MODULE INFORMATION SHEET

Name of Module Unit	**Chemistry**
Name in polish language	Chemia
Module type	compulsory / ~~elective~~
Form of studying	full-time day courses
Level of study	undergraduate course (B.Sc. level)
Type of study (for extra-mural courses)	-
Programme	Environmental Engineering
Speciality	Environmental Engineering
Responsible department	Department of Informatics and Environment Quality Research
Responsible person	Małgorzata Kucharska, PhD (laboratories, tutorials), Jan Bogacki PhD (lecture)

Semester	Lectures(E)	Tutorials	Laboratory	Computer Exercises	Projects	ECTS
2	30 (Exam)	15	30			6

Objectives (summary)

The main purpose of the subject is to introduce students to chemistry, covering both theoretical and computational problems, as well as the basics of work in a chemical laboratory.
After the course, the students will be able to analyze and solve basic chemical and environmental engineering problems in their further study.

Prerequisites

None.

Rules of integrated grade setting

0.4*lecture + 0.4*laboratory + 0.2*tutorials

Recommended readings

Chemical Principles, 5th ed., P. Atkins, L. Jones,
Chemistry: Molecules, Matter and Change, 4th ed., P. Atkins, L. Jones,
Organic Chemistry, 8th ed., J.E. McMurry,
Bogacki, Kucharska, Piotrowska, Basics of Chemistry Laboratory. Oficyna Wydawnicza PW, Warszawa 2014

Contents of lectures (syllabus)

	Topics	Time (hrs.)	Scope (S / Ex)
1	Structure of matter	4	S
2	Chemical bonds	4	S
3	Inorganic compounds	4	S
4	Redox reactions	2	S
5	Chemical kinetics. Concentrations. Chemical equilibria.	10	S
6	Organic compounds	6	S
	Total	**30**	**hours**

S – topics listed in the legal study programme standards from 12.07.2007
Ex – extended topics

Lecturers

Dr Jan Bogacki

Assessment method

Written exam

Contents of tutorials

	Topics	Time (hrs.)	Scope (S / Ex)
1	Atom symbols and stoichiometric indexes. Ion charge. Formal unit. Hydrates and radical formulas. Oxidation state. Systematic and common names of oxides, hydrides, hydroxides, acids, salts, cations and anions.	2	S
2	Masses of atoms, molecules and ions. Definition of mol. The volume of gas in different pressure and temperature values. Clapeyron's equation.	2	S
3	Equations of chemical reactions - stoichiometry.	2	S
4	Electronic balance in redox reactions.	2	S
5	Percentage concentration. Molar concentration. Normal concentration. Finding new concentration after mixing / dilution of the solutions	2	S
6	Electrolytes solutions. Ion dissociation. Strong and weak electrolytes. Degree of dissociation. Dissociation constant. pH	2	S
7	Solubility equilibrium. Molar solubility.	2	S
8	Final test.	1	S
	Total	**15**	**hours**

S – topics listed in the legal study programme standards from 12.07.2007
Ex – extended topics

Persons responsible for tutorials

Małgorzata Kucharska PhD

Assessment method for tutorials

Written test

Contents of laboratory

	Topics	**Time** (hrs.)	**Scope** (S / Ex)
1	Introduction to the laboratory work. General and safety rules in the laboratory. Rules of complete the course. Equipment of the laboratory (laboratory glass).	3	S
2	Introduction to titration methods. Alkacymetry. Preparing about 0.1 N HCl and NaOH solution. Standardize HCl on Na2CO3. Standardize NaOH on HCl. Determination of H2SO4 mass.	3	S
3	Argentometry.Standardize AgNO3on NaCl. Determination of NaCl and Cl-mass.	2	S
4	Complexometry.Determination of Mg2+and Ca2+ ions	2	S
5	Introduction to redoxometric methods. Manganometry.Standarization of KMnO4with Na2C2O4. Determination of Fe2+ions in solution.	2	S
6	Iodometry.Standarization of Na2S2O3with potassium dichromate (IV). Chlorine content determination. Test 1	2 + 1	S
7	Colorimetry.Colorimetrical phosphates (V) determination. Colorimetrical colloidal silica titration.	3	S
8	Spectrometry. Determination of chromium ions in solution.	3	S
9	Ion exchange. Determination of a total volume exchange capacity and a breakthrough exchange capacity of the strongly acidic cation exchanger.	3	S
10	Adsorption.	3	S
11	Test. Repetition of outstanding laboratories	1 + 2	S
	Total	**30**	**hours**

S – topics listed in the legal study programme standards from 12.07.2007
Ex – extended topics

Persons responsible for laboratory

Małgorzata Kucharska PhD, Dariusz Dmochowski PhD

Assessment method for laboratory

Correct performance of all chemical analyzes during laboratories and submission of correct reports. Written test.