KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

UNIWERSYTET GDAŃSKI

UNIA EUROPEJSKA
EUROPEJSKI
FUNDUSZ SPOŁECZNY

Projekt jest współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego

Course title **Quantum computation**	**ECTS code** 13.2.0417

Name of unit administrating study
Department of Mathematics, Physics and Informatics

Studies

Faculty	**Field of study/ phd studies/doctoral school/postgraduate studies**	**Type**	**Form**
Quantum Information Technology	MSc studies	stationary	

Teaching staff
prof. dr hab. Paweł Horodecki

Forms of classes, the realization and number of hours	**ECTS credits**
A. Forms of classes, in accordance with the UG Rector's regulations **lecture, auditory classes**	**5 ECTS**
B. The realization of activities **classes in the teaching room of the University of Gdańsk** **blended learning**	
C. Number of hours **lecture 30, classes 30**	

The academic cycle
According to study program

Type of course	**Language of instruction**
mandatory	**English**

Teaching methods
problem lecture
lecture with multimedia

discussion
solving problems
case study

Form and method of assessment and basic criteria for evaluation or examination requirements

A. Final evaluation, in accordance with the UG study regulations
Exam
Credit with grade

B. Assessment methods
Written exam
Test

C. The basic criteria for evaluation or exam requirements
The final grade is determined according to the indicator percentage ("UG Study Regulations").

D. Method of verification of the established effects of education

established effect of education	test	exam
		+
W01		+
W02	+	
U01	+	
U02		

Required courses and introductory requirements

A. **Formal requirements**
none

B. **Prerequisites**
none

Aims of education

To show main algorithms performed by quantum computing and analyze their specific features

Course contents

1) **Measurement and quantum teleportation**
2) **No cloning, entanglement, and density matrices**
3) **Non-local games**
4) **Entropy and Entanglement Distillation**
5) **The Deutsch-Josza and Bernstein-Vazirani algorithms**
6) **Simon's algorithm and applications to cryptography**
7) **The Quantum Fourier Transform**
8) **Shor's quantum factoring algorithm**
9) **Grover search and approximate counting**

Bibliography of literature

A. **Literature required to pass the course**
- **Nielsen and Chuang, Quantum Computation and Quantum Information**

The learning outcomes (for the field of study and specialization) K_W01 K_W02 K_W04 K_U01 K_U02	**Knowledge** The student knows: W01: Main algorithms of quantum computing (K_W01, K_W02, K_W04) W02: Specific features and abilities of quantum computation (K_W04)
	Skills The student can: U01: Analyze properties of quantum algorithms (K_U01) U02: Solve problems within the theory of quantum computation (K_U02)
	Social competence

Contact
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