MASTER - Physique

Physique cellulaire (PC)

Objectifs du parcours

Langue du parcours			Anglais
ECTS			120 ECTS
Volume horaire			
TP : 0h	TD : 0h	CI : 0h	CM : 0h
Formation initiale			Oui
Formation continue			Non
Apprentissage			Non
Contrat de professionnalisation			Non
Stage : (durée en semaines)			16

Objectives of this year program are to train students in physics, biology, chemistry, and maths, with practicals.
The focus is targeted on biological functions and translations between scientific fields.

- **Topics**: Systems biology, Cell physics, Developmental biology, Statistical mechanics, Collective effects, Experimental physics, Chemical biology.
- **Practicals**: Molecular biology, Cell biology, Developmental biology, Numerical simulations, Machine shop, Microfabrication and microfluidics, Electronics, Imaging.

Compétences à acquérir

Students who will graduate from this program will have a deep understanding of living matter and its complexity.
With basics at the beginning of the year in biology, physics, maths, chemistry, and the students from any scientific backgrounds will be prepared to follow lectures by 20 lecturers from Europe in this integrated course.
Each week, a master meeting will allow to debate ideas in lectures and in the field. Introductions to scientific writing and patents will be given throughout the year.

Poursuite d'études

- This program prepares for doctoral studies in France and abroad.

Contact

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Master 1 Physique - Tronc commun (TC)

Semestre 1 - Master Physique (tronc commun)

	ECTS	CM	CI	TD	TP	TE	Stage
UE 1 - Semestre 1 - Quantum mechanics and statistical mechanics	9 ECTS	56 h		56 h			
Quantum mechanics		28 h		28 h			
Statistical mechanics		28 h		28 h			
UE 2 - Semestre 1 - Computer programming and Current research in physics	6 ECTS	40 h			18 h		
Computer programming and numerical simulations		28 h					
Current research in physics		12 h					
UE 3 - Semestre 1 - Experimental physics I	6 ECTS				60 h		
Experimental physics I					60 h		
UE 4 - Semestre 1 - Elective course (2 to choose among)	6 ECTS	56 h					
Mécanique des milieux continus		28 h					
Astrophysical objects and their observations		28 h					
Group theory		28 h					
Ionizing radiation and detection methods		28 h					
General relativity		28 h					
Physique statistique avancée & Introduction à l'analyse complexe		28 h					
Variational principles and analytical mechanics		28 h					
Advanced quantum mechanics		28 h					
Project		28 h					
Photonics for quantum science and technology		28 h					
Soft condensed matter		28 h					
UE 5 - Semestre 1 - Free course	3 ECTS						
UE facultative (au-delà de 30 ECTS validés) - Bases de mécanique quantique et physique statistique	3 ECTS	32 h					
Bases de mécanique quantique							
Bases de physique statistique							

Semestre 2 - Master Physique (tronc commun)

	ECTS	CM	CI	TD	TP	TE	Stage
UE 1 - Semestre 2 - Nuclear physics and elementary particles - Solid state physics	9 ECTS	52 h		52 h			
Nuclear physics and elementary particles		26 h		26 h			
Solid state physics		26 h		26 h			
UE 2 - Semestre 2 - Computer programming and Numerical simulations	3 ECTS	12 h			10 h		
Computer programming and Numerical simulations		12 h			10 h		
UE 3 – Semestre 2 - Laboratory physics	12 ECTS	4 h					4 sem
Laboratory internship							4 sem
Experimental physics II: nano fabrication in clean room							
UE 4 - Semestre 2 - Elective course (1 to choose among)	3 ECTS	28 h					
Particles and astroparticles		28 h					
Stellar physics		28 h					
Atomic and molecular physics		28 h					
Introduction to physics of living systems		28 h					
Relativistic quantum mechanics		28 h					
Numerical methods in physics		28 h					
Project		28 h					
Electronics for quantum science and technology		28 h					
Phénomènes critiques et physique statistique hors-équilibre		28 h					
UE 5 - Semestre 2 - Free course	3 ECTS						
UE 7 - Semestre 2 - Optional	3 ECTS						8 sem
Voluntary internship							8 sem

Master 2 Physique cellulaire

Semestre 3 - Master Physique cellulaire

	ECTS	CM	CI	TD	TP	TE	Stage
UE 1 - Semestre 3 - Physique à l'échelle de la cellule et physique statistique hors équilibre	6 ECTS	76 h					
Physique cellulaire théorique							
Physique cellulaire expérimentale							
Bases en physique							
UE 2 - Semestre 3 - Biologie cellulaire, biologie des systèmes	6 ECTS	84 h					
Biologie des systèmes							
Biologies des populations							
Physique et biologie de la matière vivante							
Bases en biologie							
UE 3 - Semestre 3 - Chimie pour le vivant	3 ECTS	36 h					
Chimie pour le vivant							
Bases en chimie							
UE 4 - Semestre 3 - Mathématiques pour le vivant	3 ECTS	36 h					
Mathématiques pour le vivant							
Bases en maths							
UE 5 - Semestre 3 - Travaux pratiques pour le vivant (4 au choix)	9 ECTS				60 h		
Microfabrication					15 h		
Microfluidique					15 h		
Atelier de mécanique					15 h		
Simulation numérique					15 h		
Biologie cellulaire et biologie moléculaire					15 h		
Imageries					15 h		
Electronique					15 h		
UE 6 - Semestre 3 - Rédaction d'article scientifique	3 ECTS	16 h					
Rédaction d'article scientifique		16 h					
UE Facultative au-delà de 30 ECTS validés (1 au choix)					15 h		
Microfabrication					15 h		
Microfluidique					15 h		
Atelier de mécanique					15 h		
Simulation numérique					15 h		
Biologie cellulaire et biologie moléculaire					15 h		
Imageries					15 h		
Electronique					15 h		

Semestre 4 - Master Physique cellulaire

	ECTS	CM	CI	TD	TP	TE	Stage
Expériences en laboratoires	30 ECTS						16 sem
Expériences en laboratoires							16 sem
Optional							8 sem
Voluntary internship							8 sem