

QCLASS23/24

Introductory & Intermediate Level Quantum Courses

Welcome!



Sep 11, 2023

We uniquely offer

- Global, fully-virtual, free
- Linked to actual courses (in collaboration with University of Latvia)
- Certification with grading
- Open-sourced self-contained hands-on notebooks for every lecture
- Live and recorded lectures & labs
- Regular mentoring support at the class server
- Exercises for practicing and quizzes & exams for evaluation

Virtual QClass23/24

- QCourse101-1: Fundamentals of Quantum Computing & Programming
- QCourse104-1: Introduction to Quantum Algorithms
- Self-study module “Quantum Key Distribution”
- Self-study module “Quantum Error Correction”
- Self-study module “Quantum Annealing”
- Self-study module “Topological Quantum Computing”
- QJam2023 “Quantum Games”
- Invitation to CLASSIQ Quest bootcamp & hackathon
- Hands-on Quantum Algorithms Development with Classiq (certified mini workshop)
- QCourse551-1 “Quantum Software Development with Classiq” (invitation based)
- Quantum Game Jam 2023
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Introductory QCourses

- **QCourse101-1: Fundamentals of Quantum Computing & Programming**
 - 3 ECTS, undergraduate level, 14 weeks from Sep 11 to Dec 17
 - Review of python, mathematics, & quantum mechanics.
 - Basics of classical and quantum systems. Superposition & measurement. Operations on real-valued qubits.
 - Entanglement, superdense coding, and quantum teleportation.
 - Bloch sphere and complexed-valued quantum operators.
- **QCourse104-1: Introduction to Quantum Algorithms**
 - 3 ECTS, undergraduate level, 13 weeks from Feb 5 to May 5
 - Classical gates.
 - Conventional quantum algorithms: Deutsch Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon's Algorithm.
 - Grover's search algorithm & Solving Max-Cut problem using Grover's Search.
 - Quantum Fourier Transform & phase estimation.
 - Shor's algorithm.

QBook101

- A new book style tutorial combining our Bronze, Nickel, Silver with certain extensions
- <https://qworld.net/qbook101/>
- Composed by Jupyter notebooks
- Ready to run on Google Colab (no local installations)
- Alternatively it can be used locally (after certain installations)
- *You may also try Binder, qBraid, Strangework, etc. But, we do not have any preparation for any such solutions.*
- We will share QBook101 with you part by part, as we are still working on it
- QBook101 uses Qiskit & Cirq

Self-study modules

- 4 weeks, 3 online/recording sessions, 3 exercises, 3 tests, 60% for certificate
- Self-study module “Quantum Key Distribution”, 4 weeks in Dec & Jan
- Self-study module “Quantum Error Correction”, 4 weeks in May
- Self-study module “Quantum Annealing”, 4 weeks in May
- Self-study module “Topological Quantum Computing”, 4 weeks in May
- Each has its own tutorial (no promise, but we will try to put them on Colab as well)

Partners

- University of Latvia
- Latvian quantum initiative
- Unitary Fund
- Classiq
- Quantum Game Jam 2023
- *We are talking with a few industrial partners and hope to have them on board*
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Local partner(s): Institute of Business Administration (Karachi)

Online tools

- Discord, main platform
 - AULA
 - Social
 - Sponsors
 - QCLASS
 - Read-only
 - Our announcements, schedule, recordings, links, reminders, etc.
 - QCOURSE101
 - QCourse101 related discussions
 - QCOURSE104, QKD, QJAM2023,....
- Canvas for quizzes and exams
 - Each quiz/exam will have its own submission policy
 - We will send the invitations in the first week.
- Zoom for online meetings
 - Recordings will be shared on Discord
- We will send emails time to time to announce the new programs

Autumn semester (I)

The online lectures will be held at 18:00-20:00 (Latvia) on Mondays, and the online labs will be held at at 18:00-20:00 (Latvia) on Wednesdays.

- 1, Sep 11 – Sep 17 Review of Python, math, and quantum mechanics
- 2, Sep 18 – Sep 24 Online Quiz 1 (10%)
- 3, Sep 25 – Oct 1 Basics of classical systems
- 4, Oct 2 – Oct 8 Online Quiz 2 (10%)
- 5, Oct 9 – Oct 15 Basics of quantum systems
- 6, Oct 16 – Oct 22 Quantum operators on a real-valued qubits
- 7, Oct 23 – Oct 29 Online Quiz 3 (20%)
- 8, Oct 30 – Nov 5 Entanglement and basic quantum protocols
- 9, Nov 6 – Nov 12 Online Quiz 4 (10%)
- 10, Nov 13 – Nov 19 Complex-valued qubits & Bloch sphere – I
- 11, Nov 20 – Nov 26 Complex-valued qubits & Bloch sphere – II

Autumn semester (2)

- 12, Nov 27 – Dec 3 Online Quiz 5 (20%)
- 13, Dec 4 – Dec 10 Trial online exam
- 14, Dec 11 – Dec 17 Online exam (30%)
- 15, Dec 18 – Dec 22 QJam2023 | QKD
- 16, Dec 23 – Jan 1 break
- 17, Jan 2 – Jan 7 QJam2023 | QKD
- 18, Jan 8 – Jan 14 QJam2023 | QKD
- 19, Jan 15 – Jan 21 QJam2023 | QKD
- 20, Jan 22 – Jan 28 QJam2023
- 21, Jan 29 – Feb 4 Concluding Autumn semester

Grading & Certificates

- We follow a strict deadline policy.
- Undergrad & Grad tracks: The content is the same, for grad-level certificates, you should do more
- QCourse480-1: Individual studies in quantum computing (3 ECTS).
 - By using your two highest scored self-study modules, you can get a certificate for undergraduate level course: Then, you will not get certificate for these two self-study modules.
- QCourse501-1: Elements of Quantum Computing and Programming (3 ECTS, graduate level)
 - 70% of your score in QCourse101-1 & 30% of your score for QKD
 - Then, you will not get certificate for QCourse101-1 or QKD.
- QCourse504-1: Elementary Quantum Algorithms (3 ECTS, graduate level)
 - 70% of your score in QCourse104-1 & 30% of your highest scored of self-study module in Spring 2024
 - Then, you will not get certificate for QCourse104-1 or that self-study module in Spring 2024.
- The passing grades for QCourse is 39.50 out of 100. The grade is specified on the QCourse certificates.
- For self-study modules, you should get 60 out of 100. No grade on the certificates.

Getting credits

This is up to your local program. You must talk with your program director, etc. Our certificates will list down the topics covered, credit points, linked courses, etc.

QCourses are linked to actual courses:

- QCourse101-1, QCourse104-1, & QCourse480-1 are linked to the undergraduate third year special seminar courses at the Faculty of Computing, University of Latvia
- QCourse501-1 & QCourse504-1 are linked to the graduate courses at the Faculty of Computing, University of Latvia

Our team

- Abuzer Yakaryilmaz, QClass coordinator
- Jibran Rashid, Self-study modules coordinator
- Claudia Zendejas-Morales, Coordinator for QCourses101/104 & QBook101
- Denisa Vítková - Tech Support, Mentor
- Mahdi Sanagostar - Tech Support, Mentor, Lab-assistant
- Kennet Isamade - Mentor
- Murshed SK - Mentor
- Razeen Shuja - Mentor, Lab-assistant
- Thembelihle Rose Dlamini - Mentor
- Rumlah Amer - Mentor, Lab-assistant
- Ioannis Theodonis - Mentor
- Viktor Olejár - Mentor, Lab-assistant

Questions & Answers