
Course title: PHYSICAL CHEMISTRY

ECTS credit allocation (and other scores): 3.5

Semester: spring

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Agricultural sciences

Language: English

Number of hours per semester: 45

Course coordinator/ Department and e-mail: prof. dr hab. Lech Smoczyński, Department of Chemistry,
lechs@uwm.edu.pl.Type of classes: classes and lectures

Substantive content

CLASSES: Determination of: pKa for weak acid by the pH-metric titration method, the molar heat of neutralization of strong acid by a strong base, the Freundlich isotherm of adsorption, the isoelectric point for gelatine, the activity coefficient of copper sulphate, the dissociation constant pKa during conductometric titration of weak acid, the rate of chemical reaction and the Nernst distribution constant.

LECTURES: Surface phenomena, mechanisms of adsorption, adsorption isotherms, characteristics of selected sorbents, technological applications. Colloidal state, methods of obtainment of colloids, micelle structure, coagulation - theory and practice, electro-coagulation. Aggregates, agglomerates and flocs, electrokinetic phenomena, sedimentation. Introduction to chemical kinetics. Electrolytic conductance, conductometry; ion mobility, ionic strength. Introduction to electrochemistry. Electrochemical potential, electrodes and cells, electrochemical corrosion, analytical methods based on electrolysis.

Learning purpose: Knowledge and understanding of basic phenomena and physico-chemical processes occurring in the biosphere. Acquisition of independent research ability for selected physicochemical parameters representing components or supplementing instrumental analysis of water and soil. Mastery of mathematical and statistical methods of measurement data and analysis of the causes of errors in the measurements. Shaping teamwork skills while maintaining safety rules.

On completion of the study programme the graduate will gain:

Knowledge: The student has knowledge of the physical and chemical processes in the environment and the mechanisms of electrode potential generation. He/she knows the phenomena occurring at the interfaces and in colloidal systems in relation to the phenomena observed in water and soil. The student knows the methodology of measuring physicochemical parameters and can plan a series of measurements for statistical and mathematical data processing. The student knows the methodology of measuring physicochemical parameters and can plan a series of measurements for statistical and mathematical data processing.

Skills: The student is able to analyse the measurement data obtained and interpret them using various literature data. Student is able to adapt and use the known methods of testing physical and chemical parameters in the study of environmental protection.

Social Competencies: The student demonstrates responsibility for risk assessment at the workplace and takes care to maintain order. The student has the ability to responsibly perform tasks for measuring research and can effectively work in a group, both at the stage of experimental research and the development of measurement data. He/she understands the need to constantly improve skills.



Basic literature: Smoczyński L., Kalinowski S., Wasilewski J., Karczyński F. 2000. Podstawy chemii fizycznej z ćwiczeniami. UWM Olsztyn; Pigoń K., Ruziewicz Z. 2008. Chemia fizyczna. PWN, Warszawa; Atkins P.W. 2002. Podstawy chemii fizycznej.

Supplementary literature: –

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 1.96 ECTS points

Student's independent work: 1.54 ECTS points