UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU

Biomedical materials

Educational subject description sheet

Basic information

Study programme Chemia (General Chemistry)	**Didactic cycle** 2023/24
Speciality -	**Subject code** 02CENS.14KU.01824.23
Organizational unit Faculty of Chemistry	**Lecture languages** English
Study level First-cycle programme	**Course type** Elective
Study form Full-time	**Block** Complementary major subjects
Education profile General academic	

Subject coordinator	Anna Szwajca
Lecturer	Anna Szwajca

Period	**Activities and hours**	**Number of ECTS points**
Semester 3	• Lecture: 15, Graded credit • Laboratories: 30, Graded credit	4

Goals

Code	Goal
C1	Ability to work in the field of analysis and evaluation of the scope of application and use of existing biomedical materials.
C2	Ability to apply the basic principles of design and synthesis of new materials for biomedical applications, and the ability to work in the laboratory.
C3	Ability to the latest trends in the development of the chemistry of biomedical materials and their applications.
C4	Knowledge of the proper interpretation of test results.

Entry requirements

No prerequisites required.

Subject learning outcomes

Code	Outcomes in terms of	Learning outcomes	Examination methods
Knowledge – Student:			
W1	knowledge and understanding of the essence and the need to use biomedical materials.	CEN_K1_W04, CEN_K1_W11, CEN_K1_W13	Written colloquium, Test, Report
W2	knowledge and familiarity with explaining the structure of metallic, ceramic, polymer and composite biomedical materials.	CEN_K1_W01, CEN_K1_W02, CEN_K1_W08	Written colloquium, Test, Report
W3	knowledge of the use of biomedical materials; and understanding of legal and ethical issues related to biomaterials.	CEN_K1_W04, CEN_K1_W11, CEN_K1_W17	Test, Report
W4	familiarity with biocompatibility, biodegradability and decontamination of used biomedical materials.	CEN_K1_W01, CEN_K1_W04, CEN_K1_W11, CEN_K1_W13	Written colloquium, Test
W5	knowledge of the techniques to study the essential properties of biomedical materials.	CEN_K1_W01, CEN_K1_W14, CEN_K1_W15	Written colloquium, Test, Report
Skills – Student:			
U1	ability to synthesize and characterize simple materials for biomedical applications.	CEN_K1_U04, CEN_K1_U05, CEN_K1_U16, CEN_K1_U17	Written colloquium, Report
U2	ability to use literature sources.	CEN_K1_U20, CEN_K1_U21, CEN_K1_U24	Test, Report
U3	knowledge of new types of biomedical materials used in nanomedicine and regenerative medicine - tissue engineering.	CEN_K1_U22, CEN_K1_U25, CEN_K1_U27	Test
Social competences – Student:			
K1	is responsible for the applicable safety rules in the laboratory.	CEN_K1_K03, CEN_K1_K04	Report
K2	understand the need to expand knowledge in the field of chemistry and related sciences and to search for literature reports.	CEN_K1_K02, CEN_K1_K05, CEN_K1_K06	Test

Study content

No.	Course content	Subject learning outcomes	Activities
1.	Understanding of fundamental concepts in biomedical materials, their definition, synthesis, modification and characterization.	W1, W3, W5, U1, K1	Lecture, Laboratories

No.	Course content	Subject learning outcomes	Activities
2.	Gain a fundamental understanding of biomaterials are used to treat, diagnose, support or replace tissues or organs of the human body.	W2, W4, U3, K1	Lecture, Laboratories
3.	Gain fundamental knowledge about medical instruments, materials and medical devices.	W1, W2, W4, U2, U3, K2	Lecture
4.	Knowledge of biomaterial requirements for origin natural or synthetic to support or replace tissues materials.	W4, U1, K1	Lecture, Laboratories
5.	Familiarity with new development prospects for the production of biomedical materials based on nanotechnology and tissue engineering.	W1, W3, U3, K2	Lecture

Additional information

Activities	Teaching and learning methods and activities
Lecture	Lecture with a multimedia presentation of selected issues, Audio and/or video demonstrations
Laboratories	Laboratory method, Work in groups

Activities	Credit conditions
Lecture	Courses which have a laboratory component require students to achieve a pass in the laboratory component to pass the course. Grading scale with percentage distribution applied: • very good (very good; 5.0): achieving the assumed learning outcomes by the student at the minimum level of 92.0% • good plus (+db; 4.5): achieving the assumed learning outcomes by the student in the range of 84.0% - 91.9% • good (good; 4.0): achieving the assumed learning outcomes by the student in the range of 76.0% - 83.9% • sufficient plus (+dst; 3.5): achieving the assumed learning outcomes by the student in the range of 68.0% - 75.9% • satisfactory (dst; 3.0): achieving the assumed learning outcomes by the student in the range of 60.0% - 67.9% • unsatisfactory (ndst; 2.0): the student fails to achieve the assumed learning outcomes, and the result is below 60.0%
Laboratories	Students' participation in laboratory classes (minimum 80%) is mandatory. Each completed laboratory class should be documented by drawing up a protocol and obtaining an assessment of the theoretical knowledge presented by the Student. Grading scale with percentage distribution applied: • very good (very good; 5.0): achieving the assumed learning outcomes by the student at the minimum level of 92.0% • good plus (+db; 4.5): achieving the assumed learning outcomes by the student in the range of 84.0% - 91.9% • good (good; 4.0): achieving the assumed learning outcomes by the student in the range of 76.0% - 83.9% • sufficient plus (+dst; 3.5): achieving the assumed learning outcomes by the student in the range of 68.0% - 75.9% • satisfactory (dst; 3.0): achieving the assumed learning outcomes by the student in the range of 60.0% - 67.9% • unsatisfactory (ndst; 2.0): the student fails to achieve the assumed learning outcomes, and the result is below 60.0%

Literature

Obligatory

1. Materials provided by the lecturer.

Optional

1. Agrawal, C. Mauli, Ong, Joo L. ,Appleford, Mark R., "Introduction to Biomaterials ", Cambridge University Press 2013
2. William R. Wagner, Shelly E. Sakiyama-Elbert, Michael J. Yaszemski, "Biomaterials Science An Introduction to Materials in Medicine", Elsevier Science Publishing Co Inc 2020

Calculation of ECTS points

Activities	**Activity hours***
Lecture	15
Laboratories	30
Preparation for classes	20
Reading the indicated literature	15
Report preparation	15
Preparation for the exam	15
Student workload	**Hours** 110
Number of ECTS points	**ECTS** 4

* academic hour = 45 minutes

Efekty uczenia się dla kierunku

Kod	Treść
CEN_K1_K02	The graduate is ready to understand the importance of presenting selected developments in chemistry in an accessible manner
CEN_K1_K03	The graduate is ready to correctly assessy the risks involved in conducting chemical experiments
CEN_K1_K04	The graduate is ready to understand the importance and consequences of the professional activity of a chemist and its impact on the environment and the associated responsibility for decisions taken
CEN_K1_K05	The graduate is ready to understand and appreciate the importance of professional ethics in his/her own actions and those of others
CEN_K1_K06	The graduate is ready to formulate precise questions to deepen his/her own understanding of a topic or to find missing pieces of reasoning
CEN_K1_U04	The graduate can plan the implementation of chemical processes in terms of the choice of reagents and elimination of the side products formed
CEN_K1_U05	The graduate can carry out basic chemical synthesis processes
CEN_K1_U16	The graduate can apply analytical techniques to explain basic chemical and physicochemical phenomena
CEN_K1_U17	The graduate can select instrumental analysis methods to investigate specific chemical and physicochemical phenomena
CEN_K1_U20	The graduate can use databases to retrieve information needed in the chemist's work
CEN_K1_U21	The graduate can independently obtain information from both Polish and foreign literature, physicochemical tables and other available sources
CEN_K1_U22	The graduate can prepare a summary of the analyses of the literature data carried out
CEN_K1_U24	The graduate can speak a foreign language (English) at B2 level
CEN_K1_U25	The graduate can create a presentation of a specific chemical or physicochemical problem and propose a solution to it
CEN_K1_U27	The graduate can demonstrate the ability to make correct inferences on the basis of data from chemical or physico-chemical experiments and literature sources
CEN_K1_W01	The graduate knows and understands basic chemical laws and issues
CEN_K1_W02	The graduate knows and understands basic physics and their relationship to chemical laws
CEN_K1_W04	The graduate knows and understands fundamental knowledge of natural sciences
CEN_K1_W08	The graduate knows and understands the chemical properties of substances according to their structure/composition
CEN_K1_W11	The graduate knows and understands the chemical aspects of biological processes
CEN_K1_W13	The graduate knows and understands processes and relationships in the environment
CEN_K1_W14	The graduate knows and understands the basic laboratory and analytical techniques
CEN_K1_W15	The graduate knows and understands the basic methods of instrumental analysis
CEN_K1_W17	The graduate knows and understands opportunities for the economic optimisation of chemical processes