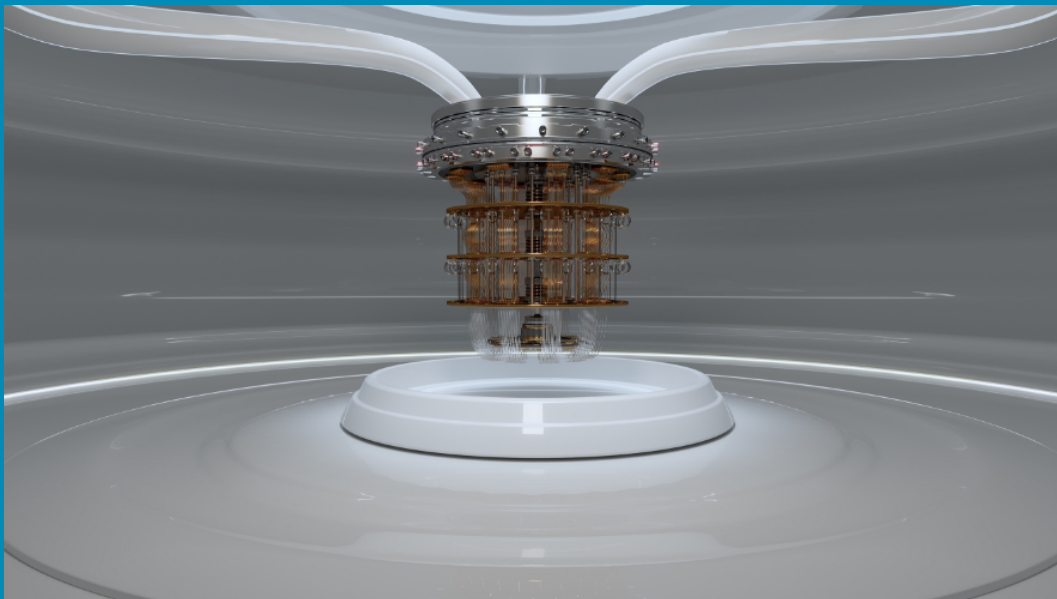


MASTER IN QUANTUM INFORMATION SCIENCE AND TECHNOLOGY

Escola
de Enxeñaría de
Telecomunicación



1. The degree

Overview

We are at the beginning of the second quantum revolution, which seeks to take advantage of the control over the quantum phenomena achieved in the last two decades to create effective and revolutionary technologies in different fields, particularly in information management. This new science will generate important opportunities associated with simulation technologies, sensors, computing, communications and cryptography. Expected applications include efficient assembly handling of massive data, the solution of exponential combinatorial problems, computer design of molecules and drugs, the implementation of unconditionally secret communications and the generation of secure keys, or the ability to measure physical quantities with much greater accuracy. The science and technology of quantum information is called to be one of the pillars of the communications and future computing.

The Interuniversity Master in Science and Quantum Information Technologies (MQIST) is one strategic alliance of the Universities of Santiago de Compostela, A Coruña and Vigo towards the offer specialized postgraduate studies in this field at the frontiers of technology, with an approach rigorous and extensive scientific that goes from scientific principles (physics, mathematics and computing) and culminates in application aspects in industrial environments and problems.

The master's degree has 60 ECTS divided in a modular way into two semesters, with a scientific part common and a wide set of optional subjects organized in three areas, quantum information, quantum computing and quantum communications.

MQIST's mission is to train a new generation of scientific specialists and technologists highly qualified in the area of computing and quantum information processing. The European Union has declared quantum technology as a scientific and technological priority launch of the Quantum Flagship program, to develop the European quantum initiative. Companies and large corporations (Google, Amazon, Microsoft, ...) are also investing heavily in laboratories to gain advantage in this new technology. This master's degree allows people with degree training in science, engineering or computer science gain advanced knowledge to a professional career in this area.

Why study this?

The objectives of the MQIST are:

- Provide specialized and advanced training in Science and Quantitative Information Technology that empowers students for its incorporation into technological companies and groups of competitive research.
- Provide an up-to-date knowledge of the status of development of a field that evolves every day, as well as its own main actors
- Give skills and abilities in one or more specific aspects of ancient technologies: computing, communications, metrology, etc.

- Introduce students to research topics that interest them allow you to carry out a doctoral thesis.

Who can study this?

The recommended entry profile is that of university graduates no The field of science (mainly physics but also chemistry, Mathematics, Nanoscience and Nanotechnology and other qualifications related) and engineering (mainly Engineering Informatics and Telecommunications Engineering, but also Industrial Engineering, Aerospace Engineering, Engineering Physics and other related qualifications).

In a more concrete sense, knowledge in the field is necessary of Mathematics (linear algebra, analysis, probability) and recommended in basic programming.

What do graduates work in?

- Quantum computer scientists and engineers.
- Specialists in quantum communications, networks and digital Internet.
- Specialists in quantum metrology, sensing and calibration with ancient instruments.
- Specialists in quantum computing algorithms for finance, biology, artificial intelligence and large-scale optimization.
- Design and management of classical-quantum information systems.
- Design and engineering of quantum computers.
- Scientists and engineers in quantum information.

Industrial environment

Advancement in ancient science and technology is one of the areas that the European Union concentrates efforts to be a leader and help it creation of new strongly competitive companies in communications, computing and measurement. Within the European space, companies such as Airbus Defense and Space, Alcatel Lucent, ASML, Bosch, IBM, Nokia, IMEC, Safran, Siemens or Thales have great interest in it historical information, and more small registered companies e2v technology, Gooch & Housego, ID Quantique, M Squared Lasers, Lux Quanta, Muquans, Single Quantum or Toptica occupy positions outstanding in their specific markets. In the medium and long term, as predicted by the IEC, the appearance of companies specializing in creation of concrete solutions based on computing and a quantitative information will be a consequence of a growth of QIST market of 50% annually.

Collaborations

- atlanTTiC
- GRADIANT
- IGFAE
- CITIC
- CTAG
- ATOS
- CESGA

What is taught?

Fundamentos de información cuántica: mecánica cuántica, entropía e capacidade, elementos de computación (circuitos), medidas cuánticas

Estruturas de computación e comunicacións: ordenadores cuánticos, algoritmos de computación, implementación de algoritmos, distribución cuántica de claves, Internet cuántica, corrección de erros

Instrumentación, medida e uso de dispositivos cuánticos

Áreas de aplicación das tecnoloxías cuánticas: optimización, intelixencia artificial, finanzas, lóxística, transporte, bioloxía fundamental, sensado de alta precisión, meteoroloxía, etc.

Admissions

The Comisión Académica of the Máster will be responsible for valuing the previous merits, to ensure compliance with the knowledge necessary to undertake this máster. The concepts to be evaluatedán contributeá maximum of points according to the following table.

Undergraduate degrees:

- Grade in Physics, Enxeñaría de Telecomunicacións and Informática or equivalent (5 pts.)
- Other titlesón Grao en Enxeñará and equivalent (5 ptos.)
- Other degrees in Science and Technologyía: Chemistry, Mathematics, Nanotechnologyía, and equivalent (ata 4 pts.)

Curriculum vitae

- Academic file (minutes 2 pts.)
- Other másters studied in subjects related to the máster (up to 1 pt.)
- Professional or research experience in the área of the máster (up to 1 pt.)

Credit transfer

The Comisión Académica will establish equivalences between studies surpassed in other universities and those that can be recognized in the syllabus. Tamén power to establish equivalence tables specifying the credits that are recognized.

Accredited work and professional experience could be tamén recognized in the form of credits, in a number not greater than 15% of the title's total credits (9 ECTS)

En chant to the recognitions for own titles of other universities, establécese a m máximum of 9 ECTS in operation of the contained.

2. Admissions dates

The application and enrollment period can be found here.

In this link you can find the official text for enrollment regulations.

	APPLICATIONS	DRAFT	AMENDMENTS	APPROVED APPLICATIONS	ENROLLMENT
1st period	2--9 July	20 July	21--23 July	27 July	28--31 July
2nd period	25-30 August	8 September	9-11 September	14 September	15-18 September

3. Curriculum

Quantum mechanics I	3, OB	Applications of Quantum Computing	3, OP
Quantum mechanics II	3, OB	Quantum Computing and High-Performance Computing	3, OP
Foundations of Quantum Information	3, OB	Quantum Materials	3, OP
Introduction to Quantum Computing	3, OB	Quantum Sensing and Metrology	3, OP
Foundations of Quantum Communications	3, OB	Open Systems and Quantum Thermodynamics	3, OP
Tools for Quantum Computing	3, OP	Quantum Error Correction	3, OP
Programming of Quantum Computers	3, OP	Quantum Networks	3, OP
Quantum Computing and Machine Learning	3, OP	Numerical Methods in Quantum Computing	3, OP
Quantum Optics	3, OP	Introduction to Quantum Simulation	3, OP
Physical Systems for Quantum Information	3, OP	Science and Technology of Superconductivity	3, OP
Advanced Quantum Communications	3, OP	Semiconductor Photonics	3, OP
Advanced Quantum Information Theory	3, OP	Quantum Systems based on Rules	3, OP
Photonic Technology for Quantum Communications	3, OP	Quantum Communications Laboratory	3, OP
Advanced Quantum Mechanics	3, OP	Satellite Quantum Communications	3, OP
Architectures for Quantum Computing	3, OP	Internship I	3, OB
Experimental Techniques for Quantum Information	3, OP	Internship II	3, OP
Master's Thesis	15		

4. Faculty



Prof. Fernando Aguado -
Satellite Commun.



Prof. Marcos Curty - Quantum
Commun.



Prof. Rebeca Díaz - Quantum
Information Theory



Manuel Fernández Veiga -
Quantum Error Correction



Prof. Ana Fernández Vilas -
Quantum Networks



Prof. Javier González Castaño
- Quantum Networks



Prof. Carlos Mosquera - Quan-
tum Commun.



Ángel Paredes - Quantum Me-
chanics

Contact: teleco.mqist@uvigo.es
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