An introductory course in chemistry emphasizing theoretical aspects and designed primarily for students who intend to take one or more additional courses in chemistry. The major topics covered are elementary classical thermodynamics (entropy and free energy), homogeneous and heterogeneous equilibria, properties of gases, liquids, and solids, theories of solutions and solubility, electrochemistry, acid-base theory and applications, and chemical kinetics.

Prerequisites: CHEM 111/111L; MATH 111 or equivalent

Co-requisite: CHEM 112L

TEXTBOOK
Chemistry: Atoms First, 2nd Edition, by Burdge and Overby

COURSE OUTLINE

1. Ch 14 Entropy and Free Energy
2. Ch 15 Chemical Equilibrium
3. Ch 13 Physical Properties of Solutions; Colligative Properties
4. Ch 16 Acids, Bases and Salts
5. Ch 17 Acid-Base and Solubility Equilibria, Buffers
6. Ch 18 Electrochemistry
7. Ch 19 Chemical Kinetics and Catalysis

GENERAL INFORMATION

Meeting Times:
   Lecture: MWF, 9:00–9:50, SSMB 138

Instructor:
   Assoc. Prof. David Boucher
   Office: SSMB 322
   Phone: 953-6493
   E-mail: boucherds@cofc.edu

Office Hours:
Prof. Boucher will hold office hours in SSMB 322 Monday (11-12), Tuesday (11-1), Wednesday (11-1), Thursday (1-2) and Friday (11-12), and by appointment.

Messages:
Students may address questions and requests for appointments by contacting Prof. Boucher via email (boucherds@cofc.edu).
Course Webpages:

**OAKS**: All important information regarding this course 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.

**McGraw-Hill ALEKS**: This semester we will use ALEKS as an online general chemistry homework system and study module. A mandatory ALEKS preparatory assignment for CHEM 112 is due by 11 pm on January 17th. This preparatory assignment will be worth 5% of your final grade. Additional ALEKS assignments will be given throughout the semester. These assignments will be worth 10% 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 “Chemistry 112 S20 - 3 & 4” using the code below:

6UUWW-MKNC6

The ALEKS prep assignment is designed to help identify where you as an individual student might need help. To most effectively use this preparatory assignment, it is suggested that you spend 30-60 min a day several days a week working on the required parts. There will be sections that require multiple attempts to ensure a satisfactory level of mastery of the content. It is also suggested that you continuously review the material before the semester; going through the material only one time will not achieve maximum results for you. Note that completion of ALEKS Prep does not guarantee any particular level of success during the course.

All students must ultimately take ownership of their learning in Chemistry 112.

There are two parts to ALEKS Prep, all of which must be completed to receive full credit: 1. *Initial Knowledge Check* – this is a measure of what you know initially and what you need to learn. 2. *Learning Mode* – “completing the pie” – this is where you will focus on the things you need to learn as identified in the *Initial Knowledge Check*.

When you reach the Review mode, you are done with the ALEKS Prep assignment. You are encouraged to review the content you just learned but it is not required.

**Attendance Policy and Classroom Conduct:**

Although the instructor will not be keeping a record of attendance, students are expected to attend all classes. Students are responsible for all information presented in class whether they are present or not. Students should obtain notes from a classmate and read the associated material in the text BEFORE they request help from the instructor about material missed.

Please note that an Absence Memorandum from the Office of Undergraduate Studies only verifies your documentation for missing a class. It does not entitle you to make up or be excused from any work, assignment or test.

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, sending text messages, or surfing the web on your laptop. Please
set cell phones on mute or vibrate before coming to lecture. Do not verbally abuse, threaten, intimidate, or ridicule your instructor or classmates. If you fail to comply with these simple requests you will be asked to leave the class and if the problems persist you will be referred to the Dean of Students for disciplinary action.

**Quizzes:**

Four quizzes worth 20 pts each will be given. The dates of the quizzes will be determined by the pace of the lecture.

**Exams:**

Four exams worth 100 pts each will be given. Tentatively, the exams will be given on Friday January 31st, February 28th, April 3rd, and Monday April 20th. **The exam with the lowest grade will be dropped prior to calculating your final grade.**

Absences from any exam must be arranged in advance. No make-up exams will be given. Students should contact Prof. Boucher as soon as possible regarding scheduling conflicts.

**Final Exam:**

A 110 minute comprehensive and standardized ACS final exam worth 100 pts is scheduled for 8 am on Friday, April 24th in SSMB 138. The multiple-choice final exam is cumulative over the material covered during the entire semester.

Requests for an alternate final exam time must be processed through the Office of Undergraduate Studies no later than 5 p.m. on the last day of class. Failure to take the final exam will result in a grade of "X" which turns to an "F" after 48 hours. Undergraduate students should be aware that excuses for missing final examinations may be obtained from the Office of Undergraduate Studies.

The acceptable reasons for missing final examinations are illness of the student (the student must provide documentation, e.g., an absence memo) or circumstances beyond the student's control. These reasons must be properly documented. See the section entitled "Final Examinations" in the Undergraduate Catalog for more information. Examinations must be taken at the time scheduled except when [a] two or more exams are scheduled simultaneously, or [b] the student has three examinations within a 24-hour period.

**Electronics Device Policy:**

No electronic devices except for calculators are allowed during exams. The use of any wireless communication devices, iPhones, iWatches, etc., during a test or the final exam is prohibited and will be considered to be a violation of the Honor Code.

**“Make-up” Policy and Regrades:**

As mentioned above, there are no make-up-tests for missed exams under any circumstances. If you have an emergency that is documented with a note from the Dean of Undergraduate Studies or a note from a medical doctor, you may be excused from an exam. Contact me as soon as possible.

Students may return exams they believe to have significant grading errors for reconsideration within one week of receipt of the graded exam. A significant error will
constitute a > 3 pt mistake on grading of an individual question. 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.** To ensure fair and equal treatment to all students, all changes in exam scores will be made only through this formal re-grade process. The professor will not discuss exam-score changes nor make exam-score changes in face-to-face meetings with students.

**IMPORTANT DATES**

<table>
<thead>
<tr>
<th>DATE</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Wednesday, January 15</td>
<td>Last Day to Drop/Add Courses</td>
</tr>
<tr>
<td>Monday, January 20</td>
<td>No Classes (MLK day)</td>
</tr>
<tr>
<td>Friday, January 31</td>
<td>Exam #1</td>
</tr>
<tr>
<td>Friday, February 28</td>
<td>Exam #2</td>
</tr>
<tr>
<td>Saturday, March 7</td>
<td>Midterm Grades available</td>
</tr>
<tr>
<td>Friday, March 13</td>
<td>Last Day to Withdraw with a Grade of “W”</td>
</tr>
<tr>
<td>March 16-20</td>
<td>Spring Break</td>
</tr>
<tr>
<td>Friday, April 3</td>
<td>Exam #3</td>
</tr>
<tr>
<td>Monday, April 20</td>
<td>Exam #4</td>
</tr>
<tr>
<td>Wednesday, April 22</td>
<td>Last Day of Lecture</td>
</tr>
<tr>
<td>Saturday, August 3</td>
<td>Final Exam (12 pm), SSMB 138</td>
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**LEARNING OBJECTIVES**

General chemistry provides you with an opportunity to do lots and lots of quantitative (numerical) and qualitative (conceptual) reasoning. General chemistry courses are often referred to as “baby” physical chemistry because they provide an introduction to the same material that is covered in the upper level physical chemistry courses, i.e., CHEM 341 and CHEM 342. At the end of CHEM 112 you should be able to use the tools of basic mathematics and physics to solve problems in chemistry and biochemistry. If someone poses a question about the physical basis of some chemical phenomenon, you should be able to apply your knowledge to suggest the appropriate theory or model to apply, be able to do the calculations necessary to apply the model and explain what you have done clearly and coherently so the person who asked the question has confidence that you know what it is you are doing. It would also be nice if, along the way, you gain some appreciation for the underlying beauty of the physical world. However, progress on this goal is hard for me to assess, so I’ll leave it up to you to decide how you are coming along.

At the end of this syllabus is a detailed list of subjects and knowledge requirements that you will encounter throughout the semester. Listed below are the general (and rather broad) learning objectives for CHEM 112:

1. Describe colligative properties and give specific examples.
2. Explain the concept of equilibrium and apply it to chemical reactions including acid/base chemistry, precipitation reactions, and oxidation-reduction reactions.

3. Define entropy and Gibbs energy. Apply these with respect to chemical reactions and evaluate how these affect the spontaneity of a chemical or physical process.
   a. Apply a kinetic analysis to chemical and physical processes (including rates, mechanisms, and activation energy).
   b. Apply the principles of thermodynamics and equilibrium to electrochemistry.

GENERAL EDUCATION LEARNING OUTCOMES

1. Students apply physical/natural principles to analyze and solve problems.
2. Students will develop an understanding of the impact that science has on society.

The General Education Learning Outcomes will be assessed in the Lab Co-requisite course, CHEM 112L

SEMESTER GRADES

Semester grades will be calculated using the following criteria:

<table>
<thead>
<tr>
<th>Grade Percentage</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>15 %</td>
<td>The ALEKS assignments, including ALEKS prep, are worth 15% of the total course grade.</td>
</tr>
<tr>
<td>15 %</td>
<td>Four in-class quizzes will be given during the semester. Dates will be determined based on the content covered.</td>
</tr>
<tr>
<td>50 %</td>
<td>Four in-class exams are scheduled on Friday during the semester. Tentative dates are on the course calendar.</td>
</tr>
<tr>
<td>20 %</td>
<td>A comprehensive ACS final exam worth 100 pts is scheduled for 8 am on Friday April 24th in SSMB 138.</td>
</tr>
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</table>

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>
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<tbody>
<tr>
<td>93-100</td>
<td>A</td>
</tr>
<tr>
<td>90-92</td>
<td>A-</td>
</tr>
<tr>
<td>87-89</td>
<td>B+</td>
</tr>
<tr>
<td>83-86</td>
<td>B</td>
</tr>
<tr>
<td>80-82</td>
<td>B-</td>
</tr>
<tr>
<td>77-79</td>
<td>C+</td>
</tr>
<tr>
<td>73-76</td>
<td>C</td>
</tr>
<tr>
<td>70-72</td>
<td>C-</td>
</tr>
<tr>
<td>67-69</td>
<td>D+</td>
</tr>
<tr>
<td>64-66</td>
<td>D</td>
</tr>
<tr>
<td>61-63</td>
<td>D-</td>
</tr>
<tr>
<td>&lt; 61</td>
<td>F</td>
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</table>
The instructor reserves the right to increase a student’s grade if the instructor feels that it is warranted.

HONOR CODE

Student conduct is expected to conform to the standards of the College of Charleston Student Honor Code Policy. In addition, students in this course are also expected to be aware and to conform to the standards of the Department of Chemistry & Biochemistry Policy on Scientific Integrity.

Students at the College of Charleston are bound by honor and by their enrollment at the College to abide by the Honor and Conduct codes and to report violations. 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.

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.

STUDENT DISABILITY/ACCESS STATEMENT

This College abides by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act and 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, (843) 953-1431. If you have a documented disability that may have some impact on your work in this class and for which you may require accommodations, you are responsible for notifying me as soon as possible and for contacting me one week before accommodation is needed.