University of Gdańsk

Subject card

Subject name and code	Quantum Mechanics for Bioinformatics, PG_00193538		
Field of study	Bioinformatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2028/2029
Education level	Bachelor's 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	academic	Assessment form	credit
Conducting unit	Institute of Theoretical Physics and Astrophysics -> Faculty of Mathematics, Physics and Informatics -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Marcin Wieśniak	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	30.0	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	0.0	45.0	75

Subject objectives

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Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOINL3_W02] Has advanced scientific knowledge necessary to understand the basic processes in living organisms.	Axioms of Quantum Mechanics Fundamental Concepts of Quantum Information Theory Consequences of Wave Function Evolution Methods for Describing the Evolution of Open Systems	[SW3] text preparation/written work
[BIOINL3_U02] Graduate is able to apply knowledge of natural sciences and science to formulate, analyze and solve problems related to bioinformatics	357 / 5 000 Understands the postulates of quantum mechanics in the Copenhagen approach Can create simulations of the evolution of basic quantum systems (e.g., harmonic oscillator, free particle) Understands the assumptions and consequences of Bell's theorem Understands the problem of describing open systems	[SU3] text preparation/written work [SU6] demonstration of practical skills

<table>
<tr><td>Subject contents</td><td>1. Axioms of Quantum Mechanics: Spin-1/2 as an Example (2 hours)
2. Informational Consequences of Qubits (Quantum Superposition)
(2 hours)
3. Multiple Qubits and Entanglement with Simulations (4 hours)
4. The Uncertainty Principle with Simulations (2 hours)
5. Free Particle Equations of Motion, Tunneling, with Simulations (4 hours)
7. Harmonic Oscillator Simulations (4 hours)
8. Perturbation Theory in the Evolution of a Harmonic Oscillator (4 hours)
9. Open System Simulation (e.g., Spin Chain Evolution) (4 hours)
(26 hours total)</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>n</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>n</td><td>51.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>n</td></tr>
<tr><td>Supplementary literature</td><td>n</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>n</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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