Major	Mechanical Engineering		
Master's programme	MATERIAL AND ENGINEERING SCIENCES		
Master's Code	MAGIS-MPAM		
Qualification awarded	**Master in Mechanical Engineering**		
Programme director	**Prof. Xavier COLIN (xavier.colin@ensam.eu)**		
Mode of study	*Level of qualification*	*Field of study*	*Language of study*
Full time	**Master ISCED 7**	**Engineering ISCED-F-07**	**English & French**
ECTS	*Campus*	*Length of programme*	*Specific arrangements for recognition of prior learning*
60	**Paris**	**1 year (from September to September)**	**Yes (VAE or VAP)**
Keywords	**Materials science, solid mechanics, thermodynamics of solids, numerical methods, advanced experimental methods, metallic materials, advanced processing techniques, plastic strain processing, additive manufacturing.**		

Admission requirements

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

Applicants interested in the MAGIS-MPAM programme must follow the online procedure and adhere to the schedule.

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

Overall objectives

MAGIS is a second-year Master's program aims at providing students with a deeper understanding of the fundamentals of materials science and engineering and solid mechanics, as well as a better knowledge of the relationships between the processing, the material, its microstructure and its mechanical properties for advanced industrial applications and innovative processing technologies.

- Students are learned to scientific methodology, ranging from advanced experimental methods to modeling and simulation of the mechanical behavior of structures, through the analysis of the mechanisms involved throughout the material life cycle, including their couplings.
- The MAGIS-MPAM track deals more particularly with innovative processing techniques of metals, such as additive manufacturing, and numerical methods for metal processing.

Programme learning goals

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

1) To lead an innovative approach in a disciplinary field that takes into account the complexity of the situation by using information that may be incomplete or seems to be contradictory
2) To lead a research project (design, fulfilment and management, dissemination) that can mobilize multidisciplinary skills in a collaborative framework and accept responsibilities
3) To adapt to different socio-professional and intercultural, but also national and international contexts
4) To update his knowledge in a specialized scientific field by performing a thorough literature review (state-of-the-art)
5) To communicate clearly and concisely (by talk, poster, written report, etc.) in French and, at least, in one foreign language (English) in front of an audience of specialists and non-specialists

Sets of expected abilities	***Expected abilities***	***Expected proficiency level***
		R&D
Disciplinary knowledge and reasoning	**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**
Personal and professional skills attributes	**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**
Interpersonal skills: Teamwork and communication	**3.1 Teamwork**	**4**
	3.2 Communications	**4**
	3.3 Communications in foreign language	**3**
Conceiving, Designing, implementing, operating, innovating and entrepreneurship in the context of Corporate Social Responsibility	**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 MAGIS-MPAM programme are as follows:

- It is held in the historical heart of Paris and in research laboratories in Paris areas (Centre des Matériaux, FAST, LMPS, PIMM, etc.)

- It is a joint program between several Parisian engineering schools: Arts et Métiers Institute of Technology, ENS-Paris-Saclay, CentraleSupélec, Mines-Paris and ESPCI-Paris
- It involves several industrial partners which give conferences and offer research internships within their own research and development departments: Air Liquide, CEA, CNES, EDF, LRCCP, ONERA, RENAULT, SAFRAN, SNCF, etc
- Each year, about half of the promotion is made up of foreign students coming from partner universities or engineering schools in order to obtain a double Master's degree: Bauman Moscow State Technical University, ENSAM Casa, ENSAM Meknes, Iran University of Science and Technology, KIT Karlsruhe, Politechnico di Bari, Universidad del País Vasco, Universidad de Valencia, University of Guilan, University of Teheran, etc
- Students interact with internationally recognized academic staffs and are in regular contact with industry due to the large volume of research works performed by laboratories for industry

Programme structure

Learning outcomes are reached through a well-balanced training program that combines theoretical and practical learning sequences.

MAGIS-MPAM is a second-year Master's program that spreads over two semesters

- **Second year (Master 2)**
  - **First semester (S3): From September to February**
    This semester is composed of a foreign language module (English for French and francophone students, French for foreign and non-francophone students), a management module (for ENSAM engineering students only), 4 general scientific modules, 3 specialized modules and 1 optional module all dedicated to this program, and a research project, for a total of 30 ECTS.
  - **Second semester (S4): From February to September**
    The second semester is dedicated to the Master thesis lasting (at least) 20 weeks for 30 ECTS. The internship will be made in a research structure (i.e. university laboratory or company department) in France or abroad.

Code	Title	Sem.	Year	ECTS	Hours	Compulsory/ Optional	Teaching modalities
NSM23	Materials science	S3	Master 2	3	30	Compulsory	Course/exercise
NSM24	Materials constitutive equations and thermodynamics of solids	S3	Master 2	3	32	Compulsory	Course/exercise
NSM25	Numerical methods for continuum mechanics	S3	Master 2	3	30	Compulsory	Course/exercise/practical work
NSM26	Advanced experimental methods	S3	Master 2	3	30	Compulsory	Course/exercise/practical work
NSM27	Research project	S3	Master 2	3	70	Compulsory	Bibliographic study
NSM30	Dynamic behaviour and failure of materials	S3	Master 2	3	30	Optional	Course/exercise
NSM31	Continuum damage mechanics	S3	Master 2	3	24	Optional	Course/exercise
NSM32	Plastic strain processing	S3	Master 2	3	25	Compulsory	Course/exercise
NSM33	Metal additive manufacturing	S3	Master 2	3	24	Compulsory	Course/exercise

Code	Title	Sem.	Year	ECTS	Hours	Compulsory/ Optional	Teaching modalities
NSM34	Numerical simulation for metal processing	S3	Master 2	3	60	Compulsory	Course/exercise/practical work
NSM35	Algorithmic modelling of multi-physical processes	S3	Master 2	3	34	Optional	Course/exercise/practical work
NSM37	Processing of polymers and composites	S3	Master 2	3	30	Optional	Course/exercise/practical work
NSM41	Fatigue of materials	S3	Master 2	3	24	Optional	Course/exercise
NSM42	Eco-Materials	S3	Master 2	3	33	Optional	Course/exercise/practical work
NSM43 E	Scientific communication in foreign language	S3	Master 2	3	30	Compulsory for French and francophone students	Course/exercise
NSM43 F	Scientific communication in foreign language	S3	Master 2	3	36	Compulsory for French and francophone students	Course/exercise
-	Risks management	S3	Master 2	n/a	24	Compulsory for engineering ENSAM students	Course/exercise
-	Master Thesis	S4	Master 2	30	N/A	Compulsory	Research internship

Table 1 : Detail of the modules of the MAGIS-MPAM 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.

Each module can be evaluated by means of practical works, projects, reports, poster or oral presentations and/or exams and the assessment rules are explained at the beginning of the programme.

- Each module is evaluated between 0 and 20.

For all modules, the research project and the master thesis, to validate the ECTS, the final mark should be ≥ 10. There is no compensation between modules.

- Resit exams are organized at the beginning of the second semester (in the middle of March).

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 24 ECTS during the first semester, with a final average ≥ 10 and no mark < 7.
- Validate 30 ECTS during the second semester.

At the end of the MAGIS-MPAM program, the final average is calculated from the average of two semesters, and different honours are awarded (highest honours, high honours, honours) only to students who have no mark < 10.

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 industry (CIFRE) or in academia to further investigate and work on up-to-date scientific challenges and thus, become a recognized expert. This is a preliminary step to reach a position of researcher or professor in France or abroad.
- Positions in large companies or start-ups (researcher in R&D laboratory, mechanical design engineer, production workshop manager, project manager, consultant, head of R&D department, etc.) in many industrial fields (aeronautics and space, automotive, building and civil engineering, energy, electricity, nuclear, health, manufacturing, etc.).