Curriculum B: Quantum Technologies paths / 1

requires individual study plan

Insegnamento	CFU	SSD
CORE - EXPERIMENTAL AND APPLIED (22 ECTS Total)		
LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS I	10	FIS/01
LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS II	6	FIS/01
PARTICLE PHYSICS III	6	FIS/01
CORE - THEORETICAL AND FOUNDATIONS OF PHYSICS (6 ECTS)		
THEORETICAL PHYSICS I	6	FIS/02
CORE - MICROPHYSICS OF MATTER AND FUNDAMENTAL INTERACTIONS (12 ECTS)		
APPLIED QUANTUM TECHNOLOGIES	6	FIS/04
PARTICLE PHYSICS I	6	FIS/04
RELATED / SUPPLEMENTARY EDUCATIONAL ACTIVITIES (18 ECTS)		
QUANTUM INFORMATION AND QUANTUM COMPUTING	6	FIS/02
Due insegnamenti affini e integrativi (12 ECTS) da scegliere tra i seguenti		
RIVELATORI DI RADIAZIONI	6	FIS/04
APPLIED ELECTRONICS	6	ING-INF/01
STATISTICS AND DATA ANALYSIS	6	FIS/01
SOLID STATE PHYSICS	6	FIS/03
ELECTIVE COURSES / LIBERA SCELTA (12 ECTS)		
Corsi a scelta libera dello studente (12 ECTS totali):		
GENERAL RELATIVITY	6	FIS/02
THEORETICAL PHYSICS II	6	FIS/02
THEORY AND PHENOMENOLOGY OF FUNDAMENTAL INTERACTIONS	6	FIS/02
* EXPERIMENTAL COSMOLOGY	6	PHYS-05/A
* ASTROPHYSICS OF GRAVITATIONAL WAVES	6	PHYS-05/A
FABRICATION AND CHARACTERIZATION OF NANO AND QUANTUM MATERIALS	6	FIS/03
RADIOATTIVITA' (*)	6	FIS/04
PROVA FINALE / TESI DI LAUREA (38 ECTS)		
Preparazione tesi magistrale ed esame finale:		
MASTER THESIS / PROVA FINALE	38	-

Quantum Sensors & Hardware

A researcher at the scientific frontier, combining a rigorous foundation in theoretical physics with **advanced quantum technologies**.

In this profile, **superconducting quantum devices** are leveraged both as innovative sensors to study fundamental phenomena (from dark matter and neutrinos to gravitational waves) and for quantum computing applied to physics.

You will develop deep theoretical insights alongside expertise in the design, simulation, and control of quantum hardware, equipping you for high-impact roles in **fundamental research** and the **quantum industry**.

* *Astrophysics and Space Physics*

for questions: Prof. A. Nucciotti
angelo.nucciotti@unimib.it

Curriculum B: Quantum Technologies paths / 2

requires individual study plan

Insegnamento	CFU	SSD
CORE - EXPERIMENTAL AND APPLIED (22 ECTS Total)		
LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS I	10	FIS/01
LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS II	6	FIS/01
PARTICLE PHYSICS I	6	FIS/04
CORE - THEORETICAL AND FOUNDATIONS OF PHYSICS (6 ECTS)		
THEORETICAL PHYSICS I	6	FIS/02
CORE - MICROPHYSICS OF MATTER AND FUNDAMENTAL INTERACTIONS (12 ECTS)		
APPLIED QUANTUM TECHNOLOGIES	6	FIS/04
SOLID STATE PHYSICS	6	FIS/03
RELATED / SUPPLEMENTARY EDUCATIONAL ACTIVITIES (18 ECTS)		
QUANTUM INFORMATION AND QUANTUM COMPUTING	6	FIS/02
Due insegnamenti affini e integrativi (12 ECTS) da scegliere tra i seguenti		
STATISTICAL MECHANICS	6	FIS/02
THEORETICAL PHYSICS II	6	FIS/02
QUANTUM MATERIALS	6	FIS/03
ELECTIVE COURSES / LIBERA SCELTA (12 ECTS)		
Corsi a scelta libera dello studente (12 ECTS totali):		
COMPUTATIONAL MATERIALS SCIENCE	6	FIS/03
MACHINE LEARNING AND STATISTICAL PHYSICS OF MACRO-MOLECULAR SYSTEMS	6	FIS/07
PARTICLE PHYSICS III	6	FIS/01
* FOUNDATIONS OF QUANTUM COMPUTING	6	PHYS-03/A
* QUANTUM INFORMATION AND ALGORITHMS	6	INF/01
THEORY AND PHENOMENOLOGY OF FUNDAMENTAL INTERACTIONS	6	FIS/02
* QUANTUM SIMULATIONS	6	FIS/02
** UNCONVENTIONAL AND QUANTUM COMPUTING	6	INF/01
QUANTUM PHOTONICS	6	FIS/03
PROVA FINALE / TESI DI LAUREA (38 ECTS)		
Preparazione tesi magistrale ed esame finale:		
MASTER THESIS / PROVA FINALE	38	-

Quantum Computing & Simulation

A profile with a versatile and exploratory background. The coursework and master's thesis work will allow you to build a personalized pathway toward quantum algorithms, simulations, and communications, applying quantum computing directly to your domain of greatest interest - from nuclear and subnuclear physics to materials science and complex physical systems.

This profile builds expertise in the principles of quantum computing, quantum algorithms, and quantum simulation, and their application to challenging problems across physics and related disciplines.

* *Artificial Intelligence for Science and Technology*
** *Informatica*

for questions: Prof. A. Nucciotti
angelo.nucciotti@unimib.it

Curriculum B: Quantum Technologies paths / 3

Research lines accessible through these QT paths

- Experimental astroparticle physics with low temperature techniques
  - Neutrino physics and astrophysics
  - Dark Matter
  - Gravitational waves
- Full stack superconducting quantum hardware for computing and simulation
- Quantum computing and simulations applied to foundamental physics problems

experimental research adopting low temperature techniques is based in the **Cryogenic Labs**:
U2 (level -3) and **U19** (new!)
https://holmes1.mib.infn.it/nucriomib
they hosts also part of the LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS

see also the **BIQUTE - Bicocca Quantum Technologies** interdepartmental centre for the QT landscape @UNIMIB
https://biqute.unimib.it

BIQUTE