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| **Course title**  Physicochemical analytical methods – ERASMUS  Fizykochemiczne metody analityczne – ERASMUS | | | **ECTS code**  13.3.1280 |
| **Name of unit administrating study**  Faculty Chemistry | | | |
| **Studies**   |  |  |  |  | | --- | --- | --- | --- | | **Field of study** | **Type** | **Form** |  | | Chemistry | Bachelor | Full-time studies |  | | Chemistry | Master | Full-time studies |  | | | | |
| **Teaching staff**  dr hab. Piotr Storoniak, prof. UG | | | |
| **Forms of classes, the realization and number of hours** | | **ECTS credits 4**  classes 30 h  tutorial classes 20 h  student’s own work 50 h  TOTAL: 100 h - 4 ECTS | |
| 1. **Forms of classes, in accordance with the UG Rector’s regulations**   laboratory classes | |
| 1. **The realization of activities**   In-class | |
| 1. **Number of hours**   30 h - lecture | |
| **The academic cycle**  winter | | | |
| **Type of course**  facultative | **Language of instruction**  English | | |
| **Teaching methods**  Laboratory experiments | **Form and method of assessment and basic criteria for evaluation or examination requirements** | | |
| **A. Final evaluation, in accordance with the UG study regulations**  course completion (with a grade) | | |
| **B. Assessment methods**  preparing final grade based on partial grades received during semester | | |
| **C. The basic criteria for evaluation** or exam requirements  Evaluation criteria in accordance with the UG Studies Regulations; | | |
| **Required courses and introductory requirements**  no requirements | | | |
| **Aims of education**  Familiarize students with theoretical (general knowledge, calculations) and practical aspects (experimental skills) contained in the contents of the course; Deepening and enriching physicochemical knowledge with experimental aspects related to the application of instrumental measurements in modern analysis (both qualitative and quantitative); Understanding physicochemical processes with the emphasis on natural environment and everyday life; Development of practical skills related to the implementation of physicochemical measurements with the participation of apparatus and calculations, processing and evaluation of results associated with them. Acquainting with the methodologies of physicochemical measurements based on modern techniques,. Inspiring students to select and evaluate the acquired information by themselves in order to develop skills of self-education by acquiring and analysing information derived from various sources. | | | |
| **Course contents**  • Measurement of the heat of dilution and neutralization of inorganic substance.  • Determination of acetic acid partition coefficient between organic and inorganic phase.  • Refractometric determination of glycerine content in cosmetic products and sugar content in fruit juices.  • Spectrophotometric determination of caffeine concentration in tea/coffee.  • Fluorimetric determination of vitamin B1 (thiamine).  • Luminometric determination of of antioxidant properties of dietary supplements. | | | |
| **Bibliography of literature**  Monographic works provided by assistants leading classes | | | |
| **Knowledge**  Student:  - knows and understands basic physicochemical methods used in the study of matter and gives examples of their applications;  - provides examples of colligative properties of solutions and knows how to use them to determine basic properties of chemical substances;  - knows theoretical principles of HPLC, TLC and LC chromatography and gives examples of applications of these methods;  - knows what parameters characterize the quality of chromatographic separations;  - provides methods of calculation of chromatographic parameters, characterizing the quality of separation, basing on experimental data;  - knows what a partition coefficient is, its practical importance and how it can be determined;  - knows what are the adsorption isotherms are how they can be determined;  - gives examples of relationships between the structure of molecules and their spectroscopic features;  - knows the principles of construction and data acquisition for crucial spectroscopic methods (NMR, MS, UV-Vis, FL);  - knows what are luminescent labels and indicators, their properties and gives examples of their applications;  - knows what solvatochromic measurements are and gives examples of their use;  - distinguishes basic types of luminescence, can characterize them and knows what applications they have;  - knows how to calculate the discussed physicochemical parameters on the basis of electronic absorption spectra and emission spectra;  - describes the physicochemical changes occurring in surroundings in terms of thermodynamics;  - distinguishes the concept of thermodynamic and kinetic control of chemical reactions;  - knows how is described and what depends on speed of chemical transformations;  - knows basic methods of calculating the kinetic and thermodynamic parameters of transformations;  - understands the terms of crystal lattice energy and the energy of chemical bond and knows how these parameters can be assessed.  - can explain the origin of the colour, the emission of fluorescence as well as chemi- of and bioluminescence of organic substances;  - is able to predict the direction of physicochemical changes basing on thermodynamic data. | | | |
| **Skills**  Student:  - is able to calculate the refraction of substances on the basis of optical measurements and use them to calculate the composition of mixtures of chemical substances;  - can assess the molar masses of the macromolecular substance basing on the knowledge of the osmotic pressure;  - can use selected equipment for physicochemical tests: refractometer, conductometer calorimetric kit, UV-Vis spectrophotometer, stationary spectrofluorimeter and plate luminometer;  - can determine the rate constants of the chemical reaction based on experimental data;  - possess basic skills in the interpretation and determination of parameters of electronic spectra (absorption and emission) and HPLC chromatograms;  - can calculate the acidity constants of organic compounds based on spectroscopic measurements;  - can calculate and evaluate the discussed HPLC parameters basing on experimental data;  - can calculate crucial parameters and on this basis predict their thermodynamic stability. | | | |
| **Social competence**  Student:  - shows interest in physicochemical problems;  - understands the physicochemical principles of surrounding world and the principle of sustainable development resulting from them;  - shows activity and commitment in experimental work;  - demonstrates creativity and activity in independent acquisition of information;  - demonstrates curiosity and the ability to acquire chemical knowledge from various sources;  - understands the complexity of nature and presents the commitment in deepening of physicochemical knowledge | | | |