



People's Democratic Republic of Algeria
Ministry of Higher Education and Scientific Research
Sétif 1 University – Ferhat Abbas



Faculty: Sciences

Master's Degree in Theoretical Physics

Presentation and Objectives of the Specialty :

The Master's program in Theoretical Physics aims to further deepen the knowledge acquired in fundamental physics and to provide students with a solid education.

It also expands these foundations by combining quantum mechanics with: special relativity, statistical physics, field theory, and optics.

The program generalizes the acquired physics concepts into more advanced elements, enabling students to begin research. These fundamental, technical, and mathematical generalizations include:

1. Classical and quantum mechanical time-dependent systems
2. Matter-radiation interaction
3. Many-body problems
4. Quantum theory of magnetism
5. Statistical physics and phase transitions
6. Quantum information
7. PT-symmetric systems

Admission requirements:

Selection will be based on a review of the student's academic record, with particular attention given to the candidate's grades and the coursework completed during their prior studies.

The eligible degrees for admission to the program are:

- Bachelor's in Physics, Specialization: Fundamental Physics
- Bachelor's in Physics
- Bachelor's in Theoretical Physics

Curriculum Highlights:

This Master's program delivers advanced training in theoretical and fundamental physics through a comprehensive curriculum that allows for specialization during the course of study. Graduates will form the core workforce of regional and national research laboratories and centers.

Furthermore, their strong foundation in fundamental sciences enables them to make valuable contributions to both the education sector and the economy.

The program prepares students for subsequent doctoral studies in either experimental or theoretical physics. Its robust curriculum naturally creates pathways to other specialized disciplines including:

1. Nuclear sciences
2. Nanotechnology
3. Medical physics
4. Space sciences and remote sensing
5. Geophysics
6. Materials physics

Academic progression information:

During the first three semesters (Semesters 1 and 2 of M1, and Semester 1 of M2), student evaluation will be conducted through :

- Continuous assessment of individual work
- Assignments for core course units
- A written examination at the end of each semester for each teaching unit

The second semester of M2 will be evaluated based on a dissertation (Master's thesis) to be presented before an examination committee at the end of the semester.

Progression requirements will be determined by the academic program committee.

Organization of Studies and Official Duration of the Program:

Program Overview:

Semestre 01 :

- Advanced Quantum Mechanics I
- Statistical Physics I
- Classical field Theory
- Mathematics I
- General theory of solid state physics
- Nuclear Physics I
- English

Semestre 02 :

- Advanced Quantum Mechanics II
- Statistical Physics II
- Relativistic Quantum Mechanics
- Mathematics II
- Numerical Analysis
- Nuclear Physics II
- English

Semestre 03 :

- Many-body problems
- Quantum field Theory
- Classical and quantum mechanical time-dependent systems
- Atomic and molecular physics
- PT-Symmetry and Pseudo-Hermiticity in Quantum Mechanics
- Quantum theory of magnetism
- English

Semestre 04 :

Mandatory internship at a research lab or company, assessed through both a written Master's thesis and public defense before an academic committee.

Training Canvas:

- Advanced Quantum Mechanics I
- Statistical Physics I
- Classical field Theory
- Mathematics I
- Advanced Quantum Mechanics II
- Statistical Physics II
- Relativistic Quantum Mechanics
- Mathematics II
- Atomic and molecular physics

Advanced training modules:

- Many-body problems
- Quantum field Theory
- Classical and quantum mechanical time-dependent systems
- PT-Symmetry and Pseudo-Hermiticity in Quantum Mechanics
- Quantum theory of magnetism

Language of instruction:

French and English

Coordinator of the Program: Dr. Yacine BOUGUERRA

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