PH510 / QU511 Quantum Computing (Fall 2024)

- Instructor: Changhun Oh (changhun0218@kaist.ac.kr)
- TA: Yongmin Kang
- Class Hours: Monday and Wednesday 10:30-12:00 (3 credits / semester)
- Exam Hours: TBD
- Classroom: 3438 Natural Science Building (E6)
- Office Hours: By appointment
- Main Textbook:
  - M. A. Nielson and I. L. Chuang, Quantum Computation and Quantum Information (Cambridge)
- References:
  - A. Y. Kitaev et al., Classical and Quantum Computation
  - J. Preskill, Lecture notes for Physics 219: Quantum Computation at Caltech
- Evaluation (tentative)
  - Midterm exam:30%, Final exam:30%, Assignments:30%, Attendance&Participation:10%
- Course Description
  This course will offer a comprehensive introduction to quantum computing. I will first introduce the basic elements of classical and quantum computers and then provide various quantum algorithms such as quantum Fourier transformation and quantum search algorithms. I will then cover quantum noise, quantum error correction, and fault-tolerant quantum computation.

- Lecture Schedule (tentative)

Week	Topic
1	Review of linear algebra
2	Postulates on quantum mechanics
3	No class (Chuseok)
4	Basics of classical computer and computational complexity
5	Quantum circuits
6	Quantum computation (No class on Oct. 9th, Hangul day)
7	Quantum computational complexity
8	**Midterm exam**
9	Quantum Fourier transformation and its applications
10	Quantum search algorithms
11	Quantum noise
12	Basics of quantum error correction
13	Stabilizer codes
14	Fault-tolerant quantum computation
15	Theory of recent quantum supremacy experiments (if time permits)
16	**Final exam**