COURSE DESCRIPTION CARD - SYLLABUS

Course name

Oddziaływanie promieniowania elektromagnetycznego z materią (Influence of electromagnetic radiation on matter)

Course

Field of study	Year/Semester
Technologia chemiczna (Chemical Technology)	3/6
Area of study (specialization)	Profile of study
-	general academic
Level of study	Course offered in
First-cycle studies	Polish
Form of study	Requirements
part-time	elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
0	15	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Agnieszka Świderska-Mocek

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Wydział Technologii Chemicznej

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Responsible for the course/lecturer:

Prerequisites

Students:

have knowledge in general chemistry (writing chemical reactions, converting concentrations, knowledge of laboratory glassware and basic laboratory equipment).

have knowledge in mathematics and physics enabling the introduction of problems in physical chemistry (basic laws of physics, differential calculus).

are able to prepare solutions of specific concentrations.

are aware of further development of their competences.

Course objective

To familiarise students with basic problems in physical chemistry at the academic level in the field of: nuclear chemistry, properties of molecules, surface phenomena and spectroscopic methods.

Course-related learning outcomes

Knowledge

Students will be able to define and explain selected problems in nuclear chemistry (properties of ionising radiation). K_W03, K_W10

Students will be able to characterise chemical compounds using selected spectroscopic methods. K_W03, K_W11

Skills

Students will be able to obtain information from literature, databases and other sources; interpret it as well as draw conclusions and formulate and substantiate opinions. K_U01

Students will be able to work individually and as part of a team; estimate the time needed to complete the assigned task. K_U2

Students will be able to apply the principles of thermodynamics in the implementation of chemical processes. K_U23

Students will have the self-study skills in the subject. K_U05

Students will be able to elaborate, describe and present results of an experiment or theoretical calculations. K_U09

Students will be able to distinguish between types of chemical reactions and to select them for specific chemical processes. K_U18

Social competences

Students will understand the need for further training and developing their professional competences. K_K01

Students will be able to properly prioritise the task. K_K04

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratory classes: The course passing is based on points received for the individual exercise description. Passing exercises from 56% .

Programme content

Laboratory classes:

Dipole moment: permanent and induced. Dielectric constant and capacity of capacitor. Orientation polarization, induced polarization, polarizability, refraction. Additivity of refraction. Ion susceptibility to deformation. Polarizabilities and molecular structures. Influence of molecule structure on the value of its dipole moment. Dipole moment of different types of bonds. Refractometria.

Surface phenomena. Vapor pressure over a curved surface. Surface tension - definition, measurement.

Adsorption - description of the phenomenon. Physical and chemical adsorption. Isotherms

Chemical equilibrium - equilibrium of complexation reactions, properties of complex compounds.

Electromagnetic radiation. Absorption of radiation by matter. Mechanisms of transition of the excited system to the ground state. Spectrum of radiation with special emphasis on the visible range (Vis). Color vision (hue and its complement). Mixing of colors. Dyes - colored organic and inorganic compounds, their structure. Indicators of pH-mechanism of color change. Construction and principle of operation of spectrophotometer. Lambert-Beer laws. Deviations from absorption laws.

Atomic nucleus, components, energy, nuclear forces. Elementary particles. Nuclear transformations. Properties of ionizing radiation. Interaction of ionizing radiation with matter. Radiometry and dosimetry. Detectors of ionizing radiation. Types and applications of radiation sources - open and closed sources. Principles of radiological protection.

Teaching methods

Laboratory classes- practical method - laboratory exercises. Planning, execution and analysis of the results of physicochemical experiment.

Bibliography

Basic

1. K. Pigoń, Z. Ruziewicz, Chemia Fizyczna, PWN Warszawa 2005

2. P.W. Atkins, Chemii Fizycznej, PWN Warszawa 2001

3. J. Sobkowski, Chemia jądrowa, PAN Warszawa 1981

4. St. Magas, Technika Izotopowa, WPP 1994 (skrypt nr.1794)

5. S. Paszyc, Podstawy fotochemii, Wydawnictwo Naukowe PWN 1992

6. P. Suppan, Chemia i światło, PWN Warszawa 1997

Additional

1. Zbigniew Kęcki: Podstawy spektroskopii molekularnej. Wyd. III. Warszawa: PWN 1992

2. Naftaly Menn: Practical optics. Elsevier, 2004, s. 193–195

3. Jurgen R. Meyer-Arendt: Wstęp do optyki. Warszawa: PWN, 1977
4. Walenty Szczepaniak: Metody instrumentalne w analizie chemicznej. Wyd. IV.Warszawa: PWN, 2002.
5. Wojciech Zieliński, Andrzej Rajca (red.): Metody spektroskopowe i ich zastosowanie do identyfikacji związków organicznych. Wyd. II. Warszawa: WNT, 2000
6. Instrukcje do ćwiczeń laboratoryjnych z chemii fizycznej

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2
Classes requiring direct contact with the teacher	17	0,5
Student's own work (preparation for laboratory classes, preparation of the report.) [1]	33	1,5

[1] delete or add other activities as appropriate