Syllabus

Term:	2022/23/2	**Subject name:**	Quantum Informatics, Cryptography	**Subject code:**	IVM180ANMI

Unit (Unit code)   (MIK-IV)

Lecturer responsible for the course: Dr. SZABÓ Levente
Requirement: Mid-semester grade
Classes per week :   2/0/0/0
Classes per term: 14/0/0/0

Purpose of education:

After successful completion of the course students will be enlightened upon the main concepts of some parts of the quantum physics, quantum information, and quantum computation. These skills will help them to make their future work better. During the semester, the following topics will be taught: basics of quantum mechanics, searching, and factoring quantum algorithms, some quantum cryptographycal protocols, quantum teleportation.

Contents:

Short overview of the subject: basics of quantum mechanics, quantum bits, quantum gates, no cloning theorem, theory of entanglement, teleportation, dense coding, Deutsch-algorithm, searching algorithms, error correcting, BB84 and B92 protocols.

Week by week:

The weekly material can be found in the pdfs released by me each week.

- Physical quantities as operators, Heisenberg's commutation relations, the linear harmonic oscillator
- Quantum mechanical description of the physical state, physical meaning of the state function
- Neutron-interference and the exact interpretation of the Born-hypothesis
- Quantum bits, quantum gates
- No cloning theorem
- Theory of entanglement, dense coding
- Bell enequalities
- Quantum teleportation
- Spring holiday
- Deutsch algorithm
- Grover algorithm
- Quantum error correcting
- BB84 protocol
- B92 protocol
- Exam

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System of examing and valuation:

Oral exam.

Students whose grade is at least 2 have the opportunity to improve it. A grade can be made better by demonstrating of a solution of a task based on the student's own idea. In a case like this the original grade can be incremented by maximum one.

In the case of having a performance evaluated on the closed range of 30 – 39%, the student can take a corrective exam to improve / correct his / her evaluation. The final grade is calculated according to the following expression:

final grade = (exam + corrective exam) / 2

Exam which has not been taken counts with 0 value in the expression above.

Grade calculation as a percentage

fail(1) 0 - 39%
pass(2) 40 - 54%
satisfactory 55 - 69%
good(4) 70 - 84%
excellent(5) 85 - 100%

Bibliography:

John Preskill, California Institute of Technology, Lecture Notes for Physics 229: Quantum Information and Computation, 1998

Also, the weekly material can be found in the pdfs released by me each week.