ARIZONA WESTERN COLLEGE
SYLLABUS

CHM 151 GENERAL CHEMISTRY I/GE
Credit Hours: 4 Lec 3 Lab 3
SUN # CHM 1151

COREQUISITES: MAT 150 or MAT 151 or approved higher level math.
NOTE: CHM 130 is highly recommended for students who have limited previous experience in chemistry.
NOTE: The AGEC-S transfer certificate and certain Associate of Science (A.S.) degrees require CHM 151 and CHM 152.

COURSE DESCRIPTION

A detailed study of inorganic chemistry is presented with emphasis on atomic and molecular structure, chemical reactions, and bonding, equilibrium, and the laws of chemistry in terms of modern theory.

1. COURSE GOALS
   - 1.1 Sufficient knowledge and relevant applications of the basic laws of chemistry and principles of chemical reactions.
   - 1.2 Awareness of the local and global relevancy of chemical principles and ideas in the environment and the marketplace.

2. OUTCOMES

   Upon satisfactory completion of the course, students will be able to:
   - 2.1 convert between SI (metric) units and among moles, mass, molar mass, and concentration units.
   - 2.2 name a chemical compound when supplied with the formula and write the formula when supplied with its name.
   - 2.3 distinguish between mass number, average atomic mass, atomic number; distinguish between stable and unstable isotopes; determine an isotopes neutron-to-proton ratio from the band of nuclear stability curve; predict parent and daughter nuclides from isotopic data and radioactive decay chains involving alpha, and beta positive and negative emission.
   - 2.4 apply requisite calculations to determine stoichiometric relationships between reactants, between products, and among reactants and products for limiting and non-limiting reactions
   - 2.5 identify organizational components of the periodic table
   - 2.6 write and balance molecular and ionic chemical reactions.
   - 2.7 determine oxidizing agent, reducing agents, reduced species, oxidized species, and oxidation number of participating elements in reactions and compounds.
   - 2.8 from a solubility-temperature graph predict the maximum solubility of ionic compounds, determine concentration of ionic solutes in aqueous solutions and determine concentration of solute needed to produce an unsaturated, saturated, and supersaturated aqueous solution; relate the concentration of ionic solutes to osmotic pressure, osmotic potential, freezing point depression, vapor pressure lowering, and boiling point elevation
   - 2.9 predict ideal gas behavior under differing conditions of pressure, temperature, volume, and quantity of gas.
   - 2.10 calculate energy changes for chemical and physical transitions from thermochemical data to determine endo- and exothermicity; determine the heat capacity and molar heat capacity of metals and the specific enthalpy and enthalpic density of a combustible organic fuel;
   - 2.11 interrogate the interaction between mass and energy
   - 2.12 predict the structure of organic molecules from carbon-13 and mass spectral data obtained from department instruments (NMR and GC-MS respectively), mass percent composition, mole ratio, and optical rotation (polarimetric analysis from department polarimeters) data

3. AWC GENERAL EDUCATION (GE) CATEGORY & CRITERIA

   NATURAL SCIENCES
   - How to describe, explain, and predict natural phenomena using scientific, logical, and quantitative reasoning and empirical evidence from observation and experimentation
   - The use of experimentation and/or observation to study natural phenomena, using the scientific method
   - How to critically evaluate scientific information, including visual displays and quantitative data

- How the tools and techniques of the natural sciences are applied to global and local issues such as sustainability, climate change, etc.

4. METHODS OF INSTRUCTION
   - 4.1 Lecture based on empirically based active learning strategies
   - 4.2 Demonstrations
   - 4.3 Appropriate audio-visual and multi-media aids
   - 4.4 Student collaborative learning activities, *i.e* use of active learning
   - 4.5 Weekly laboratory investigations based on real-time (= not simulated nor remote data downloaded from the internet) data acquired from high-end, modern analytical instruments

5. LEARNING ACTIVITIES
   - 5.1 Weekly laboratory activities are instrument-intensive; students generate data from high-end instruments located on-site and not from data found off-site such as on the internet or from a simulation; instruments that students use include:
     - benchtop 60MHz duel channel ($^{13}C$ and $^{1}H$) Nuclear Magnetic Resonance (NMR) spectrometers
     - capillary gas chromatograph-mass spectrometer (single quadruple mass analyzer; GC-MS)
     - digital and manual polarimeters and refractometers,
     - flame atomic absorption-emission spectrophotometer (FAA-ES)
     - computer-interfaced infrared (IR) spectrometers, and
     - thermal cameras interfaced with smart phones (thermography experiments).

     Other lab equipment used by students to generate data on-site include simple and fractional distillation glassware, thin-layer chromatography plates, burets for titrations, and eudiometers for gas collection.
   - 5.2 Group activities based on evidence-based active learning strategies
   - 5.3 Classroom demonstrations by the instructor
   - 5.4 Lectures based on empirically based active learning strategies

6. EVALUATION
   - 6.1 In-class examinations
   - 6.2 Final examination
   - 6.3 Quizzes
   - 6.4 Weekly laboratory investigations using data acquired in real-time and on-site from high-end, modern analytical instrumentation

7. STUDENT RESPONSIBILITIES
   - 7.1 Under AWC Policy, students are expected to attend every session of class in which they are enrolled.
   - 7.2 If a student is unable to attend the course or must drop the course for any reason, it will be the responsibility of the student to withdraw from the course. Students who are not attending as of the 45th day of the course may be withdrawn by the instructor. If the student does not withdraw from the course and fails to complete the requirements of the course, the student will receive a failing grade.
   - 7.3 Americans with Disabilities Act Accommodations: Arizona Western College provides academic accommodations to students with disabilities through Accessibility Resource Services (ARS). ARS provides reasonable and appropriate accommodations to students who have documented disabilities. It is the responsibility of the student to make the ARS Coordinator aware of the need for accommodations in the classroom prior to the beginning of the semester. Students should follow up with their instructors once the semester begins. To make an appointment call the ARS front desk at (928) 344-7674 or ARS Coordinator at (928) 344-7629, in the College Community Center (3C) building, next to Advising.
   - 7.4 Academic Integrity: Any student participating in acts of academic dishonesty including, but not limited to, copying the work of other students, using unauthorized “crib notes”, plagiarism, stealing tests, or forging an instructor’s signature—will be subject to the procedures and consequences outlined in AWC’s Student Code of Conduct.
   - 7.5 Texts and Notebooks: Students are required to obtain the class materials for the course.
   - 7.6 Arizona Western College students are expected to attend every class session in which they are enrolled. To comply with Federal Financial Aid regulations (34 CFR 668.21), Arizona Western College (AWC) has established an Attendance Verification process for "No Show" reporting during the first 10 days of each semester.
     Students who have enrolled but have never attended class may be issued a “No Show” (NS) grade

by the professor or instructor and receive a final grade of "NS" on their official academic record. An NS grade may result in a student losing their federal financial aid.
For online classes, *student attendance in an online class is defined as the following* (FSA Handbook, 2012, 5-90):

- Submitting an academic assignment
- Taking an exam, an interactive tutorial or computer-assisted instruction
- Attending a study group that is assigned by the school
- Participating in an online discussion about academic matters
- Initiating contact with a faculty member to ask a question about the academic subject studied in the course