

Elective Modules: Physical Chemistry

1	Elective Module: Physical Chemistry A	SKS	ECTS-Credits
	<i>In this elective module of Physical Chemistry A, consist of adsorption chemistry, electrochemistry, chemistry of surface and colloid.</i>		
a.	Adsorption Chemistry (PLO 2, 4, 6, 8) Concept, definition and classification of adsorption, adsorption equilibrium, adsorption isotherms and their derivatives, properties of adsorbents, calculation of surface area and pore size, practice of using SAA, types of adsorption interactions in molecular aspects, design of adsorbents by computation, design of adsorption processes.	2	2.66
b	Electrochemistry (PLO 2, 3, 4, 6) Electrochemistry studies oxidation-reduction reactions, spontaneous or non-spontaneous reaction, learn how to predict electrochemical reaction inside an electrochemical cell, kinetics of electrochemical reaction, and application of the theories to some applications.	2	2.66
c	Chemistry of surface and colloid (PLO 2, 3, 6, 8) Chemistry of surface and colloid studies surface phenomena, energy of surface, surface active agent, colloid with various disperse phase, stability of colloid, and surfactant blend.	2	2.66
Total		6	7.98
Learning Outcomes: LO 2. Students have ability to apply scientific methods in chemistry and other fields. LO 3. Students Master in theory and working as a researcher in the field of science and technology with the ability to solve community problems with an orientation to sustainable development and to disseminate research results in scientific meetings and scientific publications. LO 4. Mastery of basic principles and ability to use the software in determining the structure and energy of micro molecules, analysis, and synthesis in general or more specific fields in chemistry (organic, biochemistry, or inorganic), and data processing (analytical chemistry). 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 8. Students have experience, and able to operate common chemical instruments, as well as able to analyze data and information from these instruments.
	Prerequisites: Compulsory module of Physical Chemistry A

2	Elective Module: Physical Chemistry B	SKS	ECTS-Credits
	<i>In this elective module of Physical Chemistry B, consist of solid-state chemistry, reaction dynamics, chemistry of catalyst, renewable energy.</i>		
a.	Solid State Chemistry (PLO 2, 3, 6, 8) Crystal structure, synthesis and characterization of solid state, chemical bonding, optical properties, magnetic properties, conductivity properties and nanoscience of solid state.	2	2.66
b	Reaction Dynamics (PLO 2, 3, 6) Reaction dynamics studies Collision theory, Diffusion-controlled reactions, Transition-state theory, The dynamics of molecular collisions, Electron transfer in homogeneous systems.	2	2.66
c	Catalyst (PLO 2, 6) The Basic concepts of Catalysis, Heterogeneous catalysts include: Reaction Kinetics and Mechanisms, adsorption, synthesis, characterization, and recent trends of a heterogeneous catalyst.	2	2.66
d	Renewable energy (PLO 2, 6) This course studies the definition and classification of renewable energy; renewable energy sources and; technologies of biodiesel, bioethanol, biogas, fuel cell, and photovoltaic.	2	2.66
Total		8	10.64
Learning Outcomes: LO 2. Students have ability to apply scientific methods in chemistry and other fields. LO 3. Students Master in theory and working as a researcher in the field of science and technology with the ability to solve community problems with an orientation to sustainable development and to disseminate research results in scientific meetings and scientific publications. 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 8. Students have experience, and able to operate common chemical instruments, as well as able to analyze data and information from these instruments.			

	Prerequisites: Compulsory module of Physical Chemistry B
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