GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Synchrotron Radiation in Biology and Medicine, PG_00069718		
Field of study	Nanotechnology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2027/2028
Education level	first-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	4	Language of instruction	Polish
Semester of study	7	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Agnieszka Witkowska	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	15	1.0	9.0	25

Subject objectives

The aim of the course is to familiarize students with the principles of synchrotron radiation generation, its properties, and its unique research potential. Students will gain knowledge of advanced experimental techniques used for the analysis of biomaterials and nanobiomaterials applied in medicine, pharmacy, and environmental protection.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W01] has knowledge of materials science and understands its key role in the progress of civilization	The student has knowledge of the properties and methods of research on biomaterials and nanobiomaterials and understands the key role in the progress of civilization associated with this scientific discipline.	[SW1] Assessment of factual knowledge
[K6_W07] has systematic knowledge of the physical and chemical principles of nanotechnology (methods of obtaining nanostructures, types of nanostructures, their properties, basic research methods).	The student has knowledge of advanced research methods employing synchrotron radiation, particularly methods applied in the study of biomaterials and nanobiomaterials.	[SW1] Assessment of factual knowledge

Subject contents

Lecture:

1. Introduction: a brief history of synchrotron radiation (SR)
2. Electron motion in E and B fields and radiation of a relativistic electron
3. Methods of SR generation. Synchroton and beamlnes
4. Properties of SR
5. Interaction of PS with biological objects
6. Research methods available at synchrotron laboratories
7. Examples of SR applications in biomaterials and nanobiomaterials analysis

Prerequisites and co-requisites

Mastered basic laws and issues in the field of electromagnetism, quantum physics and materials physics.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Participation in classes</td><td>0.0%</td><td>10.0%</td></tr>
<tr><td>Written examination (open questions and/or multiple choice test) on the content presented during the lecture</td><td>51.0%</td><td>90.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>[1] Kowalski B., Paszkowicz W. (Editors) (2024) Promieniowanie synchrotronowe w fizyce i chemii ciała stałego: wybrane zagadnienia, UAM Publishing (in Polish)

[2] Wllmott P. (2011), An introduction to synchrotron radiation : techniques and applications, John Wiley & Sons, Ltd.,</td></tr>
<tr><td>Supplementary literature</td><td>[1] Podbielska (Ed.) (2011), Optyka biomedyczna, wybrane zagadnienia, Oficyna Wydawnicza Politechniki Wrocławskiej (in Polish)

[2] Selected articles and scientific studies</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Structure and operation of a synchrotron (basic methods of SR generation).

Properties of synchrotron radiation.

List and briefly describe two research methods that use synchrotron radiation.

Classify and briefly characterize X-ray spectroscopy methods according to a selected criterion.

List the benefits and limitations of using PS in biomaterials research.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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