GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Micro- and nanodozimetry, PG_00053320		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Optional subject group Specialty subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	blended-learning
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Division of Complex Systems Spectroscopy -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Brygida Mielewska	
	Teachers	dr Brygida Mielewska	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	0.0	0.0	15.0	45

E-learning hours included: 36.0

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	45	4.0	26.0	75

Subject objectives

To present the state of the art of knowledge in the field of ionizing radiation dosymetry in micro- and nanoscale.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	Student discussses the topics and methods in teh group	[SK1] Assessment of group work skills
[K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	student knows and understands selected laws of physics of electromagnetism, nuclear physics and radiobiology	[SW1] Assessment of factual knowledge
[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science	Student solves and presents problems related to the subject on the base of current literature and numerical models	[SU2] Assessment of ability to analyse information

Subject contents

Course content – lecture
Lectures: 1. Fundamentals of dosimetry and radiological protection - 3h, 2. Physical characteristic of the beam of ionizing radiation - 1h 3. Interaction of radiation with matter - 4h 4. Damage to biological material 1h 5. Effect of the low-LET beams in material/tissue 2h 6. Effect of the high-LET beams in material/tissue 4h 7. Definitions of microdosimetric quantities - 2h 8. Experimental microdosimetry 4h 9. Microdosimetry in medicine, biology and radiation chemistry - 3h 10. From micro- to nanodosimetry 1h 11. Experimental nanodosimetry - 2h 12. Nanodosimetry in biology - 2h 13. Final test 1h

Prerequisites and co-requisites

Physics fundamentals

<table>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>oral presentation</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Written exam or tests</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">H. Rossi, M.Zaider, Microdosimetry and its applications, SpringerVerlag Berlin Heidelberg 1996 Yigal Horowitz, Microdosimetric Response of Physical and Biological Systems to Low- and High-LET Radiations - Theory and Applications to Dosimetry, Elsevier Science 2006</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">B. Grosswendt, NANODOSIMETRY, FROM RADIATION PHYSICS TO RADIATION BIOLOGY, Radiation Protection Dosimetry (2005), Vol. 115, No. 14, pp. 19 B. Grosswendt NANODOSIMETRY, THE METROLOGICAL TOOL FOR CONNECTING RADIATION PHYSICS WITH RADIATION BIOLOGY , Radiation Protection Dosimetry (2006), Vol. 122, No. 14, pp. 404414</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. Electromagnetic radiation and its spectral ranges 2. Linear - quadratic model 3. Dosimetric quantities vs microdosimetric quantities</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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