



MASTER SCIENCES DES MATÉRIAUX

## Advanced Ceramics training path

Level	Program duration	Credits
Master	2 years	120 credits

### Program outline

The training is mainly based on fundamental and thematic courses covering in a transversal manner the physical and chemical aspects of functional ceramic materials and their processes of development, shaping, surface treatments and control.

The objective is to train high-level specialists in the field of ceramic materials and processes with a view to professional integration in industry (engineering level) or in research (R&D, academic, etc.).

### Admissions requirements

Training in physico-chemistry of solids, synthesis and development of materials, structural characterization of condensed matter, physical properties of materials as well as knowledge of ceramic materials.

### Organization

- Internship in M1 (international mobility)
- End-of-study internship in M2
- Scientific project in M2

### How to apply

Students residing in France or the EU: [www.monmaster.gouv.fr](http://www.monmaster.gouv.fr)

International students from outside the EU:  
[www.campusfrance.org/fr](http://www.campusfrance.org/fr)

### Key info

- Selective course (limited places)
- No repetition possible in TACTIC course
- Scholarships 6000€ (4000€ in M1, 2000€ in M2)
- Financial assistance for incoming and outgoing mobility

### Study place

Institut de Recherche sur les Céramiques, Limoges

### Program contact

M1 :  
[abid.berghout@unilim.fr](mailto:abid.berghout@unilim.fr)

M2 :  
[remy.boulesteix@unilim.fr](mailto:remy.boulesteix@unilim.fr)

Project manager :  
[celine.parvy@unilim.fr](mailto:celine.parvy@unilim.fr)

### School contact

[msscience@unilim.fr](mailto:msscience@unilim.fr)



## What's next ?

- **Continuation of study**

Continuation in thesis possible.

- **Job opportunities**

**Jobs:** R&D engineer, eco consultant, business manager, project manager, researcher, assistant professor...

**Sectors:** Production, control, advice and expertise, R&D of materials and advanced production processes for applications in: energy, health, ICT, aeronautics, aerospace, automobiles, armaments, micro and nanotechnologies, metallurgy, catalysis...

## Program

### Semester 1

Course name	Course unit (UE or component)	Nbr h Lecture	Nbr h Tutorial	Nbr h Practice	Credits
Solid state chemistry	UE	17h	5.5h	0h	2
Solid state physics	UE	24h	6h	4h	3
X-ray crystallography	UE	9h	0h	13h	2
Powder synthesis	UE	7.5h	4.5h	16h	3
Diffusion in solids – focus on sintering	UE	18h	6h	12h	4
Reactivity of solids	UE	15h	7.5	0h	2
Materials and Energy Conversion	UE	12h	6h	0h	1.5
Plasmas and associated technologies for	UE	30h	6h	0h	3.5

## Advanced Ceramics

the elaboration of materials					
Soft skills	UE	20h	10h	0h	3
Quantum Chemistry and Statistical Physics	UE	21h	9h	0h	3
Laboratory research project at IRCER	Project				3

## Semester 2

Course name	Course unit (UE or component)	Nbr h Lecture	Nbr h Tutorials	Nbr h Practice	Credits
Electron microscopies	UE	9h	3h	16h	2.5
Defects in solids	UE	16.5h	3h	0h	2
Glasses	UE	7.5h	3h	9h	2
Measurement of physical properties of solids	UE	18h	6h	16h	3.5
Mechanical properties of materials	UE	16.5h	6h	12h	3
Atomic scale simulation	UE	15h	7.5h	0h	2
Language (English or French)	UE	0h	30h	0h	3
<b><i>Elective courses (1 out of 2)</i></b>					
• Novel light sources	UE	9h	0h	21h	3
• Materials properties and characterizations	UE	9h	0h	21h	3
Soft skills	UE	20h	10h	0h	3
Laboratory research project at IRCER	Project				3
Abroad internship	Internship				3

## Semester 3

Course name	Course unit (UE or component)	Nbr h Lecture	Nbr h Tutorial	Nbr h Practice	Credits
Fundamental research courses	UE				15
Rheology and Slurries	component	8h	4h	0h	
Additive manufacturing	component	8h	4h	0h	
Ecomaterials and Waste recovery	component	8h	4h	0h	
Syntheses of nanopowders	component	8h	4h	0h	
Thermal spraying of powders, solutions and slurries	component	8h	4h	0h	
Laser processing dedicated to the elaboration of thin films and nanoparticles	component	8h	4h	0h	
Ceramic/metal assemblies and reactivity	component	8h	4h	0h	
Complex structures of metal oxides	component	8h	4h	0h	
Controlled nanostructures	component	8h	4h	0h	
Ceramic materials for health	component	8h	4h	0h	
Multi-scale approach of sintering	component	8h	4h	0h	
Transparent ceramics and glass-ceramics	component	8h	4h	0h	
Structural and microstructural characterization techniques of functional ceramics	UE	12h	6h	0h	2
Simulation of materials and processes	UE	11h	0h	11h	2
Elaboration processes of bulk and thin layers materials	UE	15h	7.5h	0h	2

<b>Elective courses (1 out of 3)</b>					
<ul style="list-style-type: none"> <li>Crystal-chemistry of ionocovalent compounds</li> </ul>	UE	12h	3h	11h	1.5
<ul style="list-style-type: none"> <li>Characterization of surfaces</li> </ul>	UE	11h	0h	4h	1.5
<ul style="list-style-type: none"> <li>Fluid dynamics and basic properties of microfluidic flows</li> </ul>	UE	6h	3h	6h	1.5
<b>Elective courses (1 out of 3)</b>					
<ul style="list-style-type: none"> <li>Bio-engineering</li> </ul>	UE	18.5h	1.5h	10h	3
<ul style="list-style-type: none"> <li>Additive technologies and integration for RF and mm components and subsystems</li> </ul>	UE	9h	0h	21h	3
<ul style="list-style-type: none"> <li>Optical nonlinearity and materials</li> </ul>	UE	10h	0h	20h	3
Language (English or French)	UE	0h	30h	0h	3

## Semester 4

Course name	Course unit (UE or component)	Nbr h Lecture	Nbr h Tutorial	Nbr h Practice	Credits
Research or entrepreneurial project	Project				6
End of study internship (master's thesis)	Internship				24