HOUSTON COMMUNITY COLLEGE SOUTHWEST
COURSE OUTLINE FOR CHEM 1412 – GENERAL CHEMISTRY II
Summer II 2015, Second 5 Weeks
Class Number 56735

Discipline/Program	Chemistry
Course Level	First Year (Freshman)
Course Title	General Chemistry II
Course Rubric and Number	CHEM 1412
Semester with Course Reference Number (CRN)	Summer II 2015, Second 5 Weeks CRN 56735
Course Location/Times	Stafford Scarcella Center, 10141 Cash Road Monday - Friday, Room W121 (lecture) 8:00 – 11:50 AM Tuesday & Thursday, Room S109 (lab) 8:00 – 11:50 AM
Course Semester Credit Hours (SCH) (lecture, lab)	4 (3 lecture, 3 lab)
Total Course Contact Hours	96
Course Length (number of weeks)	5
Type of Instruction	In-person
Instructor contact information (phone number and email address)	Dr. Mohammad S. Ali Cell Phone: 713-382-7420 E-mail: mohammad.ali@hccs.edu Learning Web: http://learning.hccs.edu/faculty/mohammad.ali
Office Location and Hours	After Class hours
Course Description: ACGM or WECM	General principles, problems, fundamental laws, and theories. Course content provides a foundation for work in advanced chemistry and related sciences.
Course Description: HCC Catalog Description	Continuation of CHEM 1411. Topics include, properties of solutions, chemical kinetics, equilibrium, acids and bases, acid base equilibria, solubility and complex ion equilibria, spontaneity, entropy and free energy, electrochemistry, the nucleus: and chemists view, organic and biological molecules. Core Curriculum Course.
Course Prerequisite(s)	CHEM 1411; must be placed into college-level reading (or take GUST 0342 as a co-requisite) and be placed into MATH 0312 (or higher) and be placed into college-level writing (or take ENGL 0310/0349 as a co-requisite).
Academic Discipline Program Learning Outcomes	1. Demonstrate a basic mastery of chemistry by writing formulas and equations for chemical reactions, performing chemical calculations, and recognizing the application of chemistry in our daily lives. 2. Demonstrate a mastery of introductory and intermediate level chemistry to promote success in higher level chemistry and other science programs at four-year universities. 3. Demonstrate a mastery of General and Organic Chemistry in preparation for professional programs such as Medicine, Dentistry, and Pharmacy. 4. Conduct laboratory experiments by making measurements, performing chemical reactions, and analyzing the results in a group or individual setting.
Course Student Learning Outcomes (SLO)	1. Distinguish between the different ways of measuring concentrations of solutions, and relate concentration to the colligative properties of solutions. 2. Determine and analyze the rates of chemical reactions. 3. Write equilibrium constant expressions for chemical reactions and calculate the value of the equilibrium constant and the concentration of reactants and products at equilibrium. 4. Demonstrate proficiency in acid-base and solubility product calculations. 5. Express the three laws of thermodynamics and interrelate the enthalpy, free energy and equilibrium constant for the reaction.

	6. Based on the principles of oxidation and reduction, balance oxidation-reduction reactions, calculate cell potentials of voltaic cells based on oxidation-reduction reactions, and make quantitative calculations based on electrolysis. 7. Identify modes of radioactive decay, balance nuclear reactions, calculate energy changes associated with nuclear reactions, and relate quantities of radioactive elements with time based on the kinetics of nuclear processes. 8. Classify, name, and draw the structure of basic organic compounds; student can write chemical reactions of alkanes, alkenes, and alkynes.
Learning Objectives (Numbering system linked to SLO)	1.1 Determine if two compounds will mix to form a solution or not based on their structures. 1.2 Given the mass of a solute and the volume of a solution or the mass of the solvent, calculate the relevant concentration (molarity, molality, percent concentration, mole fraction, or ppm). Convert a given concentration from one concentration unit to another. 1.3 Relate the concentration of solutions to their colligative properties. 1.4 Determine the molecular weight of an unknown solute, given the value of a colligative property. 2.1 Determine the average rate and instantaneous rate of a reaction from concentration time data. 2.2 Determine the order of a reaction with respect to each reactant and write the rate law for the reaction. Determine the value of the rate constant, k. 2.3 Write the integrated rate law of first and second order reactions and use the rate law to relate concentration of the reactant with reaction time, rate constant, and half-life. 2.4 Given different initial reactant concentrations and the respective initial rate of the reaction, determine the value of the exponents in the rate law and the value of the rate constant. 2.5 Relate the effect of temperature and activation energy to reaction rate using the Arrhenius equation. 2.6 Relate the rate law to the mechanism of the reaction and to the molecularity of the elementary reactions comprising the mechanism. 3.1 Write the equilibrium constant expression for homogeneous and heterogeneous reactions. 3.2 Given one or more concentrations at equilibrium, calculate the value of the equilibrium constant for the reaction and/or the equilibrium concentrations of the other substances in the reaction. 3.3 Given one or more initial concentrations, calculate the concentrations of the reactants and products at equilibrium and/or the value of the equilibrium constant, using the "ICE" table method. 3.4 From the value of the reaction quotient, Q, determine whether a reaction is at equilibrium, and if not, which direction the reaction will initially proceed in order to reach equilibrium. 3.5 Apply LeChâtelier's Principle to determine the effects of changes in concentrations, temperature on compositions of equilibrium mixtures. 4.1 State the three different definitions and principles of acids and bases (Arrhenius, Bronsted-Lowry, and Lewis). 4.2 Calculate $[H^+]$, $[OH^-]$, pH, and pOH. 4.3 Use dissociation constants for weak monoprotic acids and bases to determine the pH of their aqueous solutions. 4.4 Differentiate between acidic, basic and neutral salts and determine the pH of aqueous solutions of salts. 4.5 State the common ion effect and its relevance to buffers; determine the pH of buffered solutions using the Henderson-Hasselbalch equation. 4.6 Calculate the pH at various stages of titration curves for (i) strong acids & strong bases, (ii) weak acids & strong bases, (iii) strong acids & weak bases.

	4.7 Write solubility product expressions and interconvert between the solubility constant, K_{sp} and concentrations of dissolved ions in saturated solutions of slightly soluble salts. 4.8 Given K_{sp}, determine whether precipitation will occur when two aqueous solutions of salts are mixed that react to form a sparingly soluble salt. 5.1 Express the concept of entropy and predict the sign of the entropy change for a given reaction. 5.2 Calculate the entropy change of a reaction using Hess's law or standard entropies. 5.3 From the Gibbs equation, relate and calculate the values of the entropy, enthalpy, free energy, and temperature of a reaction. 5.4 Relate and calculate the value of the equilibrium constant to the entropy, enthalpy, free energy and temperature of the reaction. 6.1 Determine the oxidation state of elements in compounds. 6.2 Based on changes in oxidation states, determine which substance in a reaction is oxidized and which is reduced. 6.3 Balance oxidation-reduction reactions in acidic and basic solution using the method of half-reactions. 6.4 Sketch voltaic and electrolytic cells, identifying the anode, cathode, anode compartment, cathode compartment, salt bridge, and direction of electron flow. 6.5 Calculate standard cell potentials from standard reduction potentials. 6.6 Rank reducing agents and oxidizing agents based on standard reduction potentials. 6.7 Determine non-standard cell potentials from standard cell potentials using the Nernst equation. 6.8 Interconvert between time, current, and masses of reactants and products in electrolysis processes. 7.1 Identify common modes of radioactive decay. 7.2 Write balanced nuclear reactions. 7.3 Differentiate between the different modes of decay and predict the likely mode of decay. 7.4 Interconvert between rates of nuclear decay, half-lives of radioactive nuclei, and amounts of radioactive nuclei. 7.5 Determine energy changes of nuclear reactions and stability of nuclei using Einstein's equation. 7.6 Distinguish between subcritical, critical, and supercritical masses; contrast nuclear fission with nuclear fusion processes. 7.7 Identify the major components and principle of operation of nuclear reactors. 8.1 Given the structure, name alkanes using the IUPAC rules of nomenclature, and vice versa. 8.2 Classify organic compounds based on the functional group present in their structures. 8.3 Given the structure, name alkenes and alkynes using the IUPAC rules of nomenclature, and vice-versa. 8.4 Optional if time permits. Write combustion and halogenation reactions of alkanes; write addition reactions of alkenes and alkynes.
SCANS and/or Core Curriculum Competencies	Critical Thinking, Communication Skills, Empirical & Quantitative Reasoning, and Teamwork

Course Calendar	**Weekly Schedule** Note that the dates of starting and finishing individual chapters are approximate, as some material may be covered on exam and lab days if necessary. July 13 Chapter 11 – Properties of Solutions **July 14 Experiment 2 – Molecular Weight Determination by Freezing Point Depression** **Home work – Experiment 1 - Solubility and metathesis reactions in aqueous solutions** Quiz on chapter 11/Online test July 15 Chapter 12 – Chemical Kinetics **July 16 Experiment 4 – Kinetics of a Chemical Reaction: The Iodine Clock Reaction** July 17 Chapter 13 – Chemical Equilibrium Quiz on Chapter 12/online test July 20 Chapter 14 – Acids and Bases Quiz on Chapter 13/online test **July 21 EXAM 1 - Chapters 11, 12, & 13** **Experiment 6 – Acid-Base Titration: Determination of the Purity of Potassium Hydrogen Phthalate** July 22 Chapter 14 – Acid and Base **July 23 Experiment 5 – Hydrolysis Reactions of Anions and Cations of Salts** July 24 Chapter 15 – Acid Base Equilibria Quiz on Chapter 14/online test July 27 **Experiment 7 – Determination of the Dissociation Constant, K_a, of a Weak Acid** July 28 Chapter 15 - Acid Base Equilibria Chapter 16 – Solubility and Complex Ion equilibria Quiz on Chapter 15/online test July 29 Chapter 17 – Spontaneity, Entropy, and Free Energy Quiz on chapter 16/online test **Experiment 9 - Qualitative analysis of the Cations** July 30 Chapter 17 – Spontaneity, Entropy, and Free Energy **July 31 EXAM 2 - Chapters 14, 15, & 16** Chapter 17 – Electrochemistry ↓ **Last Day for Administrative Students Withdrawals (for a grade of W)** ↓ Aug 3 Chapter 18 – Electrochemistry Quiz on Chapter 17/online test **Experiment 11 - Spectrophotometric Determination of Iron** Aug 4 Chapter 18 – Electrochemistry Chapter 19 – Nucleus: A chemist's View Aug 5 Chapter 19 – Nucleus: A chemist's View Quiz on Chapter 18/online test **Experiment 15 – Structural Formula and Isomerism** Aug 6 Chapter 22 – Organic and Biological Molecules Aug 7 Quiz on Chapter 19/online test **Experiment 17 - Synthesis of Aspirin (Acetylsalicylic acid)** **Aug 10 Exam 3 Chapters 17, 18 & 19** Aug 11 Review for Final **Aug 12 FINAL EXAM – Chapters 11–19, 22, Time 8:00 - 10:00 AM**
Instructional Methods	Standard class lectures using the whiteboard with occasional use of PowerPoints.
Student Assignments	Outside of laboratory reports and chapter quizzes, special assignments are normally not

	required. I will recommend practice problems but these are not graded. Practice problems, such as those at the end of the chapters, are highly beneficial to learning chemistry. The Chang textbook has "in text" problems within the chapters with answers provided at the end of the chapter. Answers to the even-numbered end of chapter problems are provided at the end of the textbook. Online problems can be found on my Learning Web site. It is helpful to have a spiral leaf notebook just for working chemistry problems. That will keep your work more organized and you (or I) can more easily review your work.
Student Assessment(s)	The overall score is based on the following: • Three regular exams 55% • Laboratory 20% • Final Exam 25% Overall Score = 0.55(Average of three regular exams) + 0.20(Laboratory grade) + 0.25(Final Exam)
Instructor's Requirements	**<u>Laboratory Policy</u>** **Lab safety** will be reviewed before the first lab. Each student will then sign a statement affirming his or her commitment to following safe procedures in the laboratory, and turn the form in to the instructor. Be especially aware of the need for adequate ***eye protection*** and ***proper dress*** in the laboratory. • ***Safety glasses or goggles must be worn at all times during the laboratory period.*** • ***No food or drinks are allowed in the lab.*** • ***Open-toed shoes and/or shorts should not be worn in the lab.*** • ***Admission to the lab may be denied for violation of any of these rules.*** Normally, experiments will be performed in groups of two to three students. Students should arrive at the lab *on time* with their lab manual. After you have finished the experiment, show me your results for me to examine briefly, and I will **initial** ("*S.D.*") your lab report before you leave. *Laboratory reports are due on the next lab day*. Each report must be done *individually*, but of course you can work with your lab partners on it. Each report will be graded on a 10-point basis. Come to lab *prepared*. Read through the experiment beforehand and do the pre-lab questions at the end of the lab report. You will be much better organized when doing the experiments, and your laboratory experience will be much more rewarding! **<u>Exams and Make-up Policy</u>** Examinations will consist of three non-cumulative regular exams plus a comprehensive final. Make-up exams will not normally be given, so make every effort to take the exams on their scheduled dates. In the event that you *must* miss a regular exam, I will count the grade made on the final exam as the grade for the missed exam (for one missed exam only), and calculate the final course grade accordingly. If you do not miss any of the regular exams, I will replace your lowest exam score with your final exam score if the final exam grade is higher. This is intended to provide you a "second chance" if you do not do well on a particular exam. Remember that the final exam will be *comprehensive* (meaning that it will cover *all* of the material from the whole semester, not just the last part). Please note that all students are required to take the final (no student can be exempted).
Program/Discipline Requirements	At the program level, the Chemistry Discipline strives to accomplish the Program Learning Outcomes, Student Learning Outcomes, and Learning Objectives as described above. We desire that you receive a challenging and rewarding experience in your chemistry classes at HCC which will prepare you well for future chemistry and related science courses that you may take in the future.
HCC Grading Scale	A = 100 – 90;……4 points per semester hour B = 89 – 80: ……3 points per semester hour

	C = 79 – 70: ……2 points per semester hour D = 69 – 60: ……1 point per semester hour 59 and below = F……..0 points per semester hour IP (In Progress) ……0 points per semester hour W(Withdrawn)……0 points per semester hour I (Incomplete)……0 points per semester hour AUD (Audit) ……0 points per semester hour IP (In Progress) is given only in certain developmental courses. The student must re-enroll to receive credit. COM (Completed) is given in non-credit and continuing education courses. To compute grade point average (GPA), divide the total grade points by the total number of semester hours attempted. The grades "IP," "COM" and "I" do not affect GPA.
Instructor Grading Criteria	See the above descriptions of the lab, exams, quizzes, and final. The course grade is based on these four criteria according to the Assessment section above.
Instructional Materials	**Textbook**  **Chemistry, The Ninth Edition** **Steven S. Zumdahl, Susan A. Zumdahl** **ISBN: 978-1-305-03343-6** **www.cengage.com** **www.cengagebrain.com** Laboratory Manual  **Laboratory Maual for CHEM 1412 – General Chemistry II** by Pahlavan, Bai, and Askew, Blue Door Publishing: 2011. ***HCC System-Wide Edition*** ISBN-13: 978-1-59984-381-0 **Optional Study Guide and Solutions Manual** Student Study Guide to accompany Chemistry 11th Edition, by Raymond Chang McGraw-Hill ISBN-13: 978-0-07738-657-3
HCC Policy Statement: **ADA** **Academic Honesty** **Student attendance** **3-peaters** **Withdrawal deadline**	Access Student Services and other information at: http://www.hccs.edu/district/students/ **Disability Support Services (DSS)** "Any student with a documented disability (e.g. physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the Disability Services Office at the respective college at the beginning of each semester. Faculty are authorized to provide only the accommodations requested by the Disability Support Services Office." If you have any special needs or disabilities which may affect your ability to succeed in college classes or participate in any college programs or activities, please contact the DSS office for assistance. At Southwest College, contact Dr. Becky Hauri, 713-718-7909. More information is posted at the Southwest College Counseling webpage at http://learning.hccs.edu/programs/counseling/southwest.

	Academic Honesty "Students are responsible for conducting themselves with honor and integrity in fulfilling course requirements. Disciplinary proceedings may be initiated by the college system against a student accused of scholastic dishonesty. Penalties can include a grade of "0" or "F" on the particular assignment, failure in the course, academic probation, or even dismissal from the college. Scholastic dishonesty includes, but is not limited to, cheating on a test, plagiarism, and collusion." **Use of cell phones during exams will result in a zero on the exam!** **Attendance Policy** The HCCS attendance policy is stated as follows: "Students are expected to attend classes regularly. Students are responsible for materials covered during their absences, and it is the student's responsibility to consult with instructors for make-up assignments. Class attendance is checked daily by instructors. *Although it is the responsibility of the student to drop a course for non-attendance, the instructor has full authority to drop a student for excessive absences. A student may be dropped from a course for excessive absences after the student has accumulated absences in excess of 12.5% of the hours of instruction (including lecture and laboratory time).*" If circumstances significantly prevent you from attending classes, please inform me. I realize that sometimes outside circumstances can interfere with school, and I will try to be as accommodating as possible, but please be aware of the attendance policy. **Policy Regarding Multiple Repeats of a Course** "NOTICE: Students who repeat a course three or more times may soon face significant tuition/fee increases at HCC and other Texas public colleges and universities. If you are considering course withdrawal because you are not earning passing grades, confer with your instructor/counselor as early as possible about your study habits, reading and writing homework, test-taking skills, attendance, course participation, and opportunities for tutoring or other assistance that might be available." **Last Day for Administrative and Student Withdrawals** For 5-week Summer II 2015 classes, this date is July 31. I urge any student who is contemplating withdrawing from the class to see me first! You may be doing better than you think. Either way, I want to be accessible and supportive. I do not believe in "weed out" classes, and I consider you to be much more than just a name or number! Note my office hours above; if you need assistance, I'm here to help. ☞ **Policy Regarding Withdrawals** ☜ Students desiring to withdraw from a class must do so by the above withdrawal date by filling out a **withdrawal form** at the registrar's office. *After this date, instructors can no longer enter a grade of "W" for the course for any reason*.
Distance Education and/or Continuing Education Policies	Access DE Policies on their Web site: http://de.hccs.edu/student-services/ Access CE information on their Web site: http://www.hccs.edu/continuing-education/
Test Bank	Extra practice problems by chapter, sample exams, and sample finals may be found at the following web sites: http://learning.hccs.edu/faculty/mohammad.ali

	http://swc2.hccs.edu/pahlavan
Scoring Rubrics	Regular exams and the final will consist of multiple-choice and show-work questions. These are graded in the standard manner. The regular exams will include extra questions for extra credit, for a total possible score of about 105 to 110 points. The lab reports are graded on the basis of completeness, neatness, and the correctness of the calculations tied to the experimental result. The pre- and post-lab questions are also checked. Each report is graded on a 10 point basis.
Sample Assignments	N/A
Sample Instructional Methods/Activities	See the PowerPoints at my Learning Web site for an overview of the content of each chapter: http://learning.hccs.edu/faculty/mohammad.ali

☞ **Important Dates** ☜

July 12	Sunday	Last Day for Drop/Add/Swap
July 13	Monday	Classes Begin
July 31	Thursday	Last Day for Administrative/ Student Withdrawals with a grade of "W" 4:30 PM **After the withdrawal date no W can be given,** ***you must receive a regular grade (A-F) in the course*.**
August 11	Tuesday	Instruction Ends
August 12	Wednesday	**Final Exam** (No deviation from the printed schedule is permitted.)
August 21	Friday	Grades Available to Students

Other Information

Free chemistry tutoring is available. A tutoring schedule will be posted in the classroom and lab and will also be placed on my web site at http://learning.hccs.edu/faculty/steven.dessens/chemistry_resources/tutoring-schedules.

AskOnline In addition to "face to face" tutoring, HCC also offers online tutoring from AskOnline. It is also free and is available for chemistry and many other subjects. The login page is at http://www.hccs.askonline.net.

There are also many interesting chemistry resources on the Internet which can be found by using keyword searches. But your best immediate source of information is your *textbook* - make thorough use of it!

The publisher of your textbook has an extensive online site called **Connect** at http://highered.mcgraw-hill.com/sites/0000065899/student_view0/getting_started/student_sign_in.html, Access to the full features requires an account and password. A simplified ARIS page for the ninth edition of Chang is at http://highered.mcgraw-hill.com/classware/selfstudy.do?isbn=0072980605 and does not require you to log in.

The student companion site for the tenth edition of the Chang textbook is at http://highered.mcgraw-hill.com/sites/0023654666/student_view0/ and also does not require a login.

Evaluation for Greater Learning Student Survey System (EGLS$_3$)
"At Houston Community College, professors believe that thoughtful student feedback is necessary to improve teaching and learning. During a designated time, you will be asked to answer a short online survey of research-based questions related to instruction. The anonymous results of the survey will be made available to your professors and division chairs for continual improvement of instruction. Look for the survey as part of the Houston Community College Student System online near the end of the term." http://www.hccs.edu/EGLS3

New Meningitis Vaccination Requirement

Texas Senate Bill 1107 passed in May 2011, requires that new HCC students and former HCC students returning after an absence of at least one fall or spring semester who are under the age of 30 are required to present a physician-signed certificate showing they have been vaccinated against bacterial meningitis. The immunization must be administered at least 10 calendar days before the start date of your classes and must have been received within the last five years.http://www.hccs.edu/continuing-education/students/apply/meningitis/

General Suggestions

Chemistry is a vast field, ranging from the study of simple inorganic salts to enormously complex molecules such as enzymes and nucleic acids in living organisms. In this course, we will be covering chemical kinetics, equilibrium, pH and buffer solutions, thermodynamics, electrochemistry, nuclear chemistry, and organic chemistry. A professional chemist may devote his or her entire career to only one of these general disciplines; we have five weeks to touch on all of them! Here are some general suggestions:

- Learning chemistry takes time. A reasonable guide is to plan for two hours of study for each hour of lecture. Heavy work and/or class loads are not compatible with learning chemistry!
- Attend class regularly (!) and take generous notes during class. Ask questions.
- When beginning a new chapter, I recommend that you read through it quickly the first time, just to give yourself a good feel for what it is about. I you are really on the job you will have done this before the class lecture on the chapter! You will understand what's going on in class much better if you do this.
- Next, start tackling the end of chapter problems or other available problem sets. Often, working problems facilitates understanding much better than just reading and rereading the chapter itself. Chemistry is a "hands on" course - working problems is essential. However, do not spend an inordinate amount of time on a single problem - skip it for the time being and go on to another. Try working some of the sample exercises. They are worked out in the chapter and are very helpful.
- You should have a good, scientific calculator that has scientific notation ("EE" or "EXP" key), log, ln, x^2, $\sqrt{}$, etc. Business calculators usually do not have all of these features. As noted above, the use of programmable calculators is not allowed when taking exams.
- Review basic math operations such as properties of logarithms, if you are rusty.
- Study groups can be very helpful. Keep the group small though, no more than three or four people.
- Finally, keep a positive outlook! Chemistry can be hard, but with a good approach, you will succeed in mastering it!

I hope you find chemistry to be an interesting and rewarding subject which will not only be useful in your academic major, but will give you a better insight into the many scientific challenges we are facing today. I look forward to working with you this summer.

Mohammad Ali
July, 2015