GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

| | | | |
|---|---|---|---|
| Subject name and code | Micro- and nanodozimetry, PG_00053320 | | |
| Field of study | Biomedical Engineering, Biomedical Engineering | | |
| Date of commencement of studies | February 2026 | Academic year of realisation of subject | 2025/2026 |
| Education level | second-cycle studies | Subject group | Optional subject group<br>Specialty subject group<br>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 -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr Brygida Mielewska | |
| | Teachers | dr Brygida Mielewska | |

**Lesson types and methods of instruction**

| 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_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 |
| [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_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 |

**Subject contents**

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="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written exam or tests</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>oral presentation</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>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>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>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1. Electromagnetic radiation and its spectral ranges 2. Linear - quadratic model 3. Dosimetric quantities vs microdosimetric quantities</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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