Course Goals: To understand the introductory fundamentals of chemistry; these fundamentals include:

- Solutions
  - What are solutions-definitions of various types
    - Intermolecular Forces and how they affect solutions
  - Energy of dissolution
  - Various Methods for defining solution concentrations
  - Factors that affect solubility
  - Colligative properties and calculation using these properties
  - Colloids.

- Chemical Equilibrium (excluding chapter 15.4)
  - Reaction Quotient vs. Equilibrium Constant
  - Homogeneous vs. Heterogeneous Equilibrium
  - Calculating Equilibrium Expressions
  - Le Chatelier’s Principle

- Acids and Bases
  - Bronsted Acids and Bases
  - Molecular Structure and Acid Strength
  - Water as an acid/base
  - pH and pOH
  - Strong Acid and Bases
  - Weak Acid and Bases
    - Calculations of Dissociation (Ionization Constant)
    - Calculations of pH and or pOH
  - Conjugate Acid Base pairs
  - Relationship between acid and base ionization constants
  - Di and polyprotic acid
  - Acid/Base properties of
    - Salts
    - Oxides
    - Hydroxides
  - Lewis Acids and Bases

- Acid-Base Equilibria
  - Common Ion Effect
  - Buffers
  - Acid-Base Titrations
    - Indicators

- Solubility Equilibria
  - Predicting Precipitation
Factors affecting solubility

- Entropy and Free Energy
  - Entropy
    - Definition
    - Predicting the sign of entropy
    - Second Law of Thermodynamics
    - Third Law of Thermodynamics
  - Gibbs Free Energy
    - Definition
    - Predicting Spontaneity
    - Relationship between equilibrium constant and Gibbs Free Energy (chapter 15.4)

- Electrochemistry
  - Redox Reactions
  - Standard Reduction Potentials
  - Spontaneity based on Reduction Potentials
  - Nernst Equation
  - Batteries and electrolysis

- Chemical Kinetics
  - Collision Theory
  - Reaction rates
  - Rate Laws and Rate mechanism
    - Time and Temperature dependence
    - Rate determining step
  - Catalysis

- Nuclear Chemistry
  - Nuclear particles
  - Nuclear stability
  - Radioactive decay
    - Dating
  - Transmutation, Fission and Fusion
  - Chemical use of Isotopes

These topics are covered in Chapters 7, 12, 13-20 in your book. Please note that we do not cover these exactly in order so you should refer to the excel spreadsheet with topics, dates and homework for each of the topics.

After completing this course, you should have a strong foundation for upper level courses in the Chemistry Department. We hope also that as part of this learning community that you will understand better the connections between the study of chemistry and how it relates to other scientific areas.

Overall Course Learning Goals:

- Demonstrate competency with all of the learning goals stated for Chem 111 and Math 111
- Apply common mathematical techniques to describe the kinetic and thermodynamic processes related to chemical equilibria
- Understand and be able to predict the consequences of weak and strong acids and base and their salts.
- Understand the concept of entropy and Free Energy and be able to apply them
- Understand the key concepts of electrochemistry and be able to apply them.
- Understand the key concepts of kinetics and nuclear chemistry

**General Education Learning Outcomes:**

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

**Pre-requisite:** A passing grade in Chemistry 111 (students with a D in Chemistry 111 are recommended to retake that course)

**Co-requisite:** Chemistry 112 Lab, which is a separate one-hour course.

**Texts:**
1) Required: Burdge and Overby, *Chemistry: Atoms First* (McGraw-Hill) 2nd edition. For online registration of the Connect Database use the following:
2) Learn Smart Prep, this module which must be purchased separately from the textbook (see instructions on the web and in the e-mail) counts for 5% of your final grade and must be completed by **September 5 (11 PM)** and is a requirement for the course.

**Calculator:** You will need a calculator for exams. You will need to bring this calculator to class.

**Course Expectations:**

A. Attendance and Class Participation
   Class attendance is mandatory with 4 allowed absences during the semester. With small exception, performance in the course is directly proportional to
attendance. Students are responsible for all information presented in class whether they are present or not. Students should obtain notes from a classmate, read the associated material in the text, and then come ask me questions. Overall class participation and attendance comprise **5% of your grade**.

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.

B. Responsibilities

You are accountable for all material covered or assigned in class. You are expected to spend a minimum of 3 hours of study for every hour spent in lecture. The instructor is here to explain the material and help you to the best of his time and ability. However, the burden of learning is upon you, the student.

C. Disabilities

If there is a student in this class who has a documented disability and has been approved to receive accommodations through SNAP Services, please feel free to come and discuss this with me.

D. Academic Integrity

One of the core values of the College is academic integrity. This course is conducted under the Honor Code (http://www.cofc.edu/StudentAffairs/general_info/honor_system/index.html) of the College of Charleston. Students at the College are bound by honor and by their acceptance of admission to the College to abide by the Code and to report violations. Faculty members are required to report violations of the Honor Code or Code of Conduct to the Office of Student Affairs. Conviction of an Honor Code violation in this class will result in the grade of "F" for the course. Please consult the department's Policy on Scientific Integrity (http://www.cofc.edu/~chem/advising/integrity.html).

E. Email

Email is considered an official method for communication at the College of Charleston. College of Charleston email accounts are automatically assigned
to all students upon acceptance at the College. If a student wishes to have email redirected from their official College issued account to another email address (e.g. @aol.com, @hotmail.com, @yahoo.com, or any other server other than the official @g.cofc.edu), they may do so, but at their own risk. Having email redirected does not absolve the student from the responsibilities associated with official communication sent to his or her College account. The College is not responsible for the handling of email by outside vendors or unofficial servers. A link to instructions on how to forward Edisto email can be found by clicking on Web Mail from the CofC home page. Students are expected to check their College of Charleston official email on a frequent and consistent basis in order to remain informed of College related communications. Checking email on a daily basis is recommended. Students have the responsibility to recognize that certain communications may be time-critical. “I didn’t check my email”, error in forwarding email, or email returned to the College with “Mailbox Full” or “User Unknown” are not acceptable excuses for missing official College communications via email.

F. Course Materials: Some course materials will be available to students on OAKS. You will need to take careful lecture notes and additional homework packets will be assigned prior to class and are noted in the excel spreadsheet.

G. Homework: The key to success in this class is doing chemistry problems again and again. If you are not working out problems every single day, you will not do well in this class. This class is very problem solving centric so doing assignments is critical. You will be expected to work through problem sets assigned as well as the end-of-chapter questions.

The assigned homework (found on Oaks) must be handed in on the Tuesday following the assignment. The homework will be graded based on effort shown, clarity of answer and correctness. The homework is worth 10% of your grade. If you do not hand in the homework on time, you will receive a 0% for that assignment. There are 10 homework assignments and I will count the top 8 for your homework grade.
In addition to the required homework, I am attaching a sheet of recommended problems from our textbook that you should do to enhance your learning experience (last page of syllabus).

H. Hourly Exams
The following are tentative dates for the exams. These dates are subject to change. There are 3 hourly exams and a Final.
Tuesday, September 19
Thursday, October 19
Thursday, November 16

Final Exam: On Tuesday, December 12 at 12:00 PM in our regular classroom. Your final is a standardized exam written by the American Chemical Society. It is a TIMED, multiple choice test. You will have 110 minutes to complete the 70 multiple-choice questions.

Makeups: There are NO makeup tests unless you have an exceptional excuse. An unexcused absence on the day of an exam will result in a zero on that exam. If you have an excused absence either documented by the Dean of Undergraduate Studies or explained to me such that I find the excuse plausible, you will be allowed to take a make-up exam at a time and place of my choosing. If you are going to miss an exam, notify me ahead of time by phone message or by email. Even if you have a good excuse, you may not miss more than one exam and you cannot miss or reschedule the final exam. You will be dropped from the roll for excessive absences if you miss more than one exam.

Supplemental Instruction and Tutoring: This learning community will have an SI for the course that is responsible for provide additional instruction of the chemistry content. Our SI is Tiffany Penaloza. The SI will be arranging a variety of times when she will be available to work through problems with you. Your attendance is not required, but data has shown that students who attend regularly do better in the course. Also, tutoring at the Center for Student Learning in chemistry is available to students at no cost. The hours of the walk-in science tutoring room are available online (http://csl.cofc.edu/labs/).
**Deportment:**

To maintain a classroom environment that is conducive to learning, I expect certain behavior from students in my classes. Students that text, chatter, giggle, sleep, whisper, whine, arrive late, leave early, or come unprepared are disrupting their fellow students’ learning experience.

**Learn Smart Prep:**

Learn Smart Prep, this module which must be purchased separately from the textbook (see instructions on the web and in the e-mail) counts for 5% of your final grade and must be completed by **September 5 (11 PM)** and is a requirement for the course.

**Key Date:**
October 26, 2017 is the last date to withdraw from class with a W.

**Grading:**
Your final grade will be calculated by the following formula:

- 3 Exams: (2 @20% and the lowest at 15%) 55%
- Final Exam, ACS Standard Exam, 25%
- Homework 10%
- Learn Smart Prep 5% (done by 9/5) 5%
- Class participation and deportment 5%

**Total** 100%
## Grades

<table>
<thead>
<tr>
<th>Letter</th>
<th>%</th>
<th>GP</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
<td>4.0</td>
</tr>
<tr>
<td>A-</td>
<td>90-92</td>
<td>3.7</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
<td>3.3</td>
</tr>
<tr>
<td>B</td>
<td>83-86</td>
<td>3.0</td>
</tr>
<tr>
<td>B-</td>
<td>80-82</td>
<td>2.7</td>
</tr>
<tr>
<td>C+</td>
<td>77-79</td>
<td>2.3</td>
</tr>
<tr>
<td>C</td>
<td>73-76</td>
<td>2.0</td>
</tr>
<tr>
<td>C-</td>
<td>70-72</td>
<td>1.7</td>
</tr>
<tr>
<td>D+</td>
<td>67-69</td>
<td>1.3</td>
</tr>
<tr>
<td>D</td>
<td>63-66</td>
<td>1.0</td>
</tr>
<tr>
<td>D-</td>
<td>60-62</td>
<td>0.7</td>
</tr>
<tr>
<td>F</td>
<td>Below</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>
Recommended Problems

- **Chapter 7**- 7.21,7.22,7.25,7.26,7.27,7.28,7.30,7.31
- **Chapter 12**- 12.2,12.12,12.14
- **Chapter 17**- 17.1-17.22, 17.27-17.37, 17.49-17.58,17.61, 17.64-17.75
- **Chapter 18**- 18.1,18.2, 18.10-18.17, 18.21-18.26, 18.30-18.36, 18.44-18.60
- **Chapter 20**-20.5,20.6, 20.21-20.31, 20.34-20.37