СИЛАБУС ДИСЦИПЛІНИ
«CHEMISTRY»

Ступінь вищої освіти - Бакалавр
Спеціальність 192 – Construction and Civil Engineering
Освітня програма «Construction and Civil Engineering»
Рік навчання I, семестр I
Форма навчання _денна (денна, заочна**)**
Кількість кредитів ЄКТС_____3
Мова викладання англійська

Лектор дисципліни	**_____ Senior Assistant Professor, PhD Kravchenko Olha ___**
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Сторінка дисципліни в eLearn	https://elearn.nubip.edu.ua/course/view.php?id=1339

ОПИС ДИСЦИПЛІНИ

(до 1000 друкованих знаків)

Chemistry is a fundamental discipline, which provides engineering students with a background in important concepts and principles of chemistry. Some of the most important objectives, though, are more global in nature. Emphasis will be placed on those areas considered most relevant in a civil engineering context, and practical applications in construction and civil engineering will be examined. These goals deal with the overall relationship between chemistry (or science in general) and civil engineering rather than with the details of any particular chemical principle. Overview of chemical engineering through discussion and engineering analysis of physical and chemical processes. Topics: overall staged separations, material and energy balances, concepts of rate processes, energy and mass transport, and kinetics of chemical reactions. Applications of these concepts to areas of current technological importance: biotechnology, energy, production of chemicals, materials processing, and purification.

СТРУКТУРА ДИЦИПЛІНИ

Тема	**Години** (лекції/лабораторні, практичні, семінарські)	**Результати навчання**	**Завдання**	**Оцінювання**
1 семестр				
Module 1. **The basics atomic-molecular theory of the matter structure**				
Topic 1. **The main concepts and laws of chemistry**	2/2	**To know**: the basic concepts of atomic-molecular theory, the basic laws of chemistry **To be able to:** carry out the calculations of chemical formulas and chemical equations, **To apply**: apply basic chemical laws, necessary for future civil engineers	*Execution of laboratory works. Writing tests. Performing independent work (including elearn) Solution of tasks, etc.*	**5**

Topic 2. **Atomic structure of chemical elements**	2/2	**To know**: The main role of atomic structure in prediction of the physical and chemical properties of elements and their compounds.; Modern ideas about the structure of the atom. The structure and dimensions of the nucleus, the electron. **To be able to:** To predict chemical properties of elements and compounds using atomic structure of chemical elements **To analyze**: chemical properties of metals and alloys using modern quantum mechanics theory:		**5**
Topic 3. **The periodic law and Mendeleev's periodic table of chemical elements**	1/2	**To know:** The modern formulation of periodic law. Mendeleev's periodic system of elements. The concept of group, sub-group, period., s-, p-, d-elements. **To understand**: The concept of atom radius, ionization energy, electron affinity, electronegativity and their changes in periods and groups of the periodic system. To **distinguish** the main patterns of the periodic system: metal and non-metal, acid-basic, redox properties of elements.		**5**
Topic 4. **The chemical bond and the structure of molecules.**	1/2	**To know**: modern ideas about the nature of the chemical bond. To master the basic types of chemical bonds, their properties, characteristics of metallic interaction and relationship type of chemical bond that exists in the compound and its chemical properties. **To understand**: The modern concepts about the nature of the chemical bond. The main types and features of chemical bonds. **To distinguish** ionic and covalent bonds. Hydrogen bond. **To analyze**: The mechanism of formation, characteristics and role of chemical bond in the processes of civil engineering and construction.		**5**
Module 2. **The main patterns of chemical reactions**				
Topic 1. **Thermodynamic laws of chemical transformations**	-/2	**To know**: The basic concepts of chemical kinetics. The rate of chemical reaction. The factors affecting to the rate of a chemical reaction. Law of mass action - basic law of chemical kinetics. **To understand**: The concept of activation energy, heat of reaction. **To be able to**: Calculate the effect of temperature on the rate of reaction using Van't Hoff Rule.	*Execution of laboratory works. Writing tests. Performing independent work (including elearn) Solution of tasks, etc.*	**5**

		To use: The concept of catalysis and its nature in civil engeering prosseces		
Topic 2. **The chemical equilibrium and conditions of its shift.**	-/2	**To know:** Reversible and irreversible reactions. The concept of chemical equilibrium. Constant of chemical equilibrium. **To analyze:** The shift of chemical equilibrium. **To be able to**: calculate the influence of external factors on chemical equilibrium using Le Chatelier's principle. **To use:** The concepts of chemical kinetics and chemical equilibrium within the meaning of chemical processes for production and processing of civil engineering.		
Topic 3. **The solutions of electrolytes.**	1/2	**To know**: The general idea about dispersion systems. The concept of the solutions and their role in the nutrition of plants and animals. The physical and chemical nature of the solutions. **To be able to**: calculate the concentraton of solution using different ways of expressing concentration; to prepare solution wuth given concentration **To understand**: The mechanism of electrolytic dissociation.. **To apply**: concept of electrolytic dissociation in civil engineering and construction.		**5**
Topic 4. **The solution of non-electrolytes..**	1/2	**To know:** The concept of heterogeneous systems. **To understand:** Colligative properties of solutions of non-electrolytes and their application in civil engineering and construction. **To analyze:** Surface phenomena at the interface. Sorption processes. Disperse systems in nature.		
Topic 5. **The redox processes and their conditions..**	1/2	**To know**: The general concept of redox processes. The most important redox processes in living organisms, nature and technological processes**.** **To be able to** calculate degree of oxidation of the elements in the compounds. **To understand**: The influence of medium on redox reactions. The concept of redox potentials. **To analyze**: The motion of redox reactions and determination of its direction. The redox processes in civil engineering and construction.	*Execution of laboratory works. Writing tests. Performing independent work (including elearn) Solution of tasks, etc.*	**5**
Topic 6. **Bases of**	1/2	**To know:** The object and purpose of electrochemistry. The conversion of chemical energy into electrical energy.		**5**

electrochemistry.		**To understand:** The mechanism of electrode potentials of metals. Standard electrode potentials. Several voltages metals. Nernst equation. **To analyze:** Oxidative - reductive processes in electrolytic cells. **To distinguish:** Chemical current sources. Batteries. Fuel cells. **To use:** The value of chemical power sources in civil engineering and construction..		
Topic 7. **Electrolysis of melts and solutions of electrolytes as oxidation - reduction process..**	1/2	**To know:** The conversion of electrical energy into chemical. Laws of of electrolysis of melts. Features electrolysis of aqueous solutions. **To understand:** The quantitative characteristics of the process of electrolysis Faraday laws. **To apply:** practical uses of electrolysis: Electroplating, electrometallurgy, electrosynthesis. Value electrolysis to obtain some structural materials, their decoration and protection against corrosion.		**5**
Topic 8. **Corrosion processes and materials protection against corrosion.**	1/2	**To know:** Overview of corrosion processes. To distinguish: The types and mechanisms of corrosion. **To understand:** Corrosion of metals and alloys as oxidative – restorative process. Incompatibility metals in metal structures **To be able to** choose methods for determining the rate of corrosion. **To use** Methods of protection of metals, alloys and other construction materials from corrosion. The concept of corrosion inhibitors**.**		**5**
Module 3**. Chemical elements and compounds of elements as the basis of inorganic and organic structural materials**				
Topic 1. **Properties of non-metals and their compounds in materials and excipients engineering**	-/2	**To know:** General characteristics of non-metals and their position in the Periodic System **To analyze:** The dependence of the properties of the electronic structure of atoms of non-metals. **To use:** the non-metal compounds for the production of polymers, CFCs and preservatives, wood, glass, fire-resistant paint, fiberglass, chemical power sources, corrosion inhibitors, detergents, and in welding work in lighting technology, the vulcanization of rubber, and others	*Execution of laboratory works. Writing tests. Performing independent work (including elearn) Solution of tasks, etc.*	**5**
Topic 2. **Chemistry of metals.**	1/2	**To know**: the regulation of metals in the Periodic System, general characteristics of metals. **To understand**: Features of the electronic structure of atoms. The		**5**

		physical properties of metals, electrical conductivity, thermal conductivity, ductility. **To analyze**: Methods of obtaining metals and alloys, special alloys properties, heat resistance, lightness, corrosion resistance, hardness etc. **To distinguish**: Properties metals side subgroups ability to form complexes.. **To use:** metals and their compounds in batteries, for the manufacture of mirrors, white, glass, glaze, decoration, electrical wires, tubes, semiconductors.		
Topic 3. **Bases of organic chemical compounds**.	1/1	**To know**: The theory of chemical structure of organic compounds A. Butlerova. Classification, nomenclature and isomerism of organic compounds. Structure and properties of hydrocarbons. **To distinguish**: Natural sources of hydrocarbons. And functional-element compound. The physiologically active substances. **To use:** organic substances for the manufacture of detergents, varnishes, mastics, waxes, dyes, explosives, polymers, fuels, etc .		**5**
Topic 4. **Polymeric materials and their applications in engineering**	1/1	**To know:** General characteristics of Macromolecular Compounds. Natural and synthetic polymers. The reactions of polymers: polymerization and polycondensation. **To analyze:** Advantages and disadvantages of plastic construction materials in comparison with others. **To apply:** Oil and oil products. Distillation and cracking of petroleum. Detonation stability fuels. Biodiesel and shale gas..		**5**
Summary				**70**
Exam				**30**
The sum of points				**100**

ПОЛІТИКА ОЦІНЮВАННЯ

Політика щодо дедлайнів та перескладання:	Роботи, які здаються із порушенням термінів без поважних причин, оцінюються на нижчу оцінку. Перескладання модулів відбувається із дозволу лектора за наявності поважних причин (наприклад, лікарняний).
Політика щодо академічної доброчесності:	Списування під час контрольних робіт та екзаменів заборонені (в т.ч. із використанням мобільних девайсів). Курсові роботи, реферати повинні мати коректні текстові посилання на використану літературу

Політика щодо відвідування:	Відвідування занять є обов'язковим. За об'єктивних причин (наприклад, хвороба, міжнародне стажування) навчання може відбуватись індивідуально (в он-лайн формі за погодженням із деканом факультету)

ШКАЛА ОЦІНЮВАННЯ ЗНАНЬ СТУДЕНТІВ

Рейтинг студента, бали	**Оцінка національна за результати складання екзаменів заліків**	
	екзаменів	**заліків**
90-100	відмінно	зараховано
74-89	добре	
60-73	задовільно	
0-59	незадовільно	не зараховано