Due to the unpredictable nature of this semester resulting from the COVID-19 pandemic, the syllabus is subject to change by the instructor.

**Textbook**

*CHEM341 Lecture Notes*, is available as a pdf on OAKS. Additionally, there are several options for additional textbooks. Dr. Boucher recommends (1) *Physical Chemistry: Thermodynamics, Structure, and Change*, 10th Ed., (Atkins and DePaula), or (2) *Thermodynamics, Statistical Thermodynamics, & Kinetics*, 2nd Ed. (Engel and Reid).

**Course Description**

Basic principles of chemistry treated primarily from a theoretical viewpoint. The major topics covered are elementary classical and statistical thermodynamics, properties of gases, liquids, and solids, theories of solution, homogeneous and heterogeneous equilibria, electrochemistry, surface chemistry, transport processes, and chemical kinetics. Lectures three hours per week. Prerequisites: CHEM 221 and MATH 220; MATH 221 is strongly recommended. Co-requisite: CHEM 341L

**Office Hours**

Dr. Boucher will be available for office hours MWF (10-11 am) and T and TR (11-12). During online instruction these office hours will be held via Zoom. If you would like a one-on-one Zoom help session, please e-mail Dr. Boucher to reserve a block of time during the office hours. If you have a problem attending one of the regular office hour period Additional appointments can be made outside regular

**Course Webpages**

All important information regarding this course, e.g., exam dates, assignment due dates, etc., will be available on the OAKS webpage. This information includes all announcements and postings, lecture schedule and suggested reading assignments, lecture notes, exam answer keys, handouts. We will also make extensive use of the discussion board and dropbox features on OAKS to, respectively, openly discuss course content and submit written assignments, e.g., exams, quizzes, and problem sets.

**ALEKS**

Throughout this semester we will use ALEKS as an online tool to review our general chemistry. These review and preparatory assignments will be worth 5% of your final grade. You can access the section
assignments by logging in to www.aleks.com and then using your credentials you can add a new course “Chem 341” using the code below:

LRNEG-KACCM  

**Messages**

**Technical issues:** If you experience technical issues (unable to access material, quiz not opening, etc.) notify Dr. Boucher by using the “Technical Issues” discussion board within the course OAKS page. If you have insight into resolving a technical issue that another student posted in this board, you are encouraged to respond to the post on the discussion board and help out your classmate!

**Course content:** If you have questions about course content or a particular assignment (further clarification on assignment directions) you should post your question in the OAKS discussion board related to that content module, which are listed on the last age of this syllabus.

**Other:** All other comments or concerns regarding the course or personal needs should be directed to Dr. Boucher through email (boucherds@cofc.edu) or by making an appointment to virtually meet using Zoom. Dr. Boucher will respond within 24 hours to e-mails and discussion board posts sent Monday-Friday, and within 48 hours to discussion board posts and e-mails sent on Saturday or Sunday.

**Assignment Submission Policy**

All assignments, e.g., problem sets, quizzes, exams, etc., should be submitted as a pdf using the Dropbox on the course OAKS page. All assignments are to be completed and turned in on time. Late assignments will result in a reduced grade of 10% for each day late. Notify Dr. Boucher immediately via e-mail if you are having technical difficulties.

Please note, computer failure or unavailability does not constitute an excuse for not completing assignments by the due date. It is your responsibility to ensure you have internet access required to successfully complete this course. This may require you to be creative in cases where your original plan for network access falls through (i.e. go to a library, coffee shop, etc. if your internet goes out at home).

Due dates are subject to change and students will be notified via the OAKS announcement board.

Students are encouraged to subscribe in OAKS to receive notifications about updates. To subscribe, select the down arrow next to the “news” header on the course home page. Then select the types and methods of notifications you wish to receive. This notification system will greatly improve your ability to stay informed of course-related happenings.

**Logistics and Continuity of Learning**

Due to social distancing requirements, this class will include a variety of online and technology enhanced components to reinforce continuity of learning for all enrolled students. Before the drop/add deadline, students should decide whether the course plan on the syllabus matches their own circumstances.

A majority of the lectures will be presented in Powerpoint format. The lecture notes and Powerpoint presentation will be posted on OAKS. This practice is intended to free your hands and minds to concentrate on the material during the lectures. This practice is also intended to encourage questions as you will not have to worry about writing down everything written on the board. Course handouts, lecture notes, homework sets, and homework solutions will be available on the OAKS course website.
All class sessions will be recorded via both voice and video recording. By attending and remaining in this class, the student consents to being recorded. Recorded class sessions are for instructional use only and may not be shared with anyone who is not enrolled in the class.

Because of the reliance of online course content there are a few critical elements required to effectively participate in the course.

**Hardware requirements:**
- Computer with high speed internet access, sound card, microphone and external speakers or headphones.
- Webcam for class participation.

**Software requirements:**
- Consistent and reliable access to high speed internet.
- Adobe Acrobat Reader to view assigned readings.

**Student Resources:**
- The College of Charleston has put together an online resource guide for students enrolled in a distance education course. I recommend you take a look at the following link to view some helpful strategies and resources for successfully navigating this online course: https://academicaffairs.cofc.edu/distance-education/index.php

**Some Comments**

Physical chemistry has an intimidating reputation. This is partly because it requires you to think about chemistry in new ways. In organic chemistry you were able to use powerful symbolic ways of thinking about how molecules behave to qualitatively understand molecular behavior in synthetic chemistry. In physical chemistry we use the language of mathematics to quantitatively calibrate the intuition you have developed thus far in your career as a chemist. During this semester we will learn to use the powerful tools of thermodynamics, kinetics, and statistical mechanics to understand in a fundamental way why some molecules exist and others do not and why some molecules react with each other and others do not. As when learning any new language or skill, the key to success in physical chemistry is practice. You can study rules of grammar for years on end, but you will not be able to carry on a conversation unless you actually practice talking to people. In physical chemistry you can gain general familiarity with physical concepts like energy, entropy, and chemical potential, but unless you practice working problems you will not be able to use your familiarity with these concepts to your advantage. The goal of this class is neither to develop vague familiarity with trendy concepts like entropy nor to mindlessly plug numbers into formulas until you get a number that agrees with the answer key. Rather, the goal of this course is to gain a solid knowledge of the physical basis of chemical phenomena and to turn that knowledge into a tool for doing chemistry. In short, you need to attend the lectures, read the book, AND do the problems.

**Physical Chemistry and the Curriculum**

This course will help us meet several of the College’s curricular goals. By the time we are finished we should have a better idea of how physical chemistry is different from other areas of chemistry. Physical chemistry operates at the interfaces between chemistry, physics and mathematics, and we will use many ideas from physics and mathematics to explore chemical systems and how chemistry is related to other scientific fields. Physical chemistry’s role in the chemistry curriculum is to provide a strong physical basis for understanding ideas that chemists use every day: energy, enthalpy, equilibrium, and reaction rates. The ideas we look at this semester are the basis for how chemists understand whether or not a reaction
or process will happen (thermodynamics), to what extent it will happen (equilibrium), and how long it will take (kinetics).

**Learning Outcomes**

Physical chemistry provides us with an opportunity to do lots and lots of quantitative reasoning, to use the tools of mathematics and physics to solve problems in chemistry and biochemistry. If someone poses a question about the physical basis of some chemical phenomenon, then, as a chemist, we should be able to apply your knowledge of physical chemistry to suggest the appropriate theory or model to apply, be able to do the calculations necessary to apply the model, and we should be able to clearly and coherently explain what we have done so the person who asked the question has confidence that we know what it is we are doing. It would also be nice if, along the way, this course gives us an appreciation for the underlying beauty of the physical world.

At the end of this syllabus is a detailed list of subjects and knowledge requirements we will encounter throughout the semester. Listed below are some of the general learning outcomes for Chemistry 341:

1. Apply the basic concepts of calculus and physics to concepts in chemistry.
2. Be proficient in reading and interpreting complex graphs and figures presenting experimental data.
3. Be comfortable reading advanced physical chemistry textbooks and find the necessary information in the textbooks needed to solve a particular problem.
5. Develop the ability to use original thought (and logic) in the solutions of problems and the derivations of equations.
6. Apply critical thinking skills to solve new chemistry problems that are different than ones you have already solved.
7. Understand the physical basis of the gas laws used to describe real and ideal gas behavior.
8. Discuss the Three Laws of Thermodynamics and their development.
9. Be able to derive relationships between thermodynamic quantities.
10. Understand thermodynamic state functions and their dependence on the state variables.
11. Interpret phase diagrams and discuss phase equilibria in terms of the chemical potential.
12. Explain the origin of the equilibrium constant and its relation to activity.
13. Understand gas phase collisional and transport properties and their dependence on fundamental molecular and macroscopic properties.
14. Understand how statistical thermodynamics is used to describe the microscopic properties of matter and to determine bulk thermodynamic quantities.

**Attendance Policy and Online Conduct (“Netiquette”)**

Although the instructor will not be keeping a record of attendance, students are expected to attend all classes. If in-person classes are suspended, faculty will announce to their students a detailed plan for a change in modality to ensure the continuity of learning. All students must have access to a computer equipped with a web camera, microphone, and Internet access. Resources are available to provide students with these essential tools.

In order to foster a cordial and secure learning environment, please be respectful of your instructor and your classmates. Do not obstruct or disrupt the teaching and learning processes by carrying on conversations on your cell phone or with other students in the class using the chat feature on Zoom. Please keep your microphone muted unless you would like to engage in the lecture or ask a question.
Additionally, due to the online environment of this course, we should all strive to meet the some of the basic standards of “netiquette”, which is network etiquette, i.e., the do’s and don’ts of online communication.

**Netiquette: What to Do**

- **Be professional**: Use positive, polite language in your comments about a topic and other people’s comments, both in lecture and on the discussion board.
- **Be polite**: Avoid taking the conversation away from the course content.
- **Be a referrer**: When making a comment, be sure to refer to the lecture text (e.g., “On slide #15...”), the professor’s video lecture (e.g., “At the 4:10 mark of video lecture #10...”), or other course materials.
- **Be clear**: Remember that you are not in the room with your classmates. Any information you want to express needs to be self-evident, particularly on the discussion board.
- **Be a reader first, then a responder**: Before you respond, read the other comments on a discussion board first. If someone else made the point you wanted to make, you can agree with them and elaborate further, expand the idea, take in a different direction, or come up with a different approach altogether.

**Netiquette: What Not to Do**

- **Avoid sarcasm**: It’s difficult to detect online. Remember that you are relying on your words to show the tone you intend. If in doubt. Leave it out.
- **Avoid yelling**: ALL CAPS LOOKS LIKE YELLING. As does a lot of punctuation!!!!!!?????? Just as you wouldn’t shout during a classroom discussion, avoid shouting in an online discussion.
- **Avoid unprofessional language**: This includes avoiding texting shorthand, e.g UR, NP, AF. Also, check your spelling and grammar, and be patient with other’s spelling and grammar.
- **Avoid posting when angry**: If a post or feedback upsets you, take a breath before responding. Re-read your responses carefully before finally posting them. If you aren’t sure, wait a few minutes and then re-read. Once you’ve posted a comment or sent an e-mail their impact cannot be undone (even if the post itself is deleted).
- **Avoid overly long posts**: As the number of posts on a discussion board increases as the week goes on, it’s easier for everyone to participate if posts are clear and to the point so that everyone’s posts can be read in a timely manner.

To avoid the dreaded “timed out” issue that makes posts go “poof”, consider creating your responses using word processing or text editing software first, and then copying and pasting your comment into the discussion.

**Exams**

Four In-class examinations will be administered. The exams are tentatively scheduled for SEP 18, OCT 16, NOV 6, and DEC 4. The exam with the lowest grade will be dropped prior to calculating your final grade. Abences from any exam should be arranged in advance when possible Students should contact the instructor as soon as possible regarding scheduling conflicts, e.g., courses or other exams are scheduled for the same times as the lecture exams. If you miss an exam due to illness or an emergency you will take
that exam as you drop. If you miss more than one exam due to illness, you and your instructor will meet to
discuss if there is a reasonable accommodation for making up the exam(s).

**Exam Regrades:** Students may return exams they believe to have significant grading errors for
reconsideration within *one week* of receipt of the graded exam. Students must submit clear and succinct
explanations of the grading error(s) in question along with the exam to be regarded. The explanation
should establish that the answer key is incorrect or incomplete, that the answer given by the student is
an equivalent or equally valid solution to that given on the key, or that the student gave the same answer
as the key but it was not recognized as such. No markings or other alterations should be made on the
exam itself.

**Final Exam:** A mandatory, comprehensive final exam will be administered *8–10 am on Friday, December
11th.*

**Grading and Assessment**

Your final grade will be based on the following distribution,

- 20% 1st Hour Exam
- 20% 2nd Hour Exam
- 20% 3rd Hour Exam
- 15% Problem Sets
- 5% ALEKS
- 20% Final Exam

Graded exams, quizzes, and problem sets will be returned using the “Feedback” feature in the OAKS
dropbox.

Letter grades will be assigned based on straight grading scale shown in the table below.

<table>
<thead>
<tr>
<th>Score/%</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;75</td>
<td>A</td>
</tr>
<tr>
<td>71-74</td>
<td>A-</td>
</tr>
<tr>
<td>61-70</td>
<td>B+</td>
</tr>
<tr>
<td>63-66</td>
<td>B</td>
</tr>
<tr>
<td>59-62</td>
<td>B-</td>
</tr>
<tr>
<td>55-58</td>
<td>C+</td>
</tr>
<tr>
<td>51-54</td>
<td>C</td>
</tr>
<tr>
<td>47-50</td>
<td>C-</td>
</tr>
<tr>
<td>43-46</td>
<td>D+</td>
</tr>
<tr>
<td>39-42</td>
<td>D</td>
</tr>
<tr>
<td>35-38</td>
<td>D-</td>
</tr>
<tr>
<td>&lt; 35</td>
<td>F</td>
</tr>
</tbody>
</table>

The instructor reserves the right to increase a student’s grade if the instructor feels that it is warranted.
Periodically you will be made aware of your class standing so that you can assess your progress and
to help you avoid any surprises at the end of the semester.
Important Dates

<table>
<thead>
<tr>
<th>DATE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, August 25</td>
<td>Last Day to Drop/Add Courses</td>
</tr>
<tr>
<td>Friday, September 18</td>
<td>EXAM #1</td>
</tr>
<tr>
<td>Friday, October 16</td>
<td>EXAM #2</td>
</tr>
<tr>
<td>Tuesday, October 20</td>
<td>Grades Available via CougarTrail</td>
</tr>
<tr>
<td>Wednesday, October 28</td>
<td>Last Day to Withdraw with a Grade of “W”</td>
</tr>
<tr>
<td>Tuesday, November 3</td>
<td>Election Day— No class</td>
</tr>
<tr>
<td>Friday, November 6</td>
<td>EXAM #3</td>
</tr>
<tr>
<td>Wednesday, November 25</td>
<td>Thanksgiving Holiday Begins</td>
</tr>
<tr>
<td>Monday, November 30</td>
<td>Resume classes: ONLINE INSTRUCTION</td>
</tr>
<tr>
<td>Friday, December 4</td>
<td>EXAM #4</td>
</tr>
<tr>
<td>Friday, December 11</td>
<td>FINAL EXAM: 8-10 AM via OAKS</td>
</tr>
<tr>
<td>Saturday, December 17</td>
<td>Final Grades Available Online</td>
</tr>
</tbody>
</table>

Disabilities/Access

The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services/SNAP located on the first floor of the Lightsey Center, Suite 104. Any student eligible for and needing accommodations because of a disability is requested to speak with the professor during the first two weeks of class or as soon as the student has been approved for services so that reasonable accommodations can be arranged.

Student Code of Conduct

The Honor Code of the College of Charleston forbids lying, cheating, stealing, plagiarism, and failing to report an Honor Code violation. The Student Code of Conduct can be found in the Student Handbook.

Science is inherently collaborative. If you go on to work in industrial or academic laboratories you will work with other scientists as a collaborator, as a mentor, and as a student throughout your career. Learning to work effectively with other people is therefore an important part of your undergraduate training. You may choose to work together on homework problems with your classmates, but you should not merely copy out their answers to homework questions. Working together means working together. There are two reasons for this. The first is that you will not really understand how to do the problem simply by copying it out, and understanding the problems should be your chief goal. Secondly, your peers will get tired of your mooching. If you do work with people on your assignments, please include the name(s) of your partner(s) on your work.

When we have exams, you should not talk to anyone except your instructor during the exam.

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved. Incidents where the instructor determines the student’s actions are related more to a misunderstanding will handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student’s file.
Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration—working together without permission—is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others’ exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.

Students can find the complete Honor Code and all related processes in the Student Handbook at http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php

Statement on Religious Accommodation for Students

(Faculty/Administration Manual VIII.A.10)

The College of Charleston community is enriched by students of many faiths that have various religious observances, practices, and beliefs. We value student rights and freedoms, including the right of each student to adhere to individual systems of religion. The College prohibits discrimination against any student because of such student’s religious belief or any absence thereof.

The College acknowledges that religious practices differ from tradition to tradition and that the demands of religious observances in some traditions may cause conflicts with student schedules. In affirming this diversity, like many other colleges and universities, the College supports the concept of “reasonable accommodation for religious observance” in regard to class attendance, and the scheduling of examinations and other academic work requirements, unless the accommodation would create an undue hardship on the College. Faculty are required, as part of their responsibility to students and the College, to ascribe to this policy and to ensure its fair and full implementation.

The accommodation request imposes responsibilities and obligations on both the individual requesting the accommodation and the College. Faculty members are expected to reasonably accommodate individual religious practices. Examples of reasonable accommodations for student absences might include: rescheduling of an exam or giving a make-up exam for the student in question; altering the time of a student’s presentation; allowing extra-credit assignments to substitute for missed class work or arranging for an increased flexibility in assignment dates. Regardless of any accommodation that may be granted, students are responsible for satisfying all academic objectives, requirements and prerequisites as defined by the instructor and by the College.

<table>
<thead>
<tr>
<th>Date</th>
<th>Holiday</th>
<th>Religion</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 18 2020</td>
<td>Rosh Hashanah²</td>
<td>Jewish</td>
</tr>
<tr>
<td>September 28, 2020</td>
<td>Yom Kippur²</td>
<td>Jewish</td>
</tr>
<tr>
<td>October 2 – October 9, 2020</td>
<td>Sukkot²</td>
<td>Jewish</td>
</tr>
<tr>
<td>October 9, 2020</td>
<td>Shemini Atzeret²</td>
<td>Jewish</td>
</tr>
</tbody>
</table>

2020 – 2021 Religious Holidays¹
<table>
<thead>
<tr>
<th>Date(s)</th>
<th>Event</th>
<th>Religions</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 19 - October 26, 2020</td>
<td>Navaratri</td>
<td>Hindu</td>
</tr>
<tr>
<td>October 19, 2020</td>
<td>Birth of Baha’u’llah</td>
<td>Baha’i</td>
</tr>
<tr>
<td>January 7, 2021</td>
<td>Christmas(^3)</td>
<td>Orthodox Christian</td>
</tr>
<tr>
<td>February 17, 2021</td>
<td>Ash Wednesday (Beginning of Lent)</td>
<td>Christian</td>
</tr>
<tr>
<td>February 25-26, 2021</td>
<td>Purim(^2)</td>
<td>Jewish</td>
</tr>
<tr>
<td>March 15, 2021</td>
<td>Great Lent Begins</td>
<td>Christian</td>
</tr>
<tr>
<td>March 20, 2021</td>
<td>Naw-Ruz</td>
<td>Baha’i</td>
</tr>
<tr>
<td>April 2, 2021</td>
<td>Good Friday</td>
<td>Christian</td>
</tr>
<tr>
<td>March 26 - April 3, 2021</td>
<td>Passover(^2)</td>
<td>Jewish</td>
</tr>
<tr>
<td>April 12-May 11, 2021</td>
<td>Ramadan</td>
<td>Muslim</td>
</tr>
<tr>
<td>April 30, 2021</td>
<td>Good Friday (Orthodox)(^3)</td>
<td>Orthodox Christian</td>
</tr>
<tr>
<td>April 20 and 28, 2021</td>
<td>Ridvan</td>
<td>Baha’i</td>
</tr>
</tbody>
</table>

\(^1\) The previously included Islamic holidays of Eid al-Adha and Eid al-Fitr fall outside the regular academic year and are therefore not listed here.

\(^2\) All Jewish holidays begin at sunset on the evening before the date given.

\(^3\) Orthodox Christian holidays begin at sunset on the evening before the date given.