GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Particle Accelerator, PG_00049371		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2025/2026
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	Division of Complex Systems Spectroscopy -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Brygida Mielewska	
	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 is to present the physical aspects and technological solutions of acceleration of charged particles, particularly in medical applications

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W03] knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	- student knows the structure and physical properties of selected types of accelerators - student knows the main medical applications of acceleartors	[SW2] Assessment of knowledge contained in presentation
[K6_U07] can apply methods of process and function support, specific to the field of study	- student is able to calculate momentum and energy of relativistic particles - student is able to characterize properties and applications of selected methods of acceleration	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

1. Introduction to the subject and structure of the lectures Chronology of accelerators 2. Types and properties of accelerated particles - Motion of the charged particles in electric field 3. Linear methods of acceleration of particles 4. Circular acelerators - motion of the charged particles in magnetic field 5. Betatron method - classical cyclotron 6. Synchrotron, microtron 7. Radiotherapeutical accelerators - types and requirements 8. Electron acelerators for rutine therapy - basic elements 9. Electron acelerators - quality parameters and their control 10. Non-conventional therapy accelerators 11. Biomedical applications of synchrotron radiation 12. The production of medical isotopes in acelerators 13. Analitycal methodes based on accelerators 14 Tutor-marked assessment.

Prerequisites and co-requisites

1. Physics Very good knowledge of the preliminary physics course that is standarised for Biomedical Engeneering. 2. Introduction to atomic and molecular physics Atom and its components, bremsstrahlung effect 3. Nuclear and particle physics Spontaneous and induced nuclear transitions, interactions of ionising radiation with matter 4. Radiobiology and radiation protection Interactions of ionising radiation with biological matter, basic radiological quantities, dosimetry of ionising radiation

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
final test	50.0%	50.0%
Half term test	50.0%	50.0%

Recommended reading	Basic literature	1. Skrypt z materiałami do przedmiotu Akceleratory cząstek 2. Materiały do przedmiotu opracowane w formie edukacji na odległość, 3. Scharf W., Akceleratory cząstek naładowanych, PWN Warszawa 4. Scharf W., Akceleratory biomedyczne, PWN Warszawa
	Supplementary literature	1. Nałęcz M. (pod red.), Biocybernetyka i inżynieria biomedyczna 2000, t.9 Fizyka Medyczna, Akademicka Oficyna Wydawnicza EXIT, Warszawa 2002 2. Scharf W., Biomedical Particle Accelarators, American Institute of Physics, NY 1993
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Desribe the particle motion in electric and magnetic field	
Work placement	Not applicable	

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