

Master 2 – Immunotherapies and Systems Immunology (ITSI)

Immunotherapies and Systems Immunology (ITSI) master's program offers a multidisciplinary program, preparing students for leading roles in both academic research and the biotech/pharmaceutical industry.

A cutting-edge and interdisciplinary learning program

Research in immunology and immunopathology has been transformed with the advances in high-throughput technologies, allowing now to explore the response of the immune systems in pathological condition at an unprecedented scale. Moreover, immunotherapies offer novel platforms paving the way for personalized medicine. In this scope, ITSI master's program has been designed to offer an interdisciplinary training at the interface of integrative immunology, biotherapies, and cutting-edge technological approaches, equipping students with both experimental and computational expertise.

Learning objectives :

Students will acquire advanced knowledge in key areas of modern immunology, equipping them with the expertise needed to navigate both fundamental and translational research.

The program's learning objectives include:

- Developing a deep understanding of **immune responses and their dysfunctions in pathological contexts** (*cancer, autoimmunity, infections, allergy as well as over aging*)
- Mastering the principles, advantages and limits of **state-of-the art technologies used in immunology** (*high-throughput transcriptomics, genomics, adaptomics and microbiomics (bulk, single-cell, spatial), multi-parametric cytometry (flow & mass), metabolomics....*)
- Mastering **biotherapies and immunotherapies** principles and applications (*monoclonal antibodies, vaccines, gene therapy, and cell therapy*)
- Developing deep knowledge in **advanced modelling strategies applied to immune data**, including *artificial intelligence*, and their applications for disease diagnosis, treatment response prediction, biomarker and therapeutic target discovery...
- **Mastering R programming and high-dimensional immunological data analysis** applied to real-world biomedical challenges.

By the end of this semester, students will be equipped with both theoretical expertise and hands-on skills, providing a strong foundation for their internship.

Internship

The second semester will be fully dedicated to an internship in either an academic research laboratory or in the private sector, in France or abroad.

- The internship should be aligned with the ITSI program, therefore in the immunology field, including biotherapies' development or evaluation and/or high-throughput technologies and/or high-dimensional data analysis.
- The Internship can start either from september or from February for a maximal duration of 6 months
- The internship is evaluated based on a thesis report and an oral defense mid-june or mi-septembre (according to student' wishes)

Language & prerequisite schedule

- The program is conducted in **English**.
- Since ISTI program is grounded on the immunology program of Sorbonne Université that includes prior training in immunology (12 ECTS) and in biostatistics (6 ECTS) in Bachelor curricula and year 1 of the master, applicants must justify of equivalent education.
- A prior research experience in a lab or industry (minimum 2 months) is highly recommended.
- Medical, pharmacist and veterinarian students as well as students from other universities can contact the heads of the master to validate their profil.

Audience, capacity & schedule

- ITSI is open to scientific students enrolled in a **Master's program from Sorbonne Université or other universities fulfilling pre-requisite**, students enrolled in the **Sorbonne Université PIM - From fundamental molecular biosciences to biotherapies**, as well as students enrolled in **medical, pharmacy, veterinary studies and engineers** from Sorbonne Université or other french or foreign University.
- Sorbonne Université Fundamentals
- **Capacity: 25 students.**
- Teaching starts the 1st week of november and ends the 3rd week of January

Tentative program

Date	Courses		Evaluation type - tentative schedule
november week 1	Module 1: Immunopathologies & Translational Medicine		Final exam 1 - January week 2
november week 2	Module 2: Systems' Immunology Conferences (MUSBM560 - 3 ECTS)		
november week 3	Module 3: Molecular, cellular and gene immunotherapy (MUSBM564 - 3 ECTS)		project based: oral + written report
november week 4	Project module: Masteriales in Immunology, Immunotherapy and systems immunology (MUSBM091 - 6 ECTS)	Scientific analysis : News and Views article writing (MUSBM051 - 6 ECTS)	
december week 1	Module 4: Data Analysis in Immunology (MUSBM578 - 3 ECTS)		project based : report & oral presentation - January week 2
december week 2	Module 5: New Vaccine Strategies (MUSBM563, 3 ECTS)		final exam 2 - January week 2
december week 3	Module 6: Monoclonal Antibodies (MUSBM562 - 3 ECTS)		
december week 4	winter holidays		
January week 1			
January week 2	final Exam 1 + final exam 2		
January week 3	Module 7: Advanced Cytometry (MUSBM572 - 3 ECTS)		project based : report & oral presentation - February week 3

Teaching responsables:

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