

## MASTER - Chimie

### Chimie physique et matériaux (Chemical physics and materials)

#### Pré-requis obligatoires

**Recruitment of students and requested background** A committee decides on the specific criteria and the requested background for acceptance in the master program. This committee, the so called "Commission Pédagogique," includes professors involved in the first and second year of the master M1 teaching and M2, as well as the professors responsible for the master program.

Given the multidisciplinary nature of this master program, students from other universities or other master programs may be accepted after evaluation of their background. A valid M1 is necessary at any time. Students may be invited for an interview before each admission.

It is noted that sufficient command of English is necessary, knowledge of French is desirable. As already said, all lectures are performed in English, including evaluation

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)	30

#### Objectifs du parcours

This Master's degree offers a thorough training in Chemical Physics, Materials and Nanomaterials Chemistry, Biophysical Chemistry or Theoretical Chemistry. The academic training in the first year is followed by a salaried experimental internship in the second semester that can be performed either in academic laboratories or in industry. The M2 Master "Chemical Physics and Materials (CPM)" corresponds to the second year for the M1 Master "Physical Chemistry, Analytical Chemistry and Materials (CPAM)". It aims to provide students with the necessary theoretical and experimental knowledge and basic skills, for the understanding of matter. All lectures are performed in English, as well as the evaluation.

#### Skills and Objectives of the program

Students can join on the M2 level if they have a valid first year of a master, which gives the necessary background in physical chemistry. Usually students join after the M1 Master "Physical Chemistry, Analytical Chemistry and Materials (CPAM)" but we also accept students from other master programs and countries (see below)

The master program includes lectures in three main axes: "Physical Chemistry", "Chemistry of Materials" and "Theoretical Physical Chemistry", which lead to an excellent perspective for professional integration in research, industry or education

Depending on the choice of courses, students will acquire specific skills. More generally, students have the opportunity to develop skills in Research and Teaching.

- Design, synthesis and characterization of matter in connection with the excellence of the academic research laboratories in Strasbourg.
- understanding of the science of materials ranging from the nature of the materials, their preparation, their characterization to the study of their specific properties.
- Use of advanced spectroscopic and microscopic methods
- Skills in the main areas of physical chemistry: Thermodynamics, kinetics, electrochemistry, theoretical chemistry.

The teaching should enable students to understand the science of complex matter, including biomolecules, supramolecular structures, polymers, nanomaterials, etc. By the variety of optional courses that are offered, students can define their own competence profile.

Lectures providing students the mastering of theoretical and technical skills that will enable the extensive use of computer codes for quantum chemistry, quantum dynamics and molecular modelling, are also suggested.

Holders of this diploma will be able to work in the fields of research and development. The specificity at the level of the chemistry allows them to facilitate interactions with teams of chemists involved in the synthesis of complex matter.

#### Poursuite d'études

##### Further studies

The master degree gives successful students the possibility to apply for a PhD program, focus on research or join industry. Within the master program there is a special training for professional integration in industry, public research.

## Contacts

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# Master 1 CPIAM - Chimie physique, informatique, analytique et matériaux

## Semestre 1 CPIAM - Chimie physique, informatique, analytique et matériaux

	ECTS	CM	CI	TD	TP	TE	Stage
TP transverses	4 ECTS						
TP transverses					72 h		
Electrochemistry	3 ECTS						
Electrochemistry			24 h				
Spectroscopies optiques	3 ECTS						
Spectroscopies optiques			24 h				
Modélisation - introduction	5 ECTS						
Basics of electronic structure calculations and introduction to DFT		18 h			9 h		
Molecular modelling		10 h			8 h		
Chemoinformatics		10 h			10 h		
Cinétique et thermodynamique	3 ECTS						
Cinétique et thermodynamique			24 h				
Matériaux - introduction	3 ECTS						
Matériaux - introduction			24 h				
Méthodes statistiques	3 ECTS						
Méthodes statistiques		16 h		8 h			
CPIAM-M1S1 Bloc d'UEs à choix (pour un total de 6 ECTS)							
Chimie organique	3 ECTS						
Chimie organique			24 h				
Chimie inorganique	3 ECTS						
Chimie inorganique			24 h				
Structure et diffraction	3 ECTS						
Structure et diffraction			24 h				
Chimie analytique au service de la science et de la société	3 ECTS						
Chimie analytique au service de la science et de la société			24 h				
Algorithmique et programmation	6 ECTS		38 h		22 h		

## Semestre 2 CPIAM - Chimie physique, informatique, analytique et matériaux

	ECTS	CM	CI	TD	TP	TE	Stage
NMR spectroscopy	3 ECTS						
NMR spectroscopy		16 h		8 h			
Complex systems and non-equilibrium kinetics	3 ECTS						
Complex systems and non-equilibrium kinetics			24 h				
Pratique expérimentale en laboratoire de recherche ou stage en entreprise	9 ECTS						
Pratique expérimentale en laboratoire de recherche ou stage en entreprise							10 sem
Préparation à l'insertion professionnelle	3 ECTS						
Préparation à l'insertion professionnelle			28 h				
CPIAM-M1S2 Bloc d'UEs pour orientation M2 (pour un total de 12 ECTS)							
Chimie physique et matériaux	12 ECTS						
Matériaux nanostructurés			24 h				
Chimie moléculaire de l'état solide			24 h				
TP Chimie physique					40 h		
TP Chimie des matériaux					40 h		
Sciences analytiques	12 ECTS						
Méthodes séparatives et spectrométrie		22 h		6 h			
Métrologie et validation des méthodes d'analyse		20 h		8 h			
TP Instrumentation					40 h		
TP Chimie analytique					40 h		
Informatique	12 ECTS	54 h	48 h	12 h	10 h		
Systèmes d'exploitation et réseaux			24 h				
Chemical databases and introduction to data sciences			24 h				
Modeling of supramolecular architectures			16 h				
Electronic structure and DFT		26 h					
Programmation orientée objets		12 h		12 h	10 h		

## Master 2 - Chimie physique et matériaux

### Semestre 3 - Chimie physique et matériaux

	ECTS	CM	CI	TD	TP	TE	Stage
Nanosciences and functional materials	3 ECTS						
Nanosciences and functional materials		20 h		4 h			
Microscopy and nanoscopy	3 ECTS						
Microscopy and nanoscopy		20 h		4 h			
Energy conversion	3 ECTS						
Energy conversion		16 h		8 h			
Functional oxides	3 ECTS						
Functional oxides			24 h				
Advanced optical spectroscopies	3 ECTS						
Advanced optical spectroscopies			16 h				
Bibliographic project	3 ECTS						
Bibliographic project							
CPM-M2S3 Bloc d'UEs à choix (pour un total de 12 ECTS)							
Molecular materials : magnetism and electronics	3 ECTS						
Molecular materials : magnetism and electronics			24 h				
Surface reactivity and heterogeneous catalysis	3 ECTS						
Surface reactivity and heterogeneous catalysis			24 h				
Structural biology and molecular modelling	3 ECTS						
Structural biology and molecular modelling		16 h		8 h			
Biophysicalchemistry	3 ECTS						
Biophysicalchemistry		16 h		8 h			
Advanced quantum chemistry	3 ECTS						
Advanced quantum chemistry		16 h		8 h	8 h		
Cours du RFCT	3 ECTS						
Cours du RFCT			30 h				
Molecular dynamics simulation	3 ECTS						
Molecular dynamics simulation			24 h				

### Semestre 4 - Chimie physique et matériaux

	ECTS	CM	CI	TD	TP	TE	Stage
Stage en laboratoire de recherche ou en entreprise Training period	30 ECTS						20 sem