GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Generation and Detection of Radiation, PG_00068254		
Field of study	Biomedical Engineering		
Date of commencement of studies	October 2025	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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Physics of Organic and Perovskite Photovoltaic Structures -> 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 hab. inż. Grażyna Jarosz	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	0.0	0.0	30

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	30	2.0	43.0	75

Subject objectives

To acquaint students with the physical foundations of generation and detection of electromagnetic radiation, the design and operation of sources and radiation detectors and their use in biomedical engineering

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	Student knows physical basics of the generation and recombination of e-m radiation, knows sources and detectors used in the microwaves, IR, VIS, UV and X ranges	[SW1] Assessment of factual knowledge
[K6_U02] can perform tasks related to the field of study in an innovative way as well as solve complex and nontypical problems, applying knowledge of physics, in changing and not fully predictable conditions	Student can discuss any issue related to matter of the subject	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task

Subject contents

Course content – lecture

Lecture 1. Properties and spectrum of electromagnetic radiation. 2. Visual and energetic photometry. 3. Bremsstrahlung and atomic radiation. 4.Thermal radiation. 5. Absorption and recombination in semiconductors. 6. Luminescence. 7. Photoelectric and thermoelectric effect. 8. Discharges in gases. 9. Incandescent lamps. 10. Discharge lamps. 11. Electroluminescent diodes. 12. Lasers. 13. Microwaves sources. 14. X-ray sources. 15. Detectors of electromagnetic radiation: classification and parameters. 16. Noises in detectors. 17. Photomultiplier. 18. Photoresistors, photodiodes. 19. Thermocouples. 20. Bolometers, pyroelectric sensors.

Course content – exercises

Seminar 1. Effect of electromagnetic radiation on the human body. 2. Lasers 3. Synchrotron radiation. 4. Generation of microwaves. 5. An eye as a detector of electromagnetic radiation. 6. Scattering of light. 7. CCD detectors. 8. Photographic emulsion. 19. Pyrometers. 10. X-ray lamps.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<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>Project</td><td>100.0%</td><td>30.0%</td></tr>
<tr><td>Midterm colloquium</td><td>50.0%</td><td>70.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">J. Godlewski, Generacja i detekcja promieniowania optycznego, PWN Warszawa 2002.

Z. Bielecki, A. Rogalski, Detekcja sygnałów optycznych, WNT Warszawa 2001.

G. H. Rieke, Detection of Light, Cambridge University Press.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">No requirements</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.Basic processes in which electromagnetic radiation is generated

2. Specify the types of noise in the detectors</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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