

Applied Quantum Computing

Module Guide 2021

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Module ID	
Academic Year	2020-2021
ECTS	3
Contact hours	80
Self study hours	10
Course site	https://www.amsterdamuas.com/summerschool

Module overview

This guide gives you an overview of the summerschool course Applied Quantum Computing

1.1 Content

In recent years an considerable progress in the field of Quantum Computing regarding the hardware and software has taken place. Although fault tolerant full scale Quantum Computing is not expected within five to ten years, companies need to built up expertise. The possibility to decrypt by a Quantum Computer foreshadows the need to become aware of Quantum Security.

The summerschool Applied Quantum Computing offers several perspectives on Quantum Computing. Students get an introduction in understanding and developing applications for Quantum Computing.

1.2 Learning outcomes

#	You can:
1.	implement a basic quantum algorithm and understand its behaviour,
2.	use a platform specific for quantum computing environment to implement a basic application,
3.	learn about the international race to engineer a quantum computer,
4.	learn about the quantum computing ecosystem in the Netherlands, Europe and global,
5.	learn to discern between reality and hype w.r.t. quantum computing.

1.3 Learning activities

- ✓ attending presentations by the staff and external speakers,
- ✓ participation in workshops to learn hands-on several skills w.r.t. quantum computing,
- ✓ working in an international projectteam of 3 or 5 students,
- ✓ team progress presentations and reporting,
- ✓ visiting scientific and commercial organisations related to quantum computing.

1.4 Teaching methodologies

- ✓ lectures
- ✓ workshops with exercises
- ✓ teamwork
- ✓ presentations by students

1.5 Study materials & recommended further reading

During the course several sources will be used. Some pointers to interesting online sources:

- <https://quantum.country/qcvc>
- <https://qiskit.org>

A laptop on in which the Qiskit environment can be installed and used is a prerequisite for attendance.



1.6 Assignments & assessment

Assignments / Tests	Weight (%)
Team reports with an individual reflections of team members	50%
Team presentations of prototype	50%
	100%



2. Lesson Planning

Week 1 Day 1	8:00 – 9:00 Registration 9:00 - 10:00 Opening Summer school 10.00 – 12.30 Introduction to quantum computing 12:30 – 13:30 Lunch 13.30 – 16.00 Introduction to tools for quantum computing 16:00 – 17:00 Dutch Culture/ film 17:00 Welcome drinks
Week 1 Day 2	09.00 – 10.30 One qubit world 10.30 – 12.30 Workshop Mathematics for quantum computing 12:30 – 13:30 Lunch 13.30 – 15.30 Multi qubit world 15.30 – 17.00 Workshop Mathematics for quantum computing
Week 1 Day 3	09.00 – 12.30 Basic quantum algorithms 12:30 – 13:30 Lunch 13.30 – 17.00 Workshop on basic quantum computing
Week 1 Day 4	09.00 – 10.30 Basic quantum algorithms 10.30 – 12.30 Workshop on basic quantum computing 12:30 – 13:30 Lunch 13.30 – 17.00 Visit to Nikhef
Week 1 Day 5	09.00 – 12.30 Teamwork on subject 12:30 – 13:30 Lunch 13.30 – 15.30 Team workshop on subject 15.30 – 17.00 Guest lecture by member of QuSoft
Week 2 Day 1	09.00 – 12.30 Teamwork 12:30 – 13:30 Lunch 13.30 – 15.30 Teamwork, preparing presentation 15.30 – 17.00 Presentation on plans
Week 2 Day 2	09.00 Visit to Qblox and QuTech
Week 2 Day 3	09.00 – 12.30 Teamwork 12:30 – 13:30 Lunch 13.30 – 15.30 Team workshop on subject 15.30 – 17.00 Teamwork
Week 2 Day 4	09.00 – 12.30 Teamwork 12:30 – 13:30 Lunch 13.30 – 15.30 Teamwork, preparing presentation 15.30 – 17.00 Presentation



Week 2 Day 5	09.00 – 12.30 Discussion on prototypes
	12:30 – 13:30 Lunch
	13.30 – 16.00 Guest lecture
	16:00 Certificate ceremony
	17:00 Farewell drink

