Teaching guide

IDENTIFICATION DETAILS

Degree:	Diploma in Quantum Computing (Awarded Degree associated with Mathematical Engineering)
Faculty/School:	Higher Polytechnic School
Course:	QUANTUM COMPUTING
Type:	Compulsory Internal
ECTS credits:	4
Year:	3
Code:	49515
Teaching period:	Sixth semester
Teaching type:	Classroom-based
Language:	English
Total number of student study hours:	100

Teaching staff	E-mail
Ricardo Stefanescu Abad	rstefanescu@protonmail.com

SUBJECT DESCRIPTION

The purpose of this course is to provide hands on practice in Quantum Computing.
Starting from the main concepts behind this new paradigm, such as superposition, entanglement and interference.
A deep dive into some fundamental quantum algorithms is given and a study of the implementation on universal quantum computers.

The purpose of this course is to provide hands on practice in Quantum Computing.
Starting from the main concepts behind this new paradigm, such as superposition, entanglement and interference.
A deep dive into some fundamental quantum algorithms is given and a study of the implementation on universal quantum computers.

GOAL

The objective of this subject is to establish the QC programming capability for the students to develop and complete their
roadmap in Quantum Computer in next courses.

PRIOR KNOWLEDGE

It is needed knowledge about Linear Algebra and basic concepts of Quantum Computing. Students will get this knowledge through two different subjects in previous course.

COURSE SYLLABUS

1. Classical computing
- Classical gates
2. Quantum computing Basics
-One Qubit gates
-Superposition and Hadamard gate.
-Entanglement and CNOT gate
-Running circuits in Simmulators and Quantum Computers
-Phase Kickback
2.QC Algorithms
-Berstein-Vazirani algorithm
-Search algorithms: Grover’s algorithm
-Factorization algorithms: Shor’s algorithm
* Labs with Qiskit

EDUCATION ACTIVITIES

Participatory magistral classes in order to delve into specific didactic contents
individual or group office hours
Practical classes
Laboratory
Individual or group work

DISTRIBUTION OF WORK TIME

CLASSROOM-BASED ACTIVITY	INDEPENDENT STUDY/OUT-OF-CLASSROOM ACTIVITY

40 hours	60 hours

SKILLS

Comprehension of the Atoms of Quantum Information

Comprehension of the atoms of Quantum Algorithm Design

Comprehension of basic Quantum Algorithms and the rational of their design

Programming using Qiskit for programming Quantum Algorithms

SPECIFIC LEARNING RESULTS

Qiskit Best Practices

LEARNING APPRAISAL SYSTEM

a) Partial exam: 25 %
b) Final exam: 50 %
c) Practices: 15 %
Students passing the 5.0 grade with previous criteria, and at least 80% of attendance can receive a bonus for proactive attendance and participation. This bonus can be up to 10 %.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

Tom Wong Textbook: Introduction to Classical and Quantum Computing
https://www.thomaswong.net/introduction-to-classical-and-quantum-computing-1e4p.pdf