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| Nazwa zajęć/ <i>Course title:</i> | Chemia fizyczna II | ECTS | 2 |
| Nazwa zajęć w j. angielskim/ <i>Course title in English:</i> | Physical chemistry II | | |
| Zajęcia dla kierunku studiów/ <i>Degree program name:</i> | Biotechnology | | |

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| Język kursu/ <i>Course language:</i> | English | Poziom studiów/ <i>Study level:</i> | I |
| Typ studiów/ <i>Form of studies:</i> | x intramural .. extramural | Status zajęć/ <i>Course status</i> | x podstawowe/ <i>Basic</i> obowiązkowe/ <i>mandatory</i> kierunkowe/ <i>x do wyboru/ elective major</i> |
| | | Semestr/ <i>Semester:</i> | 2 semestr zimowy/ <i>winter semester</i> x semestr letni/ <i>summer semester</i> |
| Rok akademicki/ <i>Academic year:</i> | | 2022/2023 | Numer katalogowy/ <i>Catalogue number:</i> BBT_BTa-1S-2L-19_3 |

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| Koordynator zajęć/ <i>Course coordinator:</i> | prof. dr hab. Piotr Koczoń | | |
| Prowadzący zajęcia/ <i>Teachers responsible for the course:</i> | Employees of the Department of Chemistry I Noż | | |
| Założenia, cele i opis zajęć/ <i>Aims, objectives and description of the course:</i> | <p>Getting acquainted with simple research methods and operation of the apparatus used in the determination of selected physicochemical quantities. Acquiring the ability to interpret, describe and present experimental results and work in teams.</p> <p>Lecture topics: Development and interpretation of measurement results. Laws of thermodynamics. The laws of Hess and Kirchoff and their application. Van't Hoff's isotherm and isobar. Perfect gas. Real gas - real gas equation and critical point. Phase transformations and equilibria. Properties of the liquid. Osmosis. Extraction. Nernst's law of partition. Physical and chemical adsorption - research, description and applications. Chemical kinetics. Order and molecularity of reactions. Activation energy and catalysis.</p> <p>Exercise topics: Application of the van't Hoff isobar to determine the heat of dissolution. Measurements of the refractive index and their application for qualitative and quantitative chemical analysis. Extraction of dissociating and associative compounds - determination of partition isotherms and their interpretation. Adsorption of carboxylic acids on activated carbon. Determination of Freundlich adsorption isotherms. Investigation of the kinetics of sucrose inversion reaction using the polarimetric method - determination of the influence of the catalyst concentration.</p> | | |
| Formy dydaktyczne, liczba godzin/ <i>Teaching forms, number of hours:</i> | a) lectures; number of hours: 15; b) Laboratory classes: number of hours: 15; | | |
| Metody dydaktyczne/ <i>Teaching methods:</i> | Lectures with the use of presentations developed in the "Power Point" program and short films and animations illustrating the subject matter. Laboratory exercises, experiments, observation and measurement. Possibilities of using distance learning when necessary (MS TEAMS) | | |
| Wymagania formalne i założenia wstępne/ <i>Formal requirements and prerequisites</i> | General and physical chemistry, physics, mathematics Basic knowledge of chemistry, differential and integral calculus, logarithmic calculations | | |
| Efekty uczenia się/ <i>Learning outcomes:</i> | treść efektu przypisanego do zajęć/ <i>the content of the effect assigned to the course:</i> | Odniesienie do efektu kierunkowego/ <i>Relation to the course outcomes</i> | Siła dla ef. kier*/ <i>Impact on the course outcomes*</i> |
| Wiedza (absolwent zna i rozumie) / <i>Knowledge: (the graduate knows and understands)</i> | W1 | The student knows the basic concepts and knows and understands the basic laws of physical chemistry. | K_W07 K_W11 K_W10 2 2 2 |
| Umiejętności (absolwent potrafi) / <i>Skills: (the graduate is able to)</i> | U1 | The student is able to carry out standard physicochemical measurements within the scope of the subject content. | K_U07 K_U06 2 1 |
| | U2 | The student is able to independently develop the results of measurements and draw correct substantive conclusions | K_U16 K_U22 3 2 |
| Kompetencje (absolwent jest gotów do) / <i>Competences: (The graduate is ready to)</i> | K1 | The student is able to work in a team together by taking measurements and developing their results. | K_K02 2 |
| | K2 | The student knows how to prepare and present a presentation of a series of obtained measurement results. | K_K06 2 |

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| <i>Treści programowe zapewniające uzyskanie efektów uczenia się: /Program contents ensuring the achievement of the learning outcomes:</i> | Basic issues in the field of physical chemistry and the practical application of laws describing physicochemical phenomena (with the use of mathematics). | | | |
| <i>Sposób weryfikacji efektów uczenia się/ Methods of the verification of the learning outcomes:</i> | Effect W1, U1, U2 - tests during laboratory exercises; U, K effect - assessment resulting from observation during classes / team reports on exercises performed; effect K - evaluation of the results presented by the teams after the end of the laboratory exercises, the possibility of using distance learning in necessary cases | | | |
| <i>Szczegóły dotyczące sposobów weryfikacji i form dokumentacji osiągniętych efektów uczenia się /Details on the verification methods and of the ways of documenting the learning outcomes:</i> | The content of questions from tests during exercises, a list of students' grades from tests and reports from individual exercises, a list with the grades of presentations prepared by students, the possibility of using distance learning when necessary | | | |
| <i>Elementy i wagi mające wpływ na ocenę końcową/Elements and weights influencing the final grade:</i> | The following is used to verify the learning outcomes: 1) assessment of the reports on the exercises carried out in the laboratory; 2) assessment of tests conducted during laboratory exercises; 3) assessment (made with the participation of students) from the presentation presented after the end of the exercises. For each of these elements, the maximum number of points to be obtained is specified, i.e. 1) 20 points, 2) 50 points, 3) 30 points. (100 in total). A student who obtained at least 50% of the points [respectively] from each element: 1) 10 points, 2) 25 points, 3) 15 points], completes the subject, receiving a grade depending on the sum of all points 50-59.5 points - rating 3.0; 60-69.5 points - rating 3.5; 70-79.5 points - rating 4.0; 80-89.5 points - rating 4.5; 90-100 points - rating 5.0. | | | |
| <i>Miejsce realizacji zajęć/ Teaching place:</i> | Lectures are held in the lecture hall, and laboratory classes in the didactic laboratories of the Department of Chemistry | | | |
| <i>Literatura/Literature:</i> 1 Bryłka J., Więckowska-Bryłka E., B. Parczewska-Plesnar, Bortnowska-Bareła B. „Eksperymentalna chemia fizyczna”, (red. E. Więckowska-Bryłka), Wyd. SGGW, Warszawa 2017, wyd. IV poprawione i zmienione. | | | | |
| <i>UWAGI/ANNOTATIONS</i> | | | | |

*) 3 – zaawansowany i szczegółowy, 2 – znaczący, 1 – podstawowy/ 3 – significant and detailed, 2 – considerable, 1 – basic,

Wskaźniki ilościowe charakteryzujące moduł/przedmiot/*Quantitative summary of the course:*

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| Szacunkowa sumaryczna liczba godzin pracy studenta (kontaktowych i pracy własnej) niezbędna dla osiągnięcia zakładanych dla zajęć efektów uczenia się - na tej podstawie należy wypełnić pole ECTS / <i>Estimated number of work hours per student (contact and self-study) essential to achieve the presumed learning outcomes - basis for the calculation of ECTS credits:</i> | 60 h |
| Łączna liczba punktów ECTS, którą student uzyskuje na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich lub innych osób prowadzących zajęcia/ <i>Total number of ECTS credits accumulated by the student during contact learning:</i> | 1.2 ECTS |