Course Unit Descriptor

Study Programme: Environmental Engineering

Course Unit Title: Chemical Principles in Environmental Engineering

Course Unit Code: Z109

Name of Lecturer(s): Associate Professor Jelena Radonić, PhD

Type and Level of Studies: Bachelor Academic Degree

Course Status (compulsory/elective): Compulsory

Semester (winter/summer): Summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 6

Prerequisites: None

Course Aims:

Introducing students of technical profession to the basic chemical principles and laws.

Learning Outcomes:

Acquiring basic knowledge of fundamental chemical principles which enable better understanding of a great number of chemical processes and reaction phenomena important to the field of Environmental engineering.

Syllabus:

Theory

Neutralization and hydrolysis. Ion water product and pH value. Indicators. Energy changes in chemical reactions. Terms used in chemical thermodynamics. Internal energy, enthalpy, and heat of chemical reaction. Thermochemical calculations. Hes's law, entropy, Gibbs energy. Exothermic and endothermic chemical reactions. Basic classes of organic compounds. Organic pollutants. Coordination compounds. Structure of organic compounds - building complex, ligands, coordination number. Balances in complex compounds solutions. Chemical bonds in complex compounds. Atomic complexes. Basic principles of analytical chemistry. Qualitative and quantitative chemical analysis. Complete, elementary, partial and specialized chemical analysis. Criteria in the selection of adequate analytical techniques. Cycles - the circulation of carbon, nitrogen, phosphorus and sulfur in nature. Photochemistry. Spectroscopy. Areas and types of spectroscopy. Nature of electromagnetic radiation. Primary / excited state system. Atomic / molecular spectra. Intensity of spectral lines. Lambert - Beer 's law. Basic water parameters. Waste water. Chemical analysis of water. Chemical processes of wastewater purification. The main groups of hazardous and harmful substances in waste waters of the chemical industry. Composition and sources of air pollution. Basic principles for the prevention and reduction of harmful chemical activities on the environment. Principles for defining dose limit. Modern methods for air pollution testing. Procedures for air purification.

Practice

Laboratory and Computing Practice.

Required Reading:

1. V.l. Snoeynk, D. Jeniuns .Water Chemistry. John Wiley & Sons, New York, 1980.
2. R. M. Harrison, S. J. de Mora. Introductory Chemistry for the Environmental Sciences. Cambridge University Press,

1991.
3. G. W. van Loon, S. J. Duffy. Environmental Chemistry. Oxford University Press Inc., New York, 2011.
4. P. Atkins, L. Jones. Chemical Principles. Clancy Marshall, New York 2010.

Weekly Contact Hours: 6	**Lectures: 3**	**Practical work: 3**

Teaching Methods:

Lectures. Laboratory and Computing Practice. Consultations – individual and group. During semester students are required to attend lectures, computing and laboratory practice and a number of experimental exercises can be taken through colloquiums. After successfully realized examination prerequisites, students take the final exam in written form, which consists of computational and theoretical part. Computational part of the final exam can be quarterly taken through the two colloquiums.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation	5	Written part of the exam - tasks and theory	60
Practical work	5	oral exam	10
Complex exercises	20		