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| 2021-2022 | Common Core | Year 1 - Sem. 1 |
| PHYS102 | Physical Chemistry | Mandatory |
| ECTS: 3 | Instructors : Dr. Carlos Youssef, Dr. Rami Nader, Dr. Zeinab Serhan, Dr. Mohamad Younes | Language: English/French |
| Total hours: 39 h | Period : October- February | |

Description:

Chemistry is so crucial to an understanding of many areas of engineering and industrial processing that it has become a requirement for an increasing number of academic majors. This course is the first semester of Chemistry for engineering students. The lectures cover the topics: Components of Matter – Quantum theory and atomic structure – Electron configuration and chemical periodicity – Models of chemical bonding – Shapes of molecules – Theories of covalent bonding.

Learning outcomes:

- Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories.
- Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
- Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.
- Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
- Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
- Students will be able to function as a member of an interdisciplinary problem solving team.

Content:

-The components of Matter: Elements, Compounds and Mixtures- The observations That led to Atomic View of Matter Dalton's Atomic Theory- The observations That led to the Nuclear Atom Model- The Atomic Theory Today- Elements: A First look at the Periodic Table- Compounds- Mixtures.

- Quantum theory and atomic structure: The Nature of Light- Atomic Spectra- The Wave- Particle Duality of Matter and Energy- The Quantum-Mechanical Model of the Atom.

- Electron configuration and chemical periodicity: Characteristics of Many-Electron Atoms- The Quantum-Mechanical Model and the Periodic Table- Trends in Three Atomic Properties (Atomic Size- Ionization Energy- Electron Affinity)- Atomic Properties and Chemical Reactivity.

- Atomic Properties and Chemical Bonds- The Ionic Bonding Model- The Covalent Bonding Model- Bond Energy and Chemical Change- Between the Extremes: Electronegativity and Bond Polarity- An Introduction to Metallic Bonding.

- Shapes of molecules: Depicting Molecules and Ions with Lewis Structures- Valence-Shell electron-Pair repulsion (VSEPR) Theory- Molecular Shape and Molecular Polarity.

-Theories of Covalent Bonding: Valence Bond (VB) Theory and Orbital Hybridization- Modes of Orbital Overlap and the Types of Covalent Bonds- Molecular Orbital (MO) Theory and Electron Delocalization.

References:

- The Molecular Nature of Matter and Change, Seventh Ed. by Silberberg et al., McGraw-Hill, 2015
- Chemistry for Engineering Students, 3rd Edition by Lawrence Brown and Thomas Holme, 2014
- Principles and Modern Applications, 10th Ed. By Ralph Petrucci et al., Pearson Canada, 2011

Evaluation Method:

Assessment in the following areas will be converted to points, to compute your final grade in this course:

- Mid-Term
- Final Exam
- Home Works

