SYLLABUS

Name: ***Biomedical polymers and biomaterials (WTCCXCSE-BPaB)***
Name in Polish: **Polimery biomedyczne i biomateriały**
Name in English: ***Biomedical polymers and biomaterials***

Information on course:

Course offered by department: Faculty of Advanced Technologies and Chemistry
Course for department: Faculty of Advanced Technologies and Chemistry
Term: Winter semester 2024/2025 Year
Cordinator of course edition: dr hab. inż. Magdalena Urbańska

Default type of course examination report:

Graded pass

Language:

English

Course homepage:

http://www.wtc.wat.edu.pl

Short description:

Definition of biomaterials, classification, role of chemical composition, working environment, properties, and applications of these materials. Metallic biomaterials. Ceramic biomaterials. Polymeric biomaterials. Carbon and composite biomaterials. Modern polymer and hybrid systems used in biomedicine for diagnostic and therapeutic purposes.

Description:

Lectures
1. Definition of biomaterials, classification, role of chemical composition, working environment, properties and applications of biomaterials. (2 hrs.)
2. Metal biomaterials (2 hrs.):
a) classification, chemical composition, mechanical and physical properties, applications,
b) austenitic steels,
c) cobalt-based alloys,
d) titanium and its alloys,
e) shape memory alloys.
3. Ceramic biomaterials (2 hrs.):
a) classification, chemical composition, mechanical and physical properties, applications,
b) resorbable in the body,
c) with controlled surface reactivity (bioglass),
d) neutral (alumina, zirconium oxide).
4. Polymer biomaterials (6 hrs.):
a) classification, properties, and applications,
b) natural (proteins, polysaccharides),
c) synthetic (biostable and biodegradable).
5. Carbon and composite biomaterials (2 hrs.).
Modern polymer and hybrid systems used in biomedicine for diagnostic purposes (e.g., contrast agents for magnetic resonance imaging) and therapeutic purposes (e.g., drug carriers) will also be discussed. (2 hrs.)

Exercises
1. Calculations concerning the strength of materials. (2 hrs.)
2. Calculations concerning the corrosion rate of materials. (2 hrs.)

Seminars
Development of specific issues related to biomedical polymers and biomaterials and their presentation in the form of oral presentations. (10 hrs.)

Bibliography:

1. Biomaterials and bionanotechnology / Edited by Rakesh K. Tekade. London: Academic Press, an imprint of Elsevier, 2019.
2. Biomaterials in clinical practice: advances in clinical research and medical devices / Fatima Zivic, Saverio Affatato, Miroslav Trajanovic, Matthias Schnabelrauch, Nenad Grujovic, Kwang Leong Choy editors. Cham: Springer International Publishing AG, © 2018.
3. Biomaterials from nature for advanced devices and therapies / edited by Nuno M. Neves, Rui L. Reis. Hoboken: John Wiley & Sons, cop. 2016.
4. Polymers for biomedicine: synthesis, characterization, and applications / edited by Carmen Scholz. Hoboken, New Jersey: John Wiley & Sons, 2017.
5. Biomaterials science and tissue engineering: principles and methods / Bikramjit Basu. First published in 2017.

Learning outcomes:

Symbol and number of the subject effect/learning effect/reference to the field effect
W1 / The student has established and extended knowledge in the scope of the chosen specialization / K_W02
W2 / The student has general knowledge about current directions of development and the latest discoveries in the field of chemical and related sciences / K_W16
U1 / The student is able to find the necessary information in professional literature, databases, and other sources, knows essential scientific journals in the field of chemistry, and is able to assess the reliability of the information obtained / K_U10
U2 / The student is able to apply knowledge in the field of chemical sciences to related fields of science and scientific disciplines / K_U11
U3 / The student is able to present the results of discoveries made in the field of chemistry and related disciplines in an accessible way and lead a discussion on these topics / K_U13
K1 / The student recognizes the importance of knowledge in solving cognitive and practical problems and seeking expert opinions in the event of difficulties with solving the problem independently. Is able to critically evaluate the received content / K_K01

Assessment methods and assessment criteria:

The exercises are passed based on class attendance and activity during solving tasks.
The seminars are passed based on the following: presentations prepared independently.

Grades for lectures are given based on a written test.

Achievement of the W1, W2, U2, and K1 effects is verified during the lectures, written tests, and exercises during solving tasks.
Achievement of the U1 and U3 effects is verified during the seminar and oral presentations.

Mode of study

full-time studies

Form of study

LLP Erasmus

Course

elective

Introductory subjects

Chemical materials science. Prerequisites: Metallic materials, polymeric materials, ceramic materials, and composites.

Programs

Field of study: chemistry

Form of course / number of hours / final requirement

lectures - 16 hours/grade passing
exercises - 4 hours/passing
seminars - 10 hours/passing

Author

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ECTS balance

Activity/ hours
1. Participation in lectures / 16
2. Self-study of lectures / 15
3. Participation in exercises / 4
4. Self-preparation for exercises / 10
5. Participation in seminars / 10
6. Self-preparation for seminars / 20
Hours/ECTS
Total student workload: 75 / 3
Classes with teachers: 30 / 1
Classes related to scientific work: 75 / 3

Information on course edition:

Default type of course examination report:

Exam

Bibliography:

missing bibliography in English