

MASTER'S DEGREE IN PHYSICS - F1703Q

A.Y. 2025/2026 – COURSES OFFERED IN THE THREE CURRICULA AND EXAMPLES OF RECOMMENDED STUDY PATHWAYS

Curriculum A: THEORETICAL PHYSICS

Compulsory core courses (30 ECTS)

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core - Theoretical and Foundations of Physics	24	F1703Q010	GENERAL RELATIVITY	6	FIS/02	I
		F1703Q040	QUANTUM FIELD THEORY I	6	FIS/02	II
		F1703Q053	THEORETICAL PHYSICS I	6	FIS/02	I
		F1703Q054	THEORETICAL PHYSICS II	6	FIS/02	I
Core - Microphysics of Matter and Fundamental Interactions	6	F1703Q041	QUANTUM FIELD THEORY II	6	FIS/04	II

One core course (10 ECTS) to be chosen from the following

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	10	F1703Q016	LABORATORY OF BIOPHOTONICS I	10	FIS/07	I
		F1703Q018	LABORATORY OF NUCLEAR AND SUBNUCLEAR MEASUREMENTS I	10	FIS/01	I
		F1703Q020	LABORATORY OF PLASMA PHYSICS I	10	FIS/01	I
		F1703Q022	LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS I	10	FIS/01	I
		F1703Q024	LABORATORY OF THEORETICAL COMPUTATIONAL PHYSICS	10	FIS/01	annual

Three related/supplementary courses (18 ECTS) to be chosen from the following:

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Related / Supplementary Educational Activities	18	F1703Q006	COMPUTATIONAL MATERIALS SCIENCE	6	FIS/03	I
		F1703Q008	EXPERIMENTAL METHODS IN HIGH ENERGY PHYSICS	6	FIS/04	II
		F1703Q011	GEOMETRIC METHODS FOR THEORETICAL PHYSICS	6	MAT/03	I
		F1703Q013	INTRODUCTION TO COSMOLOGY	6	FIS/05	I
		F1703Q026	MACHINE LEARNING APPLICATIONS	6	FIS/07	II
		F1703Q027	MATHEMATICAL METHODS FOR PHYSICS	6	FIS/02	I
		F1703Q059	PARTICLE PHYSICS II	6	FIS/01	II
		F1703Q034	PARTICLE PHYSICS III	6	FIS/01	II
		F1703Q042	QUANTUM GRAVITY	6	FIS/02	II
		F1703Q043	QUANTUM INFORMATION AND QUANTUM COMPUTING	6	FIS/02	I
		F1703Q044	QUANTUM MATERIALS	6	FIS/03	II
		F1703Q062	STATISTICAL MECHANICS	6	FIS/02	I
		F1703Q051	STATISTICS AND DATA ANALYSIS	6	FIS/01	II
		F1703Q055	THEORY AND PHENOMENOLOGY OF FUNDAMENTAL INTERACTIONS	6	FIS/02	II
		F1703Q064	THEORY OF CONDENSED MATTER	6	FIS/02	I

Curriculum B: PARTICLE PHYSICS AND APPLIED PHYSICS

22 ECTS from the following core courses, to be chosen as indicated below:

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	22	16 ECTS to be chosen from the following pairs of courses:				
		F1703Q016	LABORATORY OF BIOPHOTONICS I	10	FIS/07	I
		F1703Q017	LABORATORY OF BIOPHOTONICS II	6	FIS/07	II
		F1703Q018	LABORATORY OF NUCLEAR AND SUBNUCLEAR MEASUREMENTS I	10	FIS/01	I
		F1703Q019	LABORATORY OF NUCLEAR AND SUBNUCLEAR MEASUREMENTS II	6	FIS/01	II
		F1703Q022	LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS I	10	FIS/01	I
		F1703Q023	LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS II	6	FIS/01	II
		6 ECTS to be chosen from:				
		F1703Q002	APPLICATIONS OF PHYSICS TO MEDICINE - MEDICAL PHYSICS	6	FIS/07	I
		F1703Q005	BIOPHOTONICS	6	FIS/07	I
		F1703Q033	PARTICLE PHYSICS II	6	FIS/01	II
		F1703Q050	(*) SOSTENIBILITA' ENERGETICA	6	FIS/07	II

One core course (6 ECTS) to be chosen from the following:

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core - Theoretical and Foundations of Physics	6	F1703Q052	STATISTICAL MECHANICS	6	FIS/02	I
		F1703Q053	THEORETICAL PHYSICS I	6	FIS/02	I
		F1703Q056	THEORY OF CONDENSED MATTER	6	FIS/02	I

Two core courses (12 ECTS) to be chosen from the following:

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core - Microphysics of Matter and Fundamental Interactions	12	F1703Q004	APPLIED QUANTUM TECHNOLOGIES	6	FIS/04	I
		F1703Q007	ENERGY PHYSICS	6	FIS/03	II
		F1703Q030	OPTICAL MICROSCOPY	6	FIS/03	II
		F1703Q032	PARTICLE PHYSICS I	6	FIS/04	I
		F1703Q048	(*) RIVELATORI DI RADIAZIONI	6	FIS/04	I
		F1703Q049	SOLID STATE PHYSICS	6	FIS/03	I

Three related/supplementary courses (18 ECTS) to be chosen from the following:

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Related / Supplementary Educational Activities	18	F1703Q001	APPLICATION OF NEUTRON PHYSICS	6	FIS/07	I
		F1703Q003	APPLIED ELECTRONICS	6	ING-INF/01	I
		F1703Q006	COMPUTATIONAL MATERIALS SCIENCE	6	FIS/03	I
		F1703Q008	EXPERIMENTAL METHODS IN HIGH ENERGY PHYSICS	6	FIS/04	II
		F1703Q057	GENERAL RELATIVITY	6	FIS/02	I
		F1703Q025	MACHINE LEARNING AND STATISTICAL PHYSICS OF MACROMOLECULAR SYSTEMS	6	FIS/07	II
		F1703Q026	MACHINE LEARNING APPLICATIONS	6	FIS/07	II
		F1703Q027	MATHEMATICAL METHODS FOR PHYSICS	6	FIS/02	I
		F1703Q028	MONTE CARLO SIMULATION OF RADIATION DETECTORS	6	FIS/04	II
		F1703Q029	(*) NANOBIOTECNOLOGIE	6	BIO/10	II
		F1703Q058	OPTICAL SPECTROSCOPY OF SOLIDS	6	FIS/03	II
		F1703Q034	PARTICLE PHYSICS III	6	FIS/01	II
		F1703Q038	(*) PROCESSI A BASSO IMPATTO AMBIENTALE	6	CHIM/06	II
		F1703Q043	QUANTUM INFORMATION AND QUANTUM COMPUTING	6	FIS/02	I
		F1703Q044	QUANTUM MATERIALS	6	FIS/03	II
		F1703Q045	QUANTUM PHOTONICS	6	FIS/03	I
		F1703Q046	(*) RADIAZIONI ELETTROMAGNETICHE NON IONIZZANTI	6	FIS/01	II
		F1703Q047	(*) RADIOATTIVITA'	6	FIS/04	II
		F1703Q051	STATISTICS AND DATA ANALYSIS	6	FIS/01	II
		F1703Q063	THEORETICAL PHYSICS II	6	FIS/02	I
		F1703Q055	THEORY AND PHENOMENOLOGY OF FUNDAMENTAL INTERACTIONS	6	FIS/02	II

Curriculum C: PHYSICS OF MATTER

16 ECTS to be chosen from the following pairs of courses:

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	16	F1703Q014	(*) LABORATORIO DI ELETTRONICA I	10	FIS/01	I
		F1703Q015	(*) LABORATORIO DI ELETTRONICA II	6	FIS/01	II
		F1703Q020	LABORATORY OF PLASMA PHYSICS I	10	FIS/01	I
		F1703Q021	LABORATORY OF PLASMA PHYSICS II	6	FIS/01	II
		F1703Q022	LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS I	10	FIS/01	I
		F1703Q023	LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS II	6	FIS/01	II

6 ECTS to be chosen from:

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core - Theoretical and Foundations of Physics	6	F1703Q052	STATISTICAL MECHANICS	6	FIS/02	I
		F1703Q053	THEORETICAL PHYSICS I	6	FIS/02	I
		F1703Q056	THEORY OF CONDENSED MATTER	6	FIS/02	I

Three core courses (18 ECTS) to be chosen from the following:

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core - Microphysics of Matter and Fundamental Interactions	18	F1703Q004	APPLIED QUANTUM TECHNOLOGIES	6	FIS/04	I
		F1703Q007	ENERGY PHYSICS	6	FIS/03	II
		F1703Q031	OPTICAL SPECTROSCOPY OF SOLIDS	6	FIS/03	II
		F1703Q035	PHYSICS OF SEMICONDUCTORS	6	FIS/03	II
		F1703Q036	PLASMA PHYSICS I	6	FIS/03	I
		F1703Q037	PLASMA PHYSICS II	6	FIS/03	II
		F1703Q049	SOLID STATE PHYSICS	6	FIS/03	I

Three related/supplementary courses (18 ECTS) to be chosen from the following:

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Related / Supplementary Educational Activities	18	F1703Q001	APPLICATION OF NEUTRON PHYSICS	6	FIS/07	I
		F1703Q003	APPLIED ELECTRONICS	6	ING-INF/01	I
		F1703Q006	COMPUTATIONAL MATERIALS SCIENCE	6	FIS/03	I
		F1703Q008	EXPERIMENTAL METHODS IN HIGH ENERGY PHYSICS	6	FIS/04	II
		F1703Q009	FABRICATION AND CHARACTERIZATION OF NANO AND QUANTUM MATERIALS	6	FIS/03	II
		F1703Q012	(*) INFORMATICA INDUSTRIALE	6	ING-INF/05	II
		F1703Q025	MACHINE LEARNING AND STATISTICAL PHYSICS OF MACRO-MOLECULAR SYSTEMS	6	FIS/07	II
		F1703Q026	MACHINE LEARNING APPLICATIONS	6	FIS/07	II
		F1703Q027	MATHEMATICAL METHODS FOR PHYSICS	6	FIS/02	I
		F1703Q028	MONTE CARLO SIMULATION OF RADIATION DETECTORS	6	FIS/04	II
		F1703Q039	QUANTUM ELECTRONICS	6	ING-IND/22	I
		F1703Q043	QUANTUM INFORMATION AND QUANTUM COMPUTING	6	FIS/02	I
		F1703Q044	QUANTUM MATERIALS	6	FIS/03	II
		F1703Q045	QUANTUM PHOTONICS	6	FIS/03	I
		F1703Q046	(*) RADIAZIONI ELETTROMAGNETICHE NON IONIZZANTI	6	FIS/01	II
		F1703Q060	(*) RIVELATORI DI RADIAZIONI	6	FIS/04	I
		F1703Q061	(*) SOSTENIBILITA' ENERGETICA	6	FIS/07	II
		F1703Q051	STATISTICS AND DATA ANALYSIS	6	FIS/01	II

Courses marked with (*) are taught in Italian.

RECOMMENDED STUDY PATHWAYS

In order to assist students in selecting their study plan, some non-binding examples of study pathways tailored to specific interests are provided below. Courses that have not been selected among the core and/or related/supplementary options may always be included as free-choice courses.

Curriculum A: Theoretical path

Compulsory core courses (30 ECTS)

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core - Theoretical and Foundations of Physics	24	F1703Q010	GENERAL RELATIVITY	6	FIS/02	I
		F1703Q040	QUANTUM FIELD THEORY I	6	FIS/02	II
		F1703Q053	THEORETICAL PHYSICS I	6	FIS/02	I
		F1703Q054	THEORETICAL PHYSICS II	6	FIS/02	I
Core - Microphysics of Matter and Fundamental Interactions	6	F1703Q041	QUANTUM FIELD THEORY II	6	FIS/04	II

One core course (10 ECTS) to be chosen from the following:

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	10	F1703Q016	LABORATORY OF BIOPHOTONICS I	10	FIS/07	I
		F1703Q018	LABORATORY OF NUCLEAR AND SUBNUCLEAR MEASUREMENTS I	10	FIS/01	I
		F1703Q020	LABORATORY OF PLASMA PHYSICS I	10	FIS/01	I
		F1703Q022	LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS I	10	FIS/01	I
		F1703Q024	LABORATORY OF THEORETICAL COMPUTATIONAL PHYSICS	10	FIS/01	annual

Related/supplementary courses (18 ECTS):

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Related / Supplementary Educational Activities	18	F1703Q027	MATHEMATICAL METHODS FOR PHYSICS	6	FIS/02	I
		F1703Q062	STATISTICAL MECHANICS	6	FIS/02	I
		F1703Q055	THEORY AND PHENOMENOLOGY OF FUNDAMENTAL INTERACTIONS	6	FIS/02	II

At the student's choice: (12 ECTS):

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Elective course (chosen by the student)	12	Two choices among:				
		F1703Q043	QUANTUM INFORMATION AND QUANTUM COMPUTING	6	FIS/02	I
		F1703Q042	QUANTUM GRAVITY	6	FIS/02	II
		F1703Q011	GEOMETRIC METHODS FOR THEORETICAL PHYSICS	6	MAT/03	I
		Alternative options				
		F1703Q013	INTRODUCTION TO COSMOLOGY	6	FIS/05	I
		F1703Q034	PARTICLE PHYSICS III	6	FIS/01	II
		F1703Q044	QUANTUM MATERIALS	6	FIS/03	II
		F1703Q064	THEORY OF CONDENSED MATTER	6	FIS/02	I

The Statistical Mechanics course is strongly recommended for all students following the theoretical curriculum. Students interested in a master thesis focused on:

- string theory should attend Quantum Gravity
- QCD and Standard Model phenomenology should attend Theory and Phenomenology of Fundamental Interactions.
- computational physics and lattice gauge theories should attend Laboratory of Theoretical Computational Physics.

Students interested in an educational path focused on Physics and Geometry may consider inserting the course Geometric Methods of Physics and additionally a choice among: Symplectic Geometry, Geometry and Physics, Differential Geometry, Differential Topology, Algebraic and Computational Topology.

Curriculum B: Particle Physics path

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	22	F1703Q018	LABORATORY OF NUCLEAR AND SUBNUCLEAR MEASUREMENTS I	10	FIS/01	I
		F1703Q019	LABORATORY OF NUCLEAR AND SUBNUCLEAR MEASUREMENTS II	6	FIS/01	II
		F1703Q033	PARTICLE PHYSICS II	6	FIS/01	II
Core - Theoretical and Foundations of Physics	6	F1703Q053	THEORETICAL PHYSICS I	6	FIS/02	I
Core - Microphysics of Matter and Fundamental Interactions	12	F1703Q032	PARTICLE PHYSICS I	6	FIS/04	I
		F1703Q048	(*) RIVELATORI DI RADIAZIONI	6	FIS/04	I
Related / Supplementary Educational Activities	18	F1703Q008	EXPERIMENTAL METHODS IN HIGH ENERGY PHYSICS	6	FIS/04	II
		F1703Q034	PARTICLE PHYSICS III	6	FIS/01	II
		F1703Q051	STATISTICS AND DATA ANALYSIS	6	FIS/01	II
Elective course (chosen by the student)	12	Choose two courses from the list:				
		F1703Q026	MACHINE LEARNING APPLICATIONS	6	FIS/07	II
		F1703Q003	APPLIED ELECTRONICS	6	ING-INF/01	I
		F1703Q063	THEORETICAL PHYSICS II	6	FIS/02	I
		F1703Q055	THEORY AND PHENOMENOLOGY OF FUNDAMENTAL INTERACTIONS	6	FIS/02	II

Courses marked with (*) are taught in Italian.

Students interested in Collider Physics or in the course *Physics of Elementary Particles II* are advised to include in their study plan one elective course chosen between *Theory and Phenomenology of Fundamental Interactions* and *Theoretical Physics II*.

Curriculum B: Biophysics path

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	22	F1703Q016	LABORATORY OF BIOPHOTONICS I	10	FIS/07	I
		F1703Q017	LABORATORY OF BIOPHOTONICS II	6	FIS/07	II
		F1703Q005	BIOPHOTONICS	6	FIS/07	I
Core - Theoretical and Foundations of Physics	6	F1703Q052	STATISTICAL MECHANICS	6	FIS/02	I
Core - Microphysics of Matter and Fundamental Interactions	12	F1703Q030	OPTICAL MICROSCOPY	6	FIS/03	II
		One course to be chosen from:				
		F1703Q007	ENERGY PHYSICS	6	FIS/03	II
		F1703Q049	SOLID STATE PHYSICS	6	FIS/03	I
Related / Supplementary Educational Activities	18	Three courses to be chosen from:				
		F1703Q006	COMPUTATIONAL MATERIALS SCIENCE	6	FIS/03	I
		F1703Q026	MACHINE LEARNING APPLICATIONS	6	FIS/07	II
		F1703Q025	MACHINE LEARNING AND STATISTICAL PHYSICS OF MACROMOLECULAR SYSTEMS	6	FIS/07	II
		F1703Q029	(*) NANOBIOTECNOLOGIE	6	BIO/10	II
Elective course (chosen by the student)	12	Two courses to be chosen from:				
		F1703Q002	APPLICATIONS OF PHYSICS TO MEDICINE - MEDICAL PHYSICS	6	FIS/07	I
		F1703Q048	(*) RIVELATORI DI RADIAZIONI	6	FIS/04	I
		F1703Q058	OPTICAL SPECTROSCOPY OF SOLIDS	6	FIS/03	II

Courses marked with (*) are taught in Italian.

Curriculum B: Applied Physics in Medicine path

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	22	F1703Q018	LABORATORY OF NUCLEAR AND SUBNUCLEAR MEASUREMENTS I	10	FIS/01	I
		F1703Q019	LABORATORY OF NUCLEAR AND SUBNUCLEAR MEASUREMENTS II	6	FIS/01	II
		F1703Q002	APPLICATIONS OF PHYSICS TO MEDICINE - MEDICAL PHYSICS	6	FIS/07	I
Core - Theoretical and Foundations of Physics	6	F1703Q052	STATISTICAL MECHANICS	6	FIS/02	I
Core - Microphysics of Matter and Fundamental Interactions	12	F1703Q030	OPTICAL MICROSCOPY	6	FIS/03	II
		F1703Q048	(*) RIVELATORI DI RADIAZIONI	6	FIS/04	I
Related / Supplementary Educational Activities	18	F1703Q026	MACHINE LEARNING APPLICATIONS	6	FIS/07	II
		F1703Q047	(*) RADIOATTIVITA'	6	FIS/04	II
		F1703Q051	STATISTICS AND DATA ANALYSIS	6	FIS/01	II
Elective course (chosen by the student)	12	Choose two courses from the list:				
		F1703Q001	APPLICATION OF NEUTRON PHYSICS	6	FIS/07	I
		F1703Q005	BIOPHOTONICS	6	FIS/07	I
		F1703Q028	MONTE CARLO SIMULATION OF RADIATION DETECTORS	6	FIS/04	II
		F1703Q029	(*) NANOBIOLOGIE	6	BIO/10	II
		F1703Q046	(*) RADIAZIONI ELETTROMAGNETICHE NON IONIZZANTI	6	FIS/01	II

Courses marked with (*) are taught in Italian.

Curriculum B: Physics Applied to the Environment path

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	22	F1703Q018	LABORATORY OF NUCLEAR AND SUBNUCLEAR MEASUREMENTS I	10	FIS/01	I
		F1703Q019	LABORATORY OF NUCLEAR AND SUBNUCLEAR MEASUREMENTS II	6	FIS/01	II
		F1701Q142	SOSTENIBILITA' ENERGETICA	6	FIS/07	II
Core - Theoretical and Foundations of Physics	6	F1703Q052	STATISTICAL MECHANICS	6	FIS/02	I
Core - Microphysics of Matter and Fundamental Interactions	12	F1703Q007	ENERGY PHYSICS	6	FIS/03	II
		F1703Q048	(*) RIVELATORI DI RADIAZIONI	6	FIS/04	I
Related / Supplementary Educational Activities	18	F1703Q046	(*) RADIAZIONI ELETTROMAGNETICHE NON IONIZZANTI	6	FIS/01	II
		F1703Q047	(*) RADIOATTIVITA'	6	FIS/04	II
		F1703Q051	STATISTICS AND DATA ANALYSIS	6	FIS/01	II
Elective course (chosen by the student)	12	Choose two courses from the list:				
		F1703Q001	APPLICATION OF NEUTRON PHYSICS	6	FIS/07	I
		F1703Q003	APPLIED ELECTRONICS	6	ING-INF/01	I
		F1703Q005	BIOPHOTONICS	6	FIS/07	I
		F1703Q026	MACHINE LEARNING APPLICATIONS	6	FIS/07	II
		F1703Q028	MONTE CARLO SIMULATION OF RADIATION DETECTORS	6	FIS/04	II
		F1703Q038	(*) PROCESSI A BASSO IMPATTO AMBIENTALE	6	CHIM/06	II

Courses marked with (*) are taught in Italian.

Curriculum B: Quantum Technologies path

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	22	F1703Q022	LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS I	10	FIS/01	I
		F1703Q023	LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS II	6	FIS/01	II
		F1703Q033	PARTICLE PHYSICS II	6	FIS/01	II
Core - Theoretical and Foundations of Physics	6	F1703Q053	THEORETICAL PHYSICS I	6	FIS/02	I
Core - Microphysics of Matter and Fundamental Interactions	12	F1703Q004	APPLIED QUANTUM TECHNOLOGIES	6	FIS/04	I
		F1703Q032	PARTICLE PHYSICS I	6	FIS/04	I
Related / Supplementary Educational Activities	18	F1703Q044	QUANTUM MATERIALS	6	FIS/03	II
		F1703Q043	QUANTUM INFORMATION AND QUANTUM COMPUTING	6	FIS/02	I
		Choose one course from the list:				
		F1703Q003	APPLIED ELECTRONICS	6	ING-INF/01	I
		F1703Q034	PARTICLE PHYSICS III	6	FIS/01	II
		F1703Q045	QUANTUM PHOTONICS	6	FIS/03	I
Elective course (chosen by the student)	12	*** Choose two courses from the list:				
		F1703Q009	FABRICATION AND CHARACTERIZATION OF NANO AND QUANTUM MATERIALS	6	FIS/03	II
		F1703Q026	MACHINE LEARNING APPLICATIONS	6	FIS/07	II
		F9102Q028	** QUANTUM COMPUTERS AND TECHNOLOGIES	6	FIS/02	I
		F9102Q026	** QUANTUM INFORMATION AND ALGORITHMS	6	INF/01	I
		F1703Q048	(*) RIVELATORI DI RADIAZIONI	6	FIS/04	I
		F1703Q049	SOLID STATE PHYSICS	6	FIS/03	I
		F1802Q139	* TEORIA DELL'INFORMAZIONE E CRITTOGRAFIA	6	INF/01	II
		F1703Q056	THEORY OF CONDENSED MATTER	6	FIS/02	I
		F1801Q165	* UNCONVENTIONAL AND QUANTUM COMPUTING	6	INF/01	

Courses marked with (*) are taught in Italian.

* Courses offered in the Master's Degree Programme in Computer Science;

** Courses offered in the Master's Degree Programme in Artificial Intelligence for Science and Technology;

*** For the 12 ECTS of elective courses, students may also choose among the courses listed as Core or Related.

- Students interested in Quantum Technologies from the perspective of Materials and Condensed Matter Physics may choose the Solid State / Quantum Technologies track within Curriculum C.

- For further information about this track, students may contact Prof. Angelo Nucciotti.

Curriculum C: Solid State Physics/Quantum Technologies path

Type of Educational Activity / Area	ECTS Area	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	16	F1703Q022	LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS I	10	FIS/01	I
		F1703Q023	LABORATORY OF QUANTUM TECHNOLOGIES, MATERIALS AND SENSORS II	6	FIS/01	II
Core - Theoretical and Foundations of Physics	6	One course to be chosen from:				
		F1703Q052	STATISTICAL MECHANICS	6	FIS/02	I
		F1703Q056	THEORY OF CONDENSED MATTER	6	FIS/02	I
Core - Microphysics of Matter and Fundamental Interactions	18	Choose three courses from the list:				
		F1703Q004	APPLIED QUANTUM TECHNOLOGIES	6	FIS/04	I
		F1703Q031	OPTICAL SPECTROSCOPY OF SOLIDS	6	FIS/03	II
		F1703Q035	PHYSICS OF SEMICONDUCTORS	6	FIS/03	II
		F1703Q049	SOLID STATE PHYSICS	6	FIS/03	I
Related / Supplementary Educational Activities	18	Three courses to be chosen from:				
		F1703Q006	COMPUTATIONAL MATERIALS SCIENCE	6	FIS/03	I
		F1703Q009	FABRICATION AND CHARACTERIZATION OF NANO AND QUANTUM MATERIALS	6	FIS/03	II
		F1703Q039	QUANTUM ELECTRONICS	6	ING-IND/22	I
		F1703Q044	QUANTUM MATERIALS	6	FIS/03	II
		F1703Q045	QUANTUM PHOTONICS	6	FIS/03	I
		F1703Q043	QUANTUM INFORMATION AND QUANTUM COMPUTING	6	FIS/02	I
Elective course (chosen by the student)	12	*** Two Courses to be chosen from:				
		FSM02Q011	** APPLICATIONS OF MATERIALS FOR IONIZING RADIATION DETECTION	6	FIS/07	II
		FSM01Q026	** ENGINEERED NANOMATERIALS	6	ING-IND/22	I
		F1703Q026	MACHINE LEARNING APPLICATIONS	6	FIS/07	II
		FSM02Q009	** METALS SCIENCE AND SUSTAINABILITY	6	FIS/03	II
		FSM02Q013	** MOLECULAR ELECTRONICS AND PHOTONICS	6	FIS/01	II
		FSM02Q016	** NANOTECHNOLOGY & INNOVATION	6	FIS/01	I
		FSM01Q029	** PHYSICS AND TECHNOLOGY OF ELECTRONIC DEVICES	6	ING-IND/22	I
		FSM02Q015	** PHYSICS OF SOFT MATTER NANOSTRUCTURES	6	FIS/01	I

Courses that have not been selected among the Core and/or Related courses with multiple-choice options may still be included as free elective courses.

Courses marked with “***” are taught in English within the Master's Degree Programme in Materials Science and Nanotechnology.

Curriculum C: Plasma Physics path

Type of Educational Activity / Area	ECTS ambito	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	16	F1703Q020	LABORATORY OF PLASMA PHYSICS I	10	FIS/01	I
		F1703Q021	LABORATORY OF PLASMA PHYSICS II	6	FIS/01	II
Core - Theoretical and Foundations of Physics	6	F1703Q052	STATISTICAL MECHANICS	6	FIS/02	I
Core - Microphysics of Matter and Fundamental Interactions	18	F1703Q007	ENERGY PHYSICS	6	FIS/03	II
		F1703Q036	PLASMA PHYSICS I	6	FIS/03	I
		F1703Q037	PLASMA PHYSICS II	6	FIS/03	II
Related / Supplementary Educational Activities	18	Choose three courses from the list:				
		F1703Q001	APPLICATION OF NEUTRON PHYSICS	6	FIS/07	I
		F1703Q003	APPLIED ELECTRONICS	6	ING-INF/01	I
		F1703Q009	FABRICATION AND CHARACTERIZATION OF NANO AND QUANTUM MATERIALS	6	FIS/03	II
		F1703Q028	MONTE CARLO SIMULATION OF RADIATION DETECTORS	6	FIS/04	II
		F1703Q061	(*) SOSTENIBILITA' ENERGETICA	6	FIS/07	II
		F1703Q051	STATISTICS AND DATA ANALYSIS	6	FIS/01	II
Elective course (chosen by the student)	12	Choose two courses from the list:				
		FSM01Q025	** ADVANCED FUNCTIONAL POLYMERS	6	ING-IND/22	I
		F1703Q026	MACHINE LEARNING APPLICATIONS	6	FIS/07	II
		F1703Q046	(*) RADIAZIONI ELETTROMAGNETICHE NON IONIZZANTI	6	FIS/01	II
		F1703Q060	(*) RIVELATORI DI RADIAZIONI	6	FIS/04	I

Courses marked with (*) are taught in Italian.

** Course offered within the Master's Degree Programme in Materials Science and Nanotechnology.

Curriculum C: Electronic path

Type of Educational Activity / Area	ECTS ambito	Codes	Courses	ECTS	SSD	Semester
Core – Experimental and Applied	16	F1703Q014	(*) LABORATORIO DI ELETTRONICA I	10	FIS/01	I
		F1703Q015	(*) LABORATORIO DI ELETTRONICA II	6	FIS/01	II
Core - Theoretical and Foundations of Physics	6	F1703Q056	THEORY OF CONDENSED MATTER	6	FIS/02	I
Core - Microphysics of Matter and Fundamental Interactions	18	F1703Q035	PHYSICS OF SEMICONDUCTORS	6	FIS/03	II
		F1703Q049	SOLID STATE PHYSICS	6	FIS/03	I
		One course to be chosen from:				
		F1703Q004	APPLIED QUANTUM TECHNOLOGIES	6	FIS/04	I
		F1703Q007	ENERGY PHYSICS	6	FIS/03	II
		F1703Q031	OPTICAL SPECTROSCOPY OF SOLIDS	6	FIS/03	II
		F1703Q036	PLASMA PHYSICS I	6	FIS/03	I
		F1703Q037	PLASMA PHYSICS II	6	FIS/03	II
Related / Supplementary Educational Activities	18	F1703Q003	APPLIED ELECTRONICS	6	ING-INF/01	I
		F1703Q012	(*) INFORMATICA INDUSTRIALE	6	ING-INF/05	II
		F1703Q028	MONTE CARLO SIMULATION OF RADIATION DETECTORS	6	FIS/04	II
Elective course (chosen by the student)	12	Choose 12 ECTS including:				
		FSM01Q029	**PHYSICS AND TECHNOLOGY OF ELECTRONIC DEVICES WITH LABORATORY	6	ING-IND/22	I

Courses marked with (*) are taught in Italian.

** Course offered within the Master's Degree Programme in Materials Science and Nanotechnology.