Université Paris-Saclay

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M2 Plasmas Lasers Accelerateurs Tokamaks - Large facilities

Master's degree
Specialisation Physique fondamentale et applications
Language(s) of instruction
English
French

The GI-PLATO programme trains high-level scientists in the physics and technologies used in large research facilities: accelerators, lasers, magnetic fusion machines. It is aimed at students from universities and engineering colleges. This programme provides students with a common foundation both fundamental and technological, after which they choose a specialisation: lasers and laser-plasma interaction, accelerators, or magnetic fusion.

The GI-PLATO programme prepares high-level scientists to physics and technologies at stake in large research facilities: accelerators, intense lasers, magnetic fusion machines. It is aimed at students from universities and engineering schools. This programme gives to the students a common scientific background, with a core curriculum combining physics courses (relativity, plasma and tokamak physics, accelerator physics, laser-plasma interaction, etc.) and advanced technology courses (power lasers, superconductivity, etc.) through lectures and practical work, in the environment of large scale facilities in Paris-Saclay. Students will choose a specialisation (accelerators, lasers and laser-plasma interaction, magnetic fusion) concluded with a national winter school. Finally, a five-month internship must be completed in a research organisation or company.

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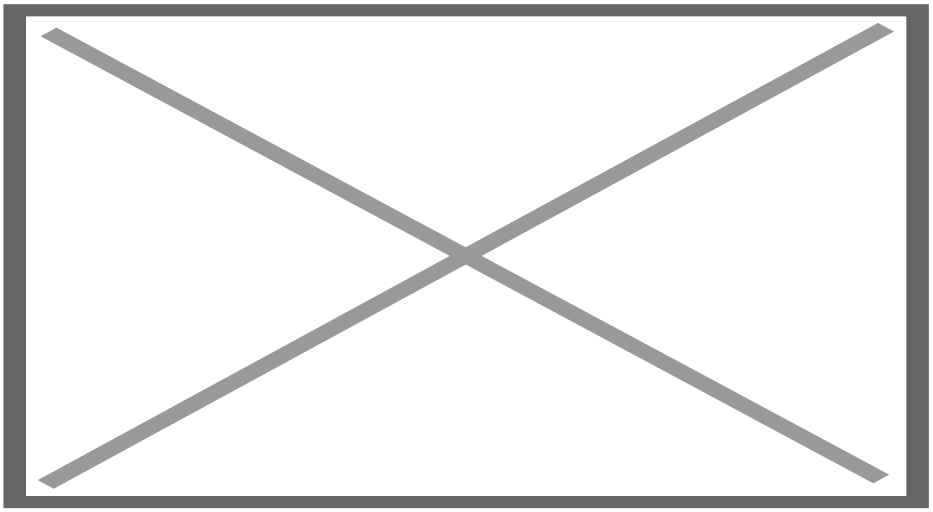

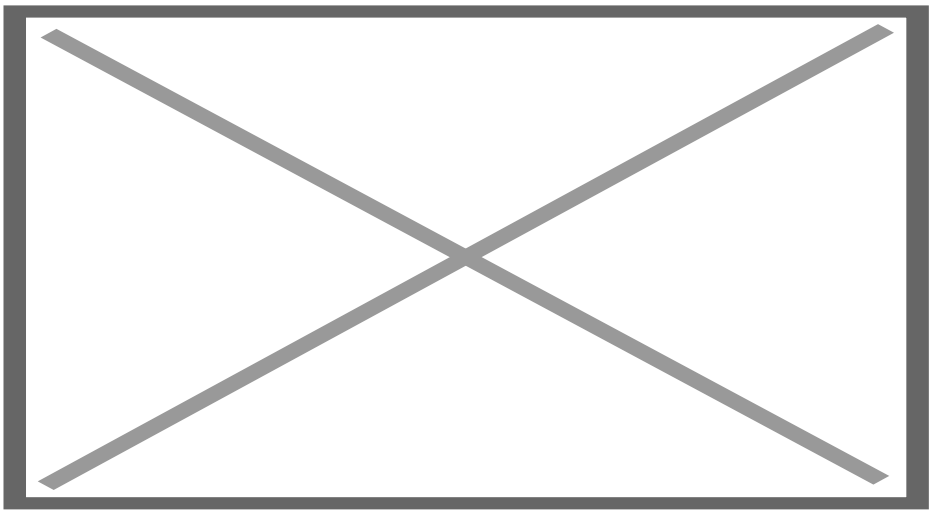

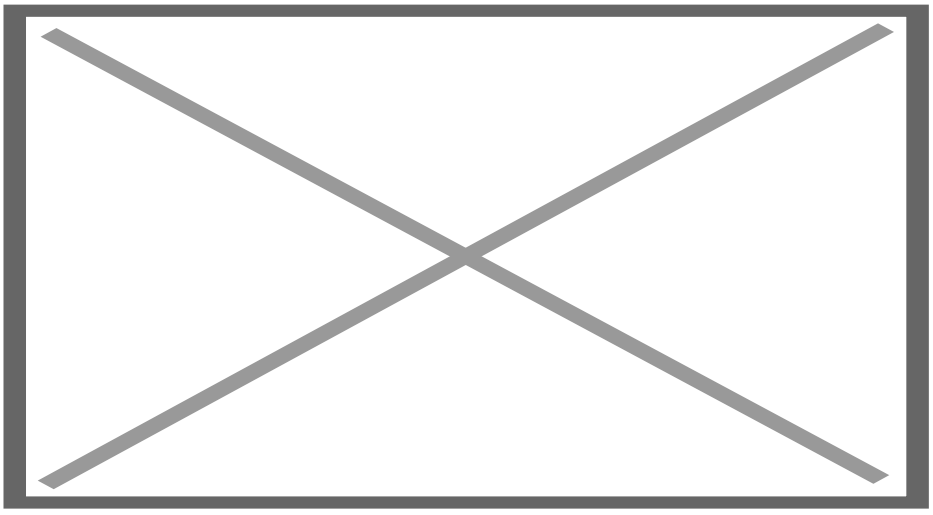

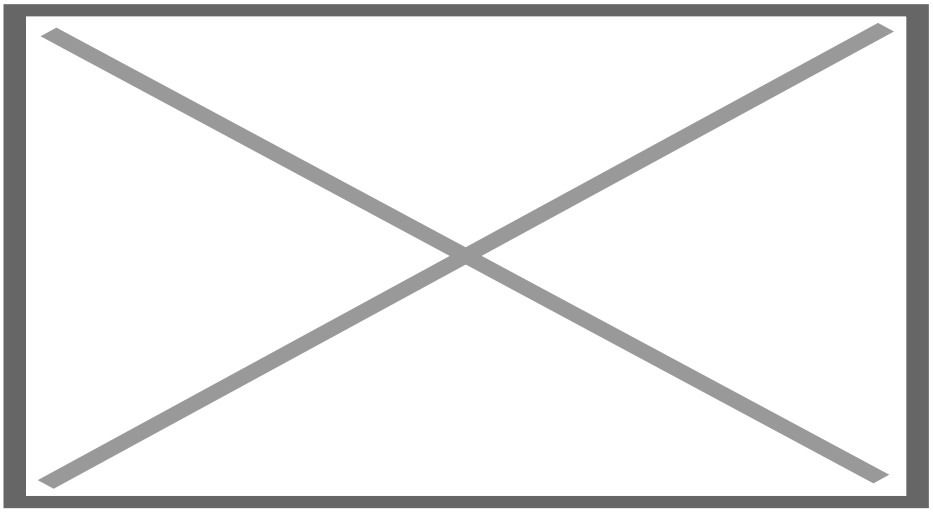

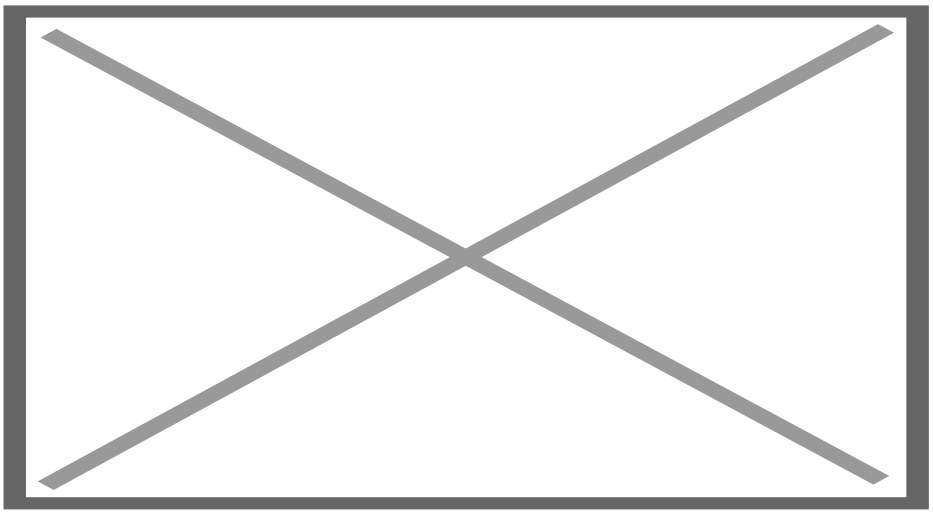

Information

- Overview
- Application requirements
- Schedule

Présentation

Objectives

The GI-PLATO programme prepares high-level scientists in physics and technologies involved in current or under development large-scale research facilities: accelerators, intense lasers, radiation sources and magnetic fusion machines. These devices are manipulating high densities of energy and power, leading to the formation of plasmas, relativistic particles, and high magnetic field, radiation and particle fluxes. The extreme conditions obtained with these machines in turn become potential sources of particles and radiation with unique properties that are useful for research.

Specialists trained in this field will go on to work in research, engineering, integration and project management in connection with major research programmes in particle physics (superconducting cavity accelerators, advanced concepts in laser particle acceleration), radiation (synchrotrons and free-electron

lasers, radiation-matter interaction, attosecond sources) and hot plasma physics (magnetic and inertial confinement nuclear fusion, high-intensity laser interaction).

Some of these major scientific facilities are located within the Saclay plateau, such as the SOLEIL synchrotron, the APOLLON laser and other high-power lasers, the accelerators at the IRFU (Institute for Research into the Fundamental Laws of the Universe) in Saclay and the IJClab (Irène Joliot Curie Laboratory) in Orsay. In addition, many laboratories in the Paris-Saclay area collaborate with major national and European facilities such as CERN, ITER, the MegaJoule laser, GANIL, X-FEL and the ELI consortium. Supported by the CEA and INSTN, the Master's programme offers leading-edge training in the physics and technologies involved in magnetic and inertial confinement fusion. At the same time, the Master's programme also offers leading-edge training in the physics and technology of high-power lasers.

Inspired by the spirit behind the founding of Paris-Saclay University, this programme is aimed at students from both the University and leading engineering schools. University students will be able to complete their physics training and acquire additional experimental and technical skills. Similarly, engineering students interested in physics research will be able to supplement their engineering training with in-depth study of fundamental physics and gain access to major scientific facilities in the Paris-Saclay area, as well as at the national and European levels. Large research instruments bring together many disciplines, and their constant evolution is leading to the emergence of more and more hybrid concepts, such as Compton scattering gamma-ray sources, which combine electron accelerators and high-power lasers. Finally, disruptive technologies, the result of fundamental research conducted with these instruments, promise new types of scientific facilities: spallation neutron sources, neutrino or muon sources, attosecond X-ray pulse sources, and plasma wakefield particle acceleration. To meet current and future challenges, the GI PLATO programme aims to provide its students with a broad fundamental, applied and technical scientific culture.

This programme therefore offers a core curriculum of fundamental courses on the physics used in large research infrastructures: relativity, statistical physics, magnetohydrodynamics, plasma physics, laser physics, accelerator physics, laser-plasma interaction, and tokamak physics. Alongside these relatively fundamental courses, students will discover the advanced technologies used in these machines, such as accelerator systems, high-power laser chains, magnetism, superconductivity, vacuum, cryogenics, and microwave power sources.

Admission

Capacity

Available Places

25

Target Audience and Entry Requirements

The master's programme is aimed at students who have completed a first year of a master's degree in physics, engineering school students, and students studying physics and applied physics at the École Normale Supérieure.

A solid background in electromagnetism and special relativity physics is required. Initial training in laser physics, plasma physics, or atomic and nuclear physics is recommended.

Période(s) de candidature

Inception Platform

From 24/03/2026 to 04/07/2026

Supporting documents

Compulsory supporting documents

Motivation letter.

All transcripts of the years / semesters validated since the high school diploma at the date of application.

Certificate of English level.

Curriculum Vitae.

Additional supporting documents

Certificate of English level (compulsory for non-English speakers).

Detailed description and hourly volume of courses taken since the beginning of the university program.

VAP file (obligatory for all persons requesting a valuation of the assets to enter the diploma).

Document indicating the list of local M2 choices available here : https://urlz.fr/i3Lo.

Programme

Subjects	ECTS	Semester	Lecture	directed study	practical class	Lecture/directed study	Lecture/practical class	directed study/practic class
Relativity, electromagnetism, plasmas	2	Semester 1	14	6				
Charger le détail								
Tokamaks Physics	3	Semester 1	20	10				
Charger le détail								
Accelerators Physics	3	Semester 1	20	10				
Charger le détail								

Subjects	ECTS	Semester	Lecture	directed study	practical class	Lecture/directed study	Lecture/practical class	directed study/practic class
Plasmas-laser Physics	3	Semester 1	20	10				
Charger le détail								
Numerical methods and simulations	3	Semester 1	20	10				
Charger le détail								
Projects and organisation of large-scale instruments	2	Semester 1	20	10				
Charger le détail								
Physics and transverse technologies	3	Semester 1	20	10				
Charger le détail								
projets sur les grands instruments	5	Annualisé						
Charger le détail								

Subjects	ECTS	Semester	Lecture	directed study	practical class	Lecture/directed study	Lecture/practical class	directed study/practical class	distan learn cour
Internship	21	Semester 2							
Charger le détail									

Subjects	ECTS	Semester	Lecture	directed study	practical class	Lecture/directed study	Lecture/practical class	directed study/practical class	di le
Detection and measurements	3	Semester 1	20	10					
Charger le détail									
Advanced accelerators	3	Semester 1	20	10					
Charger le détail									
école d'hiver juas	3	Semestre 1							
Charger le détail									

Subjects	ECTS	Semester	Lecture	directed study	practical class	Lecture/directed study	Lecture/practical class	directed study/practical class	d le
sources de rayonnement	3	Semestre 1	20	10					

Charger le détail

Subjects	ECTS	Semester	Lecture	directed study	practical class	Lecture/directed study	Lecture/practical class	directed study/practical class	d l
Materials-plasma interaction	3	Semester 1	20	10					

Charger le détail

Detection, measurements, radiation	3	Semester 1	20	10					

Charger le détail

confinement, chauffage, transport	3	Semestre 1	20	10					

Charger le détail

regroupement Cadarache	3	Semestre 1							

Charger le détail

Subjects	ECTS	Semester	Lecture	directed study	practical class	Lecture/directed study	Lecture/practical class	directed study/practical class	c l
Plasma and ultra-intense laser interaction	4	Semester 1	27	13					

Charger le détail

regroupement Bordeaux	3	Semestre 1							

Charger le détail

métrologie des sources attosecondes et femtosecondes	3	Annualisé	20	10					

Charger le détail

Subjects	ECTS	Semester	Lecture	directed study	practical class	Lecture/directed study	Lecture/practical class	directed study/practical class	c
diagnostics des plasmas denses	3	Semestre 1	20	10					
Charger le détail									
fusion par confinement intertiel	3	Semestre 1	20	10					
Charger le détail									

Teaching Location(s)

BURES SUR YVETTE
ORSAY
GIF SUR YVETTE
ST PAUL LES DURANCE
BORDEAUX
ARCHAMPS
PALAISEAU

Contact

- **Kevin DUPRAZ**

http://www.universite-paris-saclay.fr/formation/master/physique-fondamentale-et-applications/m2-grands-instruments-plasmas-lasers-accelerateurs-tokamaks