

Major	Mechanical Engineering		
Master's programme	MATERIALS AND SURFACES ENGINEERING		
Master's Code	IMS/MSE		
Qualification awarded	Master's degree in Mechanical Engineering		
Programme director	Sorin IGNAT (sorin.ignat@ensam.eu)		
Mode of study	Level of qualification	Field of study	Language of study
Full time	Master	Engineering ISCED-F-07	English & French
ECTS	Campus	Length of programme	Specific arrangements for recognition of prior learning
60	Cluny – Paris – Lille ENSAIT Roubaix UB Dijon	1 year (from February to February)	Yes (VAE or VAP)
Keywords	Materials, Surfaces, Surfaces Treatments, Composites, Manufacturing, Polymers, Textiles, Metallurgy, Project Management, Implementation Processes, Powder Metallurgy, Tribology		

Admission requirements

Type	Level	Way
French proficiency	Level B2	Certificate
English proficiency	Level B1	Certificate
Previous degree	First-year of Master's (M1) minimum, or equivalent, in Engineering	Certificate of achievement

Applicants interested in the IMS/MSE programme must follow the online procedure and adhere to the schedule.

<https://artsetmetiers.fr/en/formation/master-admissions>

Overall objectives

The IMS programme aims at training future engineers and researchers to evolve in complex multi-disciplinary industrial environments and gives:

- A broader vision of materials, processes and the influence of surfaces and interfaces
- A complementary approach between experimentation (high level materials and methodologies) and modelling (multi-physics and multi-scale)
- A project management approach in general and scientific in particular



Programme learning goals

The table below details the abilities to be acquired and the expected proficiency levels according to the following grading scale:

- 1) Deepen the essential stages of a scientific project management approach
- 2) Provide the necessary tools for understanding multiphysics and modelling, in order to improve the materials properties. Particular interest is focused on the surfaces functionalities and their integrity
- 3) Deepen basic knowledge of materials, mechanics, coating, shaping and thermal processes, as well as analysis methods and characterization of materials, surfaces and interfaces
- 4) Develop a multidisciplinary approach which deals with the development and implementation of materials, their physic, chemical and mechanical properties as well as their industrial applications
- 5) Approach the "Manufacturing Process - Microstructure - Mechanical Properties" aspects, based on modelling and concrete industrial examples.

Sets of expected abilities	Expected abilities	Expected proficiency level
		R&D
<i>Disciplinary knowledge and reasoning</i>	1.1 Knowledge of underlying mathematics and science	4
	1.2 Core fundamental knowledge of engineering	4
	1.3 Advanced engineering fundamental knowledge, methods and tools	4
<i>Personal and professional skills attributes</i>	2.1 Analytical reasoning and problem solving	4
	2.2 Experimentation, investigation and knowledge discovery	4
	2.3 System thinking	3
	2.4 Ethics, though and learning	4
	2.5 Ethics, equity and other responsibilities	4
<i>Interpersonal skills: Teamwork and communication</i>	3.1 Teamwork	4
	3.2 Communications	4
	3.3 Communications in foreign language	3
<i>Conceiving, Designing, implementing, operating, innovating and entrepreneurship in the context of Corporate Social Responsibility</i>	4.1 External, societal and environmental context	3
	4.2 Enterprise and business context	3
	4.3 Conceiving, systems engineering and management	3
	4.4 Designing	4
	4.5 Implementing	3
	4.6 Operating	3
	4.7 Leading engineering endeavours	4
	4.8 Engineering entrepreneurship	3

More specifically, the **key strengths** of the IMS/MSE programme are as follows:

Programme structure

The beginning of the academic part of this MSc takes place every year at the end of January - beginning of February, to be completed in mid-May. It is followed by a research internship during 4 to 6 months. Some partnerships (ENSAIT Roubaix, ECAM Lyon) may require the start of an internship / research project before the academic part.

The academic part of this Master starts in Cluny with UE1 (see Table 1) and an optional unit (Review: metallurgy and continuum mechanics) for the students that want/need it, followed by five other teaching units (UE) in Cluny, Paris, Roubaix, Lille and Dijon.

Code	Title	Sem.	Year	ECTS	Hours	Compulsory/ Optional	Teaching modalities
UE1	Project management and initiation to research	S3	M2	6	60	Compulsory	Course/exercise/practice
UE2	Polymers and Processing	S3	M2	4	30	Compulsory	Course/exercise/practice
UE3	Composite materials	S3	M2	4	30	Compulsory	Course/exercise/practice
UE4	Experimental techniques	S3	M2	6	58	Compulsory	Course/exercise/practice
UE5	Surface treatments	S3	M2	6	57	Compulsory	Course/exercise/practice
UE6	Powder metallurgy	S3	M2	4	30	Compulsory	Course/exercise/practice
SFE	Master Thesis	S4	M2	30	N/A	Compulsory	Internship

Table 1 : Detail of the modules of the IMS/MSE programme over the two semesters.

Study and assessment rules

Each module can be evaluated by means of practical works, projects, reports, oral presentations, exams and the assessment rules are explained at the beginning of the programme. Each module is evaluated between 0 and 20.

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- Each module is evaluated between 0 and 20.

For all the modules, the long research project and the master thesis the final mark should be ≥ 10 .

- There is no compensation between modules.
- Resit exams are also organized.

Retake exams are organized at the beginning of the second semester.

Graduation requirements

To be graduated, students need to comply with the following rules:

Master 2

- Validate 30 ECTS during the first semester
- Validate 30 ECTS during the second semester

At the end of the IMS programme, different honours are awarded (very good, good, fair, passable) only to students who have not been obliged to participate in the resit exams.

Careers of graduates and access to further studies

Depending on their results and professional expectations, graduate students can continue their professional careers as a:



- PhD student in a field related to Industry 4.0, in academia or in industry (CIFRE), to become a recognized expert in an area of the Industry 4.0
- R&D engineer/researcher in large companies or start-ups, in numerous sectors (manufacturing, construction, services, consultancy, etc.) and fields (automotive, aerospace, health, etc.) in an area of the Industry 4.0