

# Physics of quantum computation

**86-748-01**

**Lecturer:** Prof. Dmitri Gutman

**Course type:** Lecture

**Date:** 2019-2020

**semester:** B

**weekly hours:** 3

## **Aim of course:**

The purpose of this course is to study the aspect of the quantum mechanics relevant for the problem of quantum computations.

Upon completion of the course, the student will be able to write simple codes for the quantum computers and design algorithms for quantum computation.

## **Details of subjects to be covered:**

The main purpose of the course is to teach students the basic ideas of quantum computations, and related physical ideas, such as geometric phase and adiabatic manipulation.

In addition to the conventional lectures, the students will be running their programs or real Google quantum computers.

## **Syllabus:**

### Table of content:

- 1) Elements of classical computing
- 2) Basic concepts of quantum computing
- 3) Simplest quantum algorithms
- 4) One-bit manipulations
- 5) Adiabatic manipulations, geometric phase
- 6) Open quantum systems, dephasing
- 7) Topologically protected quantum systems

**Prerequisites:**

Students are expected to know the basic quantum mechanics.

**Grading:**

The grade is 100% home work.

**Bibliography:**

John Preskill "Quantum information and computation".