the BU-Blackboard Learn (registrar’s online information system). Make sure that you check your BU e-mail address regularly so that you do not miss any important messages. Please use a valid BU email address for email communication regarding CAS CH131 issues. When contacting any member of the teaching staff, please put “CH131” somewhere in the subject line (e.g., “CH131: visiting office hours”). This will help to facilitate our response.

## Course Summary

Welcome to CH131 General Chemistry for Engineering Sciences, a one-semester, terminal general chemistry course for engineering students who do not require a two-semester general chemistry sequence. Lecture topics will primarily focus on the concepts of stoichiometry, atomic and molecular structure and properties, theories of bonding, chemistry of the gaseous state, intermolecular interactions, equilibrium, and chemical kinetics. Laboratory exercises include experiments complementing the lectures. Students must register for the following four (4) course components: lecture, discussion, pre-lab lecture, and laboratory. This course fulfills a single unit in each of the following BU Hub areas: Scientific Inquiry I, Quantitative Reasoning I.

## Textbook and Other Required Course Materials

1. *Principles of Modern Chemistry*, D. W. Oxtoby, H. P. Gillis and L. J. Butler, 8th Edition, ISBN; 978-0-357-67100-9, Cengage Publishing, available at the BU Barnes & Noble bookstore and online. (Required)
2. Study Guide and Student Solution Manual to accompany “*Principles of Modern Chemistry*”, ISBN-13: 978-1-305-09227-3, Cengage Publishing, available at the BU Barnes & Noble bookstore and online. (Recommended)
3. A subscription to TopHat. (Required) **The Join Code for Top Hat will be provided separately.** To register with TopHat for the first time go to: <https://app.tophat.com/register/student>. To launch TopHat after that go to: <https://app.tophat.com/login>.
4. Calculator. (Required) A calculator with  $10^X$ , log, and ln functions is required for all class meetings and exams. Graphing capability is not necessary.
5. The additional materials detailed in your Laboratory syllabus, including:
  1. A spiral bound notebook to record your solutions to all assigned problems in the course. You may also use an electronic device. Your work in lecture, discussion, and homework should be done in this manner.
  2. An 8.5” x 11” spiral-bound notebook of any kind that will function as a lab notebook dedicated solely to the laboratory portion of the course is required.
  3. Approved safety goggles, item #9301, and laboratory coat. Massachusetts State Law requires that all students wear approved personal protective equipment at all times in all labs. Contact lenses are forbidden in chemistry labs, so make sure the goggles fit over any prescription glasses you may need. Additional details about lab safety and protection will be provided in lab.
  4. Laboratory coat
  5. Recommended: A lock to secure your belongings in the locker while in the laboratory.

## **Laboratory (Lab schedule and additional laboratory information will be provided separately.):**

1. This course contains a laboratory section and will require students to perform experiments and analyze their results in a way that complements the lecture material. All students are required to participate in nine approximately 3-hour laboratory sessions, roughly once a week. Dedicated pre-lab lectures will introduce concept and

techniques to prepare students for the lab, but students' preparation will also be assessed via pre-lab assignments, skill check-ins, and post-lab worksheets. For the safety of you and your classmates, your preparation and lab etiquette will be taken seriously, and your participation in the labs depends on your ability to work safely in a laboratory setting.

## Course Format

The course consists of **Four required components**:

1. Lectures, held in MOR 101 on Tuesday and Thursday, 9:30 am– 10:45am. The first lecture is Tuesday, September 3<sup>rd</sup>.
2. Discussions, which start the week of Monday, September 9<sup>th</sup>.
3. Pre-lab lectures, held in COM 101, Thursday, 2:00 pm - 3:15 pm, starting September 5<sup>th</sup>.
4. Labs, which start the week of September 9<sup>th</sup>.

All students in CH131 are required to be registered for all four components of the course: lecture, discussion, pre-lab lecture, and lab. If you have not yet done so, please do so right away.

## Lecture

It is strongly recommended that you read the relevant portions of the textbook before attending the lectures. I will spend the majority of the time in lecture selectively explaining the most challenging parts of the material and their chemical implications rather than just regurgitating the textbook. It's therefore very useful that you have a basic knowledge of the material, from reading the textbook, before attending the lecture. This approach will allow us to be efficient in spending most of our class time trying to achieve a deeper understanding of the material. It will also leave more time for us to have discussions around your questions in lecture.

You should feel free to ask questions during the lecture. That is part of what the lecture is for, and I strongly encourage it. If you wish to ask a question, simply raise your hand and I'll get to you as soon as I reach a suitable break. There is no such thing as a silly question - really. If, after some thought, you're still unsure about something, then you can bet that a lot of your classmates are too. Please listen respectfully, as I will, to any questions your classmates ask in class, even if the answer seems obvious to you, as you expect other people to be appropriately respectful when you have a question.

Recent studies have shown that [having your laptops or cellphones out in class](#) leads to lower performance by students in classes and on quizzes and exams. For this reason, we ask that you focus on the course content and not use electronic devices for diversionary purposes.

We realize that some of you may want to use cameras to make images of the lecture slides, etc. Please note however, all lectures are recorded and stored on our Blackboard site, so you have full access to everything that is being presented.

## Participation in lectures

In addition to traditional lecture presentations, lecture time will also be comprised of interactive individual and group-based problem solving. Students will use TopHat to answer

questions in class. A portion of your course grade (5%) will be awarded based on your participation using TopHat.

Please note: Students may only use their own TopHat account in class. Using another student's account is a violation of the Boston University Academic Conduct Code.

### **Absence Policy**

If you need to miss a single lecture due to illness or a similar serious emergency, you do not need to let me know. You should check the class website to get the reading assignments for the next class. You should cover the material you missed using the textbook and should also talk to your classmates and ask if you can look at their lecture notes for any extra details or other information that was given in class beyond what's in the published notes. Note that the taped lectures will be posted online as well. If, after having done the above, you have any questions about the material you missed, you should discuss them with discussion leader or in their office hours, or with Prof. Caradonna during his office hours (or by appointment), as you would for any other problem.

Your participation grade will be based on your performance, prompt attendance, and contributions in lecture and discussion. It is completely understandable that some students may miss a lecture or discussion due to unforeseen circumstances. At the end of the semester **the lowest two lecture participation scores and the lowest discussion participation score will be dropped**. Missed classes due to religious observances will not affect your performance score. If you have any concerns, please contact Prof. Caradonna.

### **Discussions and group work**

Each week, all students should participate in their scheduled discussion section. During each discussion, students will work in groups (3 students per group) on problem solving (selected book problems and other problems), interactive exercises, and class-wide discussions. The discussion leader (and perhaps undergraduate learning assistants, LAs) will be facilitators and mentors in discussion, working with groups to help them on their work.

Students are expected to arrive on time and to actively participate in all the discussion sections. A portion of your course grade (5%) will be awarded based on your discussion work, including (on-time) attendance; engagement (in group work and class-wide exercises) in discussion; and the effort and completeness of your problem-solving notebook. Assigned problems will be posted starting on September 3<sup>rd</sup> for the discussion sections the following week. These assignments will be posted on our Blackboard Learn site and through class announcements.

Discussion sections provide a valuable opportunity to review areas of the coursework and practice problems. Even if you feel confident you understand all the material, the discussion arising from a fellow student's question will often lead you to a deeper understanding or identify an area of uncertainty you didn't know you had. Attendance at Discussion is therefore highly recommended for all students. You must attend the Discussion section for which you are registered unless you arrange otherwise with Prof. Caradonna.

## Homework

We will regularly assign homework problems out of the book. These won't be fully graded, as some of the answers are available in the back of the book or in a Study Guide for the text. However, **it is important that you do these problems regularly and don't fall behind.** If you don't regularly spend the necessary time to properly work out these problems, there is a strong chance that you will not perform as well as you'd like in this course.

**Please Note:** Chemistry is a quantitative science and the best way to develop an understanding of its concepts is to solve problems. You should complete reading assignments before attending lectures and pre-lab sections. Problems assigned in class are to be completed by the appropriate deadline defined on the course Blackboard site. **You will submit your work by the deadline on Gradescope (instructions will be sent out shortly).** However, the more problems you do, the better your performance should be in the class. **For success, you should do as many of these as you can** and if you run into difficulties ask your teaching fellow or professor for help. You learn chemistry by solving problems, not by outlining or highlighting the text.

## Exam Schedule

There will be three mid-term exams and a cumulative final exam. Each of the three mid-term exams is 75 minutes long; they will be given during our regularly scheduled lecture time slot for the appropriate week. If the need arises, the dates of the exams may be changed. In case of a serious medical or other emergency that prevents you from attending an exam, email me before the exam so we can discuss the situation and decide how to remedy it. Examination absences that are not arranged with me in advance, or for which a satisfactory serious cause cannot be adequately documented, will result in a zero grade for that exam. Make-up exams are available only in approved situations and must have the prior consent of Prof. Caradonna. NOTE: make-up exams are not routinely allowed due to travel.

Exam 1	Thursday, October 10 <sup>th</sup>
Exam 2	Thursday, November 7 <sup>th</sup>
Exam 3	Thursday, December 5 <sup>th</sup>
Final Exam	Tuesday, December 17 <sup>th</sup> 9:00-11:00 am (as currently scheduled by BU Registrar's Office)

## Course Grading

The course grade is based on your overall course score; we do not assign letter grades to individual exams, labs, or the final exam. The components of the overall score are shown below.

In-semester exams (3)	45%
Final Exam	25%
Laboratory and lab participation	25%
Discussion and lecture participation (includes problem solutions notebook)	5%
<hr/>	
Total	100%

The three in class exams are together worth 45% your total course grade. In class exams will focus mostly on the material that has been covered since the last exam. However, problems will

frequently require you to apply concepts you have learned earlier in the course, so you should consider all examinations to be cumulative (that is, for each exam you are required to know all relevant sections of the course we have covered up until the date of the exam).

### **Questions about grading:**

**No makeup exams will be given.** A missed exam without permission counts as a grade of zero. A missed lab counts as zero. To account for illness and other excused absences, the lowest score of nine prelab assignments and the lowest of nine postlab assignments will be dropped for all students at the end of the semester. If, due to unusual circumstances, such as a documented prolonged illness, you miss an exam or more than one lab, please contact Prof. Caradonna ([caradonn@bu.edu](mailto:caradonn@bu.edu)) or Dr. Licini ([alicini@bu.edu](mailto:alicini@bu.edu)) as soon as possible so that special arrangements can be made for you to catch up with your work.

Exams in CH131 will be graded through Gradescope. In days leading up to the first exam you will get an email from Gradescope. It will have you set a password so that you can access your graded exams.

**Regrades on exams:** To ensure fairness, all exams are graded with the same rubric, so requests for additional credit for incorrect answers will not be entertained. If you believe that you've answered a question on an exam correctly, but credit was not awarded, please email your regrading request directly to Professor Caradonna (I directly handle all regrade requests) **within one week after the results of the graded exams are posted**. Please be specific in your request stating what information was missed – we follow a grading rubric that is applied to all students. I will evaluate all submitted regrade requests and communicate the outcomes by email. If you wish to discuss any issue pertaining to a regrade, please schedule a meeting with me.

### **Overall score so far**

After exam 2, we will provide the distribution of overall course scores and your individual score so far. These overall scores will consider the scores on the work completed so far (exams, labs, and participation). In this way, you will have a preliminary measure of how you are doing at that point in the course.

Your complete list of course scores will be available on [Blackboard](#) and the distribution of overall scores so far will be posted there as well.

Please note that the overall score so far will **not** take in account dropping of the lowest lab, or absences from lectures, lab lectures, or discussion. This will be done only at the end of the semester.

**Phoenix Policy:** While you will not be allowed to drop a low exam grade(s) (all material covered is essential and of equal weight), you will have the opportunity to demonstrate your ultimate understanding of the material covered in that low exam(s) during the comprehensive final exam. If you show a clear and demonstrative understanding of that material on the final exam (as defined by Prof. Caradonna), your low exam score(s) will be elevated, replacing the in-term score(s). I call this the “Phoenix Policy” (formally known as the “Resurrection Policy”). It is designed to give you the opportunity to show mastery of the material by the end of the term. If you do so, your grade will reflect this mastery. Your final grade will reflect your mastery at the end of the term,



not necessarily at an intermediate calendar date. Please note, however, that if you do not stay up to date with material and review missed concepts immediately after each exam, you will in all reality not be able to take advantage of the Phoenix Policy, as you will undoubtedly find that there is insufficient time between the end of the term and your final exam to master missed concepts. You are being given a chance to show mastery of the material – please make use of it if necessary.

During the term, you will receive numerical grades for individual exams, and laboratory reports; we do not assign letter grades to these individual assessments. Your overall course letter grade will be determined, in part, on your total score for the course. **There are no fixed or pre-designated percentages of each grade;** course letter grades will be assigned based on our assessment of how an individual performed relative to our absolute standards. This means that your grade is uncoupled from the grades of your classmates - honest. Please note that we do not offer or accept extra credit assignments to augment your scores.

**Note:** in order to pass this course, you are required to pass both the lecture and the lab components.

### **Academic Conduct**

**Please take this topic seriously – we do:** All work and conduct regarding this class (lecture and lab) are governed by the Rules and Regulations as described in the Boston University Academic Conduct Code. All students are responsible for understanding and following this Code. Specifically, all work that you submit in this class must be your own work. This clearly includes laboratory reports; for instance, only raw data should be shared between partners, not written text, figures, tables, etc. While you are encouraged to work in groups on homework assignments and laboratory reports to discuss strategies and concepts, each student must submit papers that represent their own work and is written in their own words. Students suspected of committing academic misconduct will be brought before the appropriate CAS committee.

For more information on Boston University's updated Academic Conduct Code, please see: <http://www.bu.edu/academics/resources/academic-conduct-code/>

### **Policy on Religious Observances**

Absences for documented religious observances will be excused according to the specifications of the University Policy on Religious Observance (<http://www.bu.edu/ctl/university-policies/policy-on-religious-observance/>). Please make sure to communicate about religious observances as far in advance as possible (and no later than one week before the observance, per university policy) so that accommodations can be made.

### **Office of Disability and Access Services**

The Office of Disability and Access Services (25 Buick Street, Suite 300) is responsible for assisting students with disabilities. If you have a disability, you are strongly encouraged to register with this office. Lecture hall and discussion rooms are accessible and ADA compliant.

**Learning and testing accommodation:** Boston University complies with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. If you are a student who needs academic accommodations because of a documented disability, you must present your letter of accommodation from the Office of Disability and Access Services directly to the instructor as soon as possible. If you have questions about documenting a disability or requesting academic accommodations, contact the Office of Disability and Access Services. Letters of accommodations

should be presented as soon as possible to ensure that student needs are addressed from the start of the course. Instructors are not able to provide accommodations without documentation from Boston University's Office of Disability and Access Services.

### **Boston University Policy Regarding Copyright Laws and Protection**

The syllabus, course descriptions, lab manual, and all handouts created for this course, and all class lectures, are copyrighted by the course instructors. The materials and lectures may not be reproduced in any form or otherwise copied, displayed, or distributed, nor should works derived from them be reproduced, copied, displayed, or distributed without the written permission of the instructors. Infringement of the copyright in these materials, including any sale or commercial use of notes, summaries, outlines, or other reproductions of lectures, constitutes a violation of the copyright laws and is prohibited. Please note in particular that distributing, receiving, selling, or buying class notes, lecture notes or summaries, lab reports or related materials, or similar materials both violates copyright and interferes with the academic mission of the College, and is therefore prohibited in this class and will be considered a violation of the student code of responsibility that is subject to academic sanctions.

### **Proper use of Online Resources**

Students at Boston University are required to abide by all of regulations regarding academic integrity and conduct, including the proper use of technology and digital resources. Course materials are provided by faculty for your personal use in the course only. Any other use of these materials including, but not limited to, posting of materials online in forums or websites, is a copyright violation and a violation of the academic conduct code. Additionally, materials submitted for course credit (papers, exams, etc.) are similarly not permitted to be used or posted.

### **COVID and Flu Responsibilities and Regulations**

We are all in this together, and we are committed to offering the best learning experience possible given the need for safety. To do this, we need your help. We must all be responsible and respectful. Faculty, staff, and teaching fellows will follow all BU COVID and Flu regulations, and we expect you to do the same. We also ask that you follow the safety practices recommended by BU and the CDC outside the classroom, including all state and university guidelines regarding sheltering in place while feeling ill, testing, quarantining, social contacts, and gatherings.

### **Absences due to Illness**

We hope that all of you will remain healthy throughout the semester and are able to fully engage and participate in the course. If you do unfortunately become ill, we require that you follow the protocols mandated by the University under those circumstances. The course attendance and engagement policies already reflect substantial flexibility to allow for absences of short to moderate length due to illness. Please make sure to contact your instructor immediately about any absences that will last beyond a couple of days, and certainly inform your instructor immediately about any missed in-person work in labs. In the case of a prolonged illness that is not already covered by the course absence policies, we will work with the CAS Dean's office to determine the best course of action for any given student.



## Concerns and suggestions

Your instructors are always happy to hear your suggestions for the course, and to address any concerns that you may have. Please do not hesitate to contact your instructor to set up a meeting to discuss.

If you are having trouble, please contact your course instructor without delay. If dropping the course appears to be in your best interest, we still would like to work through the decision with you. We are also happy to advise you on appropriate choices for your academic program. If you drop the course by October 8<sup>th</sup>, no record of it will appear on your transcript. After that date, until the end of the day November 12<sup>th</sup>, you may drop the course but with a W grade (withdrawn).

If you are experiencing difficulties, **please come and see me without delay**. Often, students in this course perceive that they are doing poorer work than they actually are. We recognize that it may be difficult for you to judge your academic standing in the course, since we do not use the same type of grading scheme with which you may be familiar from high school. That is why it is important for you to speak to us before making any major decision, such as dropping the course.

The Chemistry department has a Digital Suggestions Box. If you have suggestions, feedback, or concerns that are best addressed directly to the department, please go online and leave your anonymous feedback at: <http://bit.ly/BUchemSuggest>

## Other Significant Dates

Tuesday, **September 3<sup>rd</sup>**: Classes start

Monday, **September 9<sup>th</sup>**: Official registration deadline for standard courses for continuing, new, and transfer students

Monday, **September 16<sup>th</sup>**: Last day to add standard courses; Last day for undergraduate students to change standard courses from Credit to Audit status

Monday, **October 14<sup>th</sup>**: Indigenous People's Day, classes suspended

Tuesday, **October 15<sup>th</sup>**: Substitute Monday Schedule of classes

Tuesday, **October 10<sup>th</sup>**: Last day to drop class without a "W" grade

Monday, **November 12<sup>th</sup>**: Last day to drop standard class without a "W" grade; Last day for undergraduate students to designate a course Pass/Fail

## Wednesday, November 27<sup>th</sup> – December 1<sup>st</sup>: Thanksgiving Recess

Monday, **December 2<sup>nd</sup>**: Classes resume

Tuesday, **December 3<sup>rd</sup>**: Last day to officially take a leave of absence or withdraw from the University

Tuesday, **December 10<sup>th</sup>**: Last day of classes

Wednesday, **December 11<sup>th</sup>** – Thursday **December 13<sup>th</sup>**: Study Period

Friday, **December 16<sup>th</sup>**: Final Exams Begin

Thursday, **December 20<sup>th</sup>**: Final Exams end

## Withdrawals and Incompletes

If you feel that it is in your best interest to drop CH131, you will have no record of the course on your transcript if you drop before on or before Tuesday, October 10<sup>th</sup> (W-day). After October 10<sup>th</sup>, you may still drop the course by Monday, November 12<sup>th</sup>, but you will receive a grade of "W" ("withdrawn") on your transcript. In contrast, a grade of "Incomplete" (I) is given in the case when a student that is otherwise in good academic standing has not completed specific

work. Note: this grade cannot be used as a tactic to avoid receiving a poor grade. A grade of “Incomplete” is only given approved exceptional circumstances as defined in the College of Arts and Sciences (CAS) Undergraduate Programs Bulletin. Note that grades of “I” automatically convert to “F” after one calendar year if the basis of the Incomplete is not adequately addressed. If you believe that you may receive a “W” or “I” grade, please see Prof. Caradonna to discuss your status as soon as possible.

## Getting Help

There are many resources for you to use in CH131, not the least of which are office hours. These are sessions that are set aside for your benefit, and you are encouraged to make use of them.

One of the best ways to learn Chemistry is to solve problems (5-7) daily (OK, almost on a daily basis). Simply reading, highlighting, and taking notes on the text is insufficient. You have noticed that the answers to the odd numbered problems are given in the back of the text, allowing you to check your answers. As we cover material in class, solve a set of related problems at the end of the chapter. Try not to only do problems that look simple or that you can solve by inspection – find problems that you cannot immediately solve. This way, you are identifying gaps in your understanding of the material and can get help during office hours on a regular weekly basis, thereby staying up with the material covered in class. When you go to the office hours, have access to your work (get a simple notebook for your problem-solving efforts) so the staff can more easily identify which step(s) gave you difficulty in the problem-solving process. By the time an exam comes around, not only will have solved over a hundred problems, but you will have identified and filled in any gaps in your initial understanding of the material. Do not try to cram a large number of problems in a few days before the exam, experience shows (don’t forget, I am an experimentalist) that you will most likely not gain the necessary in-depth understanding of the material required for the class. There will be a premium on understanding the concepts in order to solve the problems, not simply manipulating algebraic expressions.

**Tutoring:** The first step in getting extra help is to come to office hours. In addition, **Chemia**, the Undergraduate ACS affiliate of chemistry majors at BU, operates a free tutoring service twice a week. See their website for details: [https://m.facebook.com/buchemia?\\_rd=1](https://m.facebook.com/buchemia?_rd=1) or their Instagram account: <https://www.instagram.com/buchemia/>. Tutoring is also available through the Education Resource Center in the George Sherman Union, 4<sup>th</sup> floor (<http://www.bu.edu/erc/>). We recommend Chemia.

## Appendix Summary: Tips for success in Studying Chemistry

1. **Read the relevant portions of the book chapter before coming to class**, so that in class you can focus on listening and understanding.
2. **Attend every lecture and discussion section.** Participate in lecture and discussion.
3. **If there’s something you don’t understand seek help immediately** (preferably before next lecture, and certainly within 1 week). This is critical because in chemistry each lecture builds upon the ideas and examples covered in previous lectures, so if you don’t address a problem right away it will likely prevent you from understanding subsequent material. Extra help can be obtained in several ways: (1) Ask for clarification in class (I will pause frequently to ask if there are any questions). (2) Talk to me at the end of the class (I will stay available for this purpose). (3) Re-read the relevant section of the textbook. (4) Ask your classmates in a study

group. (5) Ask your TA to go over the material in Discussion Section. (6) Ask your TA or me during one of our office hours.

4. **Work the problems in the textbook.** Chemistry is like math; reading is not enough, you must solidify your knowledge and understanding by working lots of problems. First give the problems your best effort without looking at the Study Guide, and only then turn to the Guide to check your answers and help you understand how to do those you get wrong.
5. **TRY TO NOT FALL BEHIND.** Set aside time every day to work on Chemistry and stick to this schedule. If you find yourself falling behind, fix it immediately. Because each lecture builds upon previous material, catching up by even a few days is extremely difficult. You cannot cram for a chemistry exam.
6. **Work the problems in the textbook (return to point 1).**

### Additional Tips

- Use molecular models to help you think about molecules and reactions in three dimensions.
- Don't just memorize – focus on understanding. Only then will you be able to apply your knowledge to new molecules and new situations.
- Understand the major concepts before worrying about the minor exceptions.
- To prepare for examinations, review lots of study problems from textbooks. Studying from past exams is not effective.
- The best way to tell how you are doing in this class is to work the study problems from the textbook. If, after having studied and addressed any problem areas, you can do these problems correctly and easily without referring to the study guide, you will do well on the exams.
- **Remember, you are not alone.** If you're struggling, ask for help from Dr. Licini and/or from me. If you work efficiently, there's no reason you should not do well in this course. I and the other faculty want you to do well. If you are doing your part by putting in the necessary effort, we are always available to help you through any difficulties.

### **For those interested: BU Hub capacities and Tools / Learning Objectives**

**Scientific Inquiry I (SI I, one unit):** Students will identify and apply major concepts used in the natural sciences to explain and quantify the workings of the physical world. These concepts include the following: matter is composed of atoms; elements form families; bonds form between atoms by sharing electron pairs; shape is of the utmost importance; molecules interact with one another; energy is conserved; energy and matter tend to disperse; there are barriers to reaction; and light and matter can exchange energy. Students will learn about the process by which scientific theories are developed, refined, refuted, and confirmed.

**Quantitative Reasoning I:** Students will demonstrate their understanding of core conceptual and theoretical tools used in quantitative reasoning, particularly mathematics, as a tool for the exposition and manipulation of chemical concepts and for formulating a connection between microscopic models of matter and its macroscopic properties. Students will interpret quantitative models of how energy and light interact with atoms or molecules and understand a variety of methods of communicating these, such as graphs, including spectra, tables, formulae, and chemical symbols. Students will communicate quantitative information about chemical and

physical objects and their properties using chemical symbols, visually with sketches, numerically with estimated or computed values, and verbally using appropriate chemical nomenclature. Students will recognize and articulate the capacity and limitations of quantitative methods such as dimensional analysis and the risks of using it improperly.

### CH131 Approximate Schedule of Lectures and Topics

The following course outline may very well evolve during the semester. The textbook is *Principles of Modern Chemistry*, D. W. Oxtoby, H. P. Gillis and L. J. Butler, 8th Edition, ISBN; 978-0-357-67100-9; Study Guide and Student Solution Manual to accompany “*Principles of Modern Chemistry*”, ISBN-13: 978-1-305-09227-3, Cengage Publishing.

Sept.	3	Course Introduction
		<b>Chapter 19:</b> Nuclear Chemistry (19.1-19.2/19.6)
	5	<b>Chapter 19:</b> Nuclear Chemistry (19.1-19.2/19.6)
	10	<b>Chapter 1:</b> The Atom in Modern Chemistry (1.1-1.6)
	12	<b>Chapter 1:</b> The Atom in Modern Chemistry (1.1-1.6)
	17	<b>Chapter 2:</b> Chemical Formulas, Equations, and Reaction Yields (2.1-2.5)
	19	<b>Chapter 3:</b> Atomic Shells and Classical Models of Chemical bonding (3.1, 3.3-3.6, 3.8-3.12)
	24	<b>Chapter 3:</b> Atomic Shells and Classical Models of Chemical bonding (3.1, 3.3-3.6, 3.8-3.12)
	26	<b>Chapter 3:</b> Atomic Shells and Classical Models of Chemical bonding (3.1, 3.3-3.6, 3.8-3.12)
Oct.	1	<b>Chapter 4:</b> Introduction to Quantum Mechanics (4.1-4.5)
	3	<b>Chapter 4:</b> Introduction to Quantum Mechanics (4.1-4.5)
	8	<b>Chapter 4:</b> Introduction to Quantum Mechanics (4.1-4.5)
	10	<b>Exam 1</b>
	15	Monday Schedule – no class
	17	<b>Chapter 5:</b> Quantum Mechanics and Atomic Structure (5.1-5.3, 5.5)
	22	<b>Chapter 5:</b> Quantum Mechanics and Atomic Structure (5.1-5.3, 5.5)
	24	<b>Chapter 6:</b> Quantum Mechanics and Molecular Structure (6.1-6.7)
	29	<b>Chapter 6:</b> Quantum Mechanics and Molecular Structure (6.1-6.7)
	31	<b>Chapter 6:</b> Quantum Mechanics and Molecular Structure (6.1-6.7)

Nov.	5	<b>Chapter 9:</b> The Gaseous State (9.1-9.7)
	7	<b>Exam 2</b>
	12	<b>Chapter 9:</b> The Gaseous State (9.1-9.7)
	14	<b>Chapter 10:</b> Solids, Liquids, and Phase Transitions (10.1-10.6)
	19	<b>Chapter 10:</b> Solids, Liquids, and Phase Transitions (10.1-10.6)
	21	<b>Chapter 14:</b> Chemical Equilibrium (14.1-14.2, 14.4-14.6)
	26	<b>Chapter 14:</b> Chemical Equilibrium (14.1-14.2, 14.4-14.6)
	27-1	<b>Thanksgiving break</b>
Dec.	3	<b>Chapter 18:</b> Chemical Kinetics (18.1-18.8)
	5	<b>Exam 3</b>
	10	<b>Chapter 18:</b> Chemical Kinetics (18.1-18.8)
	17	<b>Final Exam:</b> Tuesday, December 17 <sup>th</sup> 9:00-11:00 am