Compulsory modules: Physical Chemistry

The following compulsory modules corresponding to 16 SKS / 24 ECTS-Credits must be passed:

2nd & 3rd semester	**Compulsory Module: Physical Chemistry A** *Tentative name module: Equilibrium chemistry & thermodynamic*	SKS	ECTS-Credits
a	**Equilibrium Chemistry (PLO 6)** Systems of variable composition and chemical equilibrium, phase equilibrium in simple systems and the phase rule, the ideal solution and colligative properties more than one volatile component and the ideal dilute solution, equilibria between condensed phases, equilibria in non-ideal systems, equilibria in electrochemical cells.	2	2.66
b	**Thermodynamics (PLO 6)** Thermodynamics: the state of the system, equations of state, 0.1,2,3 law of thermodynamics, internal energy, work, heat, enthalpy, entropy, free energy, spontaneous-non-spontaneous changes, multi-component systems, and the chemical potential of a species.	3	3.99
c	**Experimental: Equilibrium chemistry and thermodynamics (PLO 4, 5, 6, 7 & 8)** Safety in the laboratory, vapor-liquid equilibrium, determine the surface tension, determine viscosity, Equilibrium of liquid vapor on binary solution system, temperature and the solubility function, heat of combustion, concentration of micelle critical.	1	1.33
	Total	6	7.98
	Learning Outcomes: LO 4. Students master in basic principles and ability to use software in determining the structure and energy of micromolecules, analysis and synthesis in general or more specific field in chemistry. LO 5. Students have expertise in working practices in the laboratory, handling general and special chemicals and implementing work safety and security systems. LO 6. Students master the theoretical concepts of structure, properties, changes, kinetics, and energetics of molecules and chemical systems, identification, separation, characterization, transformation, synthesis of micro-and micro molecular compound and their application. LO 7. Students are having the knowledge of safety and work safety in the laboratory as well as understanding environmental issues and related regulations. LO 8. Students have experience, and able to operate common chemical instruments, as well as able to analyze data and information from these instruments.		

	Prerequisites: Basic Chemistry Practical course of Basic Chemistry 1 & 2

3rd & 4th semester	**Compulsory Module: Physical Chemistry B** *Tentative name module: Quantum mechanics and spectroscopy*	**SKS**	**ECTS-Credits**
a.	**Bonding Chemistry and Molecular Structure (PLO 6)** Quantum theory, atomic and molecular spectra, bond energy, valence bond theory and molecular orbitals, Delocalization Electrons, conjugate Bonds.	3	3.99
b	**Microscopic characteristics (PLO 6)** Statistical thermodynamics, molecules in motion, molecular electronic properties, molecular sensing and spectroscopy (raman, laser), electronic spectroscopy (SEM, TEM), Atomic Force Microscopy.	3	3.99
c	**Kinetics (PLO 6)** The rates of chemical reactions, Integrated rate laws, Reactions approaching equilibrium, The temperature dependence of reaction rates, Reaction mechanisms, Polymerization kinetics, Enzyme-catalysed reactions, Photochemistry.	3	3.99
d	**Experimental: Kinetics and Molecular Spectroscopy (PLO 4, 5, 6, 7 & 8)** Safety in the laboratory, Chemical equilibrium in solution, Adsorption Kinetics, Dipole Moment of Relative, Permittivity and Refractive Index, Saponification Kinetics, the kinetics of electrode reactions, Bonding, Charge, and Vibration Properties of Some Structures of Simple Organic Compounds, and the use of Rietica software in determining the crystal phase.	1	1.33
	Total	10	13.3
	Learning Outcomes: LO 4. Students master in basic principles and ability to use software in determining the structure and energy of micromolecules, analysis and synthesis in general or more specific field in chemistry. LO 5. Students have expertise in working practices in the laboratory, handling general and special chemicals and implementing work safety and security systems. LO 6. Students master the theoretical concepts of structure, properties, changes, kinetics, and energetics of molecules and chemical systems, identification,		

	separation, characterization, transformation, synthesis of micro-and micro molecular compound and their application. LO 7. Students are having the knowledge of safety and work safety in the laboratory as well as understanding environmental issues and related regulations. LO 8. Students have experience, and able to operate common chemical instruments, as well as able to analyze data and information from these instruments.
	Prerequisites: Basic Chemistry Practical course of Basic Chemistry 1 & 2