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

- Intermolecular Forces and how they affect solutions
- Phase Changes
- Solutions
  - Various Methods for defining solution concentrations
  - Factors that affect solubility
  - Colligative properties and calculation using these properties
  - Colloids.
- Chemical Equilibrium (excluding 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
    - Complex Ion Formation
Quantitative Analysis using fractional precipitation

- 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 Objectives:

- Demonstrate competency with all of the learning objectives stated for Chem 111 and Math 111
- Apply common mathematical techniques to describe the kinetic and thermodynamic processes related to chemical equilibria

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.

General Education Learning Outcomes are assessed at the end of this class and the method will be announced. The assessment of these Gen Ed learning outcomes will be worth 5% of your grade.

**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:**
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 1 (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**
   Class attendance is mandatory with 4 allowed absences during the total semester. With extremely 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
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 venders 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 denoted double **assigned problems (See Excel spreadsheet attached) will be collected the class period after the assigned date and graded. There are a total of 16 designated assignments of which the top 12 will be used for final grading purposes.

H. Hourly Exams
The following are tentative dates for the exams. These dates are subject to change. There are 4 hourly exams and a Final.
Thursday, September 17
Thursday, October 15
Tuesday, November 10
Thursday, December 3
Final Exam: To Be Scheduled. 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. An unexcused absence on the day of an *exam* will result in a zero on that exam. If you have an *excused* absence documented by the Dean of Undergraduate Studies that I find plausible, your remaining test scores will all be weighted equally and more heavily towards the final course grade to compensate for the missed exam. 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. 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 *John McFaddin*. The SI will be arranging a variety of times when he/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/).

**Department and Quizzes Grade and Learn Smart Prep:**

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. There will be a total of 4 quizzes during the semester and they will comprise 10% of your grade. Quizzes will occur as noted on the excel spreadsheet and will contain 4-5 questions/problems which will be based on the homework for the chapter. The Learn Smart Prep (same as the procedure in Chemistry 111) counts 5% of your grade for a complete performance.

**Grading:**

Your final grade will be calculated by the following formula:

- **4 Exams:** (3 highest at 15% and lowest at 10%) 55%
- **Final Exam, ACS Standard Exam** 20%
- **4 Quizzes** 10 %
General Ed Assessment  
Homework 5%  
Learn Smart Prep 5% (done by 9/1)  

Total 100%

Grades

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

60