GENERAL CHEMISTRY FOR ENGINEERS COURSE SYLLABUS

Course Description: The general chemistry course provides students with an introduction to chemistry. Students will acquire knowledge and understanding about fundamental concepts related to matter and their application to personal, social, technological and environmental situations. On the other hand, they will consider how scientific knowledge is acquired, applied, and communicated, as they explore many of the key concepts central to the science of chemistry. By working through example cases and practice problems, students will further develop their chemical content knowledge, critical thinking abilities, and problem solving skills. By the end of the course, successful students will be able to demonstrate a basic understanding of the structure and properties of chemical systems using the tools of the discipline including: models, data analysis, and the use of symbolic representations.

Course Topics: 1) Matter, 2) Atom, molecules and ions, 3) Periodic table, 4) Chemical reactions and reactions in aqueous solutions, 5) Gases, 6) Thermochemistry, 7) Chemical binding, 8) Liquids and Solids, 9) Physical properties of Solutions, 10) Chemical equilibrium, 11) Acids and bases 12) Thermodynamic, 13) Electrochemistry, 14) Metallurgy and the chemistry of metals

Course Material: 1. *General Chemistry: The Essential Concepts*, Raymond Chang (electronic version as pdf is avaible) 2. Calculator (You will need a calculator to complete the problem sets, **but cellphones, ipads or programmable and graphing calculators are prohibited**)

Objectives: At the end of the class, the students will be able to describe:

1- The scientific method, Classification of matter, Physical and chemical properties of matter, Measurement, Significant numbers
2- The atomic theory, The structure of an atom, The periodic table, Molecules and ions, Chemical formulas and naming of compounds
3- Periodic relationship between the elements, periodic classification of the elements, Periodic variation in physical properties, Ionization energy and electron affinity, Variation in chemical properties of the representative elements
4- Atomic mass, Avogadro's number and molar mass of an element, The mass spectrometer, Percent composition of compounds, Determination of empirical formulas, Chemical reactions and chemical equations, Amount of reactant and product, Limiting reagents, Reagent yield, General properties of aqueous solutions, precipitation reaction, acid-base reactions, oxidation-reduction reactions
5- Substances that exist as gases, Pressure of a gas, The gas laws, The ideal gas equation, Dalton's law of partial pressures, Kinetic molecular theory of gases
6- The nature of energy and types of energy, Enthalpy of chemical reactions, Hess Law, Calorimetry, Standard enthalpy of formation and reaction
7- Lewis dot symbols, The ionic and covalent bond, Formal charge and Lewis structures, Molecular geometry, theories of molecular geometry
8- The kinetic molecular theory of liquids and solids, Intermolecular forces, Properties of liquids, Crystal structure, Types of crystals, Amorphous solids, Phase changes, Phase diagrams
9- Types of solutions, a molecular view of solution process, Concentration units, The effect of temperature on solubility, The effect of pressure on the solubility of gases, Colligative properties
10- The concept of equilibrium and the equilibrium constant, Equilibrium constant expressions, the relationship between chemical kinetics and chemical equilibrium, the factors that affect chemical equilibrium
11- Brønsted acids and bases, the acid-base properties of water, pH, strength of acids and bases, weak acids and bases, acid-base properties of salts, Lewis acids and bases
12- The three laws of thermodynamics, Spontaneous processes and entropy, Entropy, Gibbs free energy, Thermodynamics in living systems

13- Redox reactions, galvanic cells, Standard reduction potentials, Batteries, Corrosion, Semiconductors
14- Occurrence of metals, Metallurgical processes, Band theory of conductivity, Periodic trends in metallic properties

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Grading **:**

HOMEWORK AVG.	**30 %**
MIDTERM	**30 %**
FINAL	**40 %**

MIDTERM EXAM **:** 9th of November, 2019.

FINAL EXAM **:** The date of the exam will be announced.

EXAM POLICY

- There will be no makeup examinations. The only legitimate excuses are extenuating circumstances that are beyond your control. These excuses must be accompanied with proper documentation. Students that miss an exam due to illness must bring documentation from a physician stating that they were seen in the physician's office and that they were too ill to attend classes on that date. Legitimate excuses must be documented within two days of the missed exam period. If you miss your exam period because of extenuating circumstances, it is your responsibility to inform your instructor in a timely fashion. Undocumented and unapproved absences will receive a score of zero for the missesed exam.

HOMEWORK

- The homeworks will be given to the students for practicing the chapters. Every homework will be collected on time and signed.
- Completing these homeworks is an important part of ensuring your success in the course.
- On the other hand, you should solve as many practice problems as you can in your course book.

COURSE ATTENTION

- It is strongly recommended that students attend class regularly. A student absent from class bears the full responsibility for all subject matter and information discussed in class. Attendance (and participation) will be useful to make decisions in borderline cases.

CLASS RULES

- Students should join the class on time and late arrivals will disturb me and the class
- Once the lecture begins, you should remain seated throughout the entire class. If you know you have to leave early, see me before class; otherwise you are expected to remain until class is over.
- It is not appropriate to read newspapers or have extended conversations with fellow students during class.
- Turn off all electronic devices such as **cell phones**, pagers and beeping watches. They are not allowed during the class period.
- Anyone who persists in disrupting the class will be asked to leave the classroom.
- Cheating is totally unacceptable.
- No cell phones, iPods or other electronic devices may be used during the exams.