



Major	Industrial Engineering		
Master's programme	KNOWLEDGE INTEGRATION IN MECHANICAL PRODUCTION CONCEPTION, INDUSTRIALISATION, INNOVATION		
Master's Code	KIMP_CII		
Qualification awarded	Master's degree in industrial engineering		
Programme director	Dr. Jelena PETRONIJEVIC ( <a href="mailto:jelena.petronijevic@ensam.eu">jelena.petronijevic@ensam.eu</a> )		
Mode of study	Level of qualification	Field of study	Language of study
Full Time	Master Code ISCED 7	Engineering Code ISCED-F-07	English
ECTS	Campus	Length of programme	Specific arrangements for recognition of prior learning
60	Metz	1 year (from October to September)	No
Keywords	Design and manufacturing engineering, Knowledge integration, mechanical engineering, risk analysis, simulation, industrialization, robotics, machine learning for manufacturing		

## Admission requirements

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

Applicants interested in the KIMP\_CII programme must follow the online procedure and meet the schedule: <https://artsetmetiers.fr/en/formation/master-admissions>

## Overall objectives

Identifying and formalizing the Knowledge based on a scientific approach about design, innovation, production planning and manufacturing systems. The KIMP program provides training for further PhD studies, research activities or positions in industry as an expert with having an international experience by working in an international and multicultural context.

- **Co-Designing product and its manufacturing system:** innovation, conceptual design, eco-design, detail design, geometric modelling, structure analysis, integrated design and manufacturing, manufacturing process, industrialization, cost, and risk estimation
- **Developing Knowledge engineering and integration:** big data management, Knowledge management, collaborative design, capitalization and extraction of the Knowledge, digital mock-up, and manufacturing



## Programme learning goals

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

- To have experienced or been exposed to the current and future challenges for integrated design by considering current and future manufacturing paradigms (robotics, manufacturing process management, machine learning, ...).
- To be able to participate and contribute to develop transversal approaches coupling design, simulation, integration and control/monitoring of both products and manufacturing systems.
- To understand, explain and handle the concepts, methods, models, and tools required (with the help of computer science: AI data and rules driven approaches).
- To be skilled in the practice and implementation of methods, models, and tools i) to model the product and its characteristics, ii) to identify and manage the links between its parameters and the ones from its environment during its whole lifecycle, iii) to manufacture them.
- To lead or innovate in the scope of the new industrial paradigms by having a global and systemic viewpoint.

Sets of expected abilities	Expected abilities	Expected proficiency level
		R&D
<i>Disciplinary knowledge and reasoning</i>	<b>1.1 Knowledge of underlying mathematics and science</b>	<b>4</b>
	<b>1.2 Core fundamental knowledge of engineering</b>	<b>3</b>
	<b>1.3 Advanced engineering fundamental knowledge, methods and tools</b>	<b>3</b>
<i>Personal and professional skills attributes</i>	<b>2.1 Analytical reasoning and problem solving</b>	<b>4</b>
	<b>2.2 Experimentation, investigation and knowledge discovery</b>	<b>4</b>
	<b>2.3 System thinking</b>	<b>4</b>
	<b>2.4 Ethics, though and learning</b>	<b>4</b>
	<b>2.5 Ethics, equity and other responsibilities</b>	<b>5</b>
<i>Interpersonal skills: Teamwork and communication</i>	<b>3.1 Teamwork</b>	<b>4</b>
	<b>3.2 Communications</b>	<b>4</b>
	<b>3.3 Communications in foreign language</b>	<b>4</b>
<i>Conceiving, Designing, implementing, operating, innovating and entrepreneurship in the context of Corporate Social Responsibility</i>	<b>4.1 External, societal and environmental context</b>	<b>4</b>
	<b>4.2 Enterprise and business context</b>	<b>2</b>
	<b>4.3 Conceiving, systems engineering and management</b>	<b>4</b>
	<b>4.4 Designing</b>	<b>5</b>
	<b>4.5 Implementing</b>	<b>4</b>
	<b>4.6 Operating</b>	<b>4</b>
	<b>4.7 Leading engineering endeavours</b>	<b>3</b>
	<b>4.8 Engineering entrepreneurship</b>	<b>2</b>



More specifically, the **key strengths** of the KIMP\_CII programme are as follows:

- Deep theoretical knowledge and practical applications on the main concepts, methods, models, and tools involved in integrated product design and its manufacturing.
- Courses and Internship supervisions taking advantage of a research framework and context: the programme is managed and fully taught by LCFC researchers; you will interact with specialists!
- Being able to think more global (robotics, manufacturing design and monitoring ...) then focused on only one domain or expertise.
- International exposure through multiples double degree programs,
- Extended practical skills for managing product complexity and interactions during its whole lifecycle.

## Programme structure

Learning outcomes are reached through a well-balanced training program that combines theoretical and practical learning sequences, during which students are placed in both academic and real-life industrial configurations, to develop multiple transversal skills.

The KIMP\_CII programme is a one-year Master of Science programme that spans on two semesters (Figure 1):

- **Fall semester (S3):** From October to January  
This semester is dedicated to lectures and courses. These ones are composed by 4 scientific core courses of 12h each, 4 specialisation scientific modules 24h each (to choose among 5 proposed), 1 language module of 24h, 2 professional courses, for a total of 30 ECTS.
- **Spring semester (S4):** From February to September  
The second semester is dedicated to the Master thesis, a scientific project of 6 months and 30 ECTS. The internship can be made in a company or a laboratory in France or abroad.

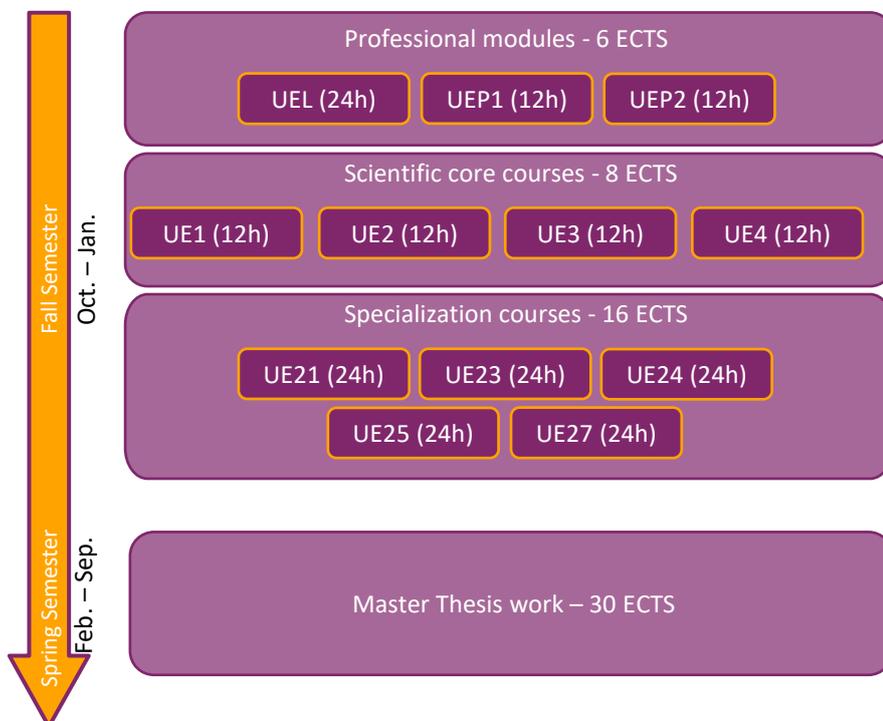


Figure 1: Structure of the KIMP\_CII programme



Code	Title	Semester	Credits	Hours	Compulsory/Optional	Teaching modalities
UE1 (S)	Methods, models for the integration of product and manufacturing process	S3	2	12	Compulsory	Course/Exercises/Project
UE2 (S)	AI tools for integrated design	S3	2	12	Compulsory	Course/Exercises/Project
UE3 (S)	Modelling and control of mechatronics devices	S3	2	12	Compulsory	Course/Exercises/Project
UE4 (S)	Manufacturing process management	S3	2	12	Compulsory	Course/Exercises/Project
UEP1 (P)	Literature review	S3	2	12	Compulsory	Course/Exercises/Project
UEP2 (P)	Human Safety in Manufacturing System design	S3	2	12	Compulsory	Course/Exercises/Project
UEL (P)	English lectures	S3	2	24	Compulsory	Course/Exercises/Project
UE21(S)	Performance Analysis and Process Supervision	S3	4	24	Optional	Course/Exercises/Project
UE23 (S)	Production System Control	S3	4	24	Optional	Course/Exercises/Project
UE24 (S)	Discrete Event System	S3	4	24	Optional	Course/Exercises/Project
UE25 (S)	Industrialization	S3	4	24	Optional	Course/Exercises/Project
UE27 (P)	Product Risk Management	S3	2	24	Optional	Course/Exercises/Project
LR	Literature review work	S4	6	N/A	Compulsory	Internship
MT	Master thesis	S4	24	N/A	Compulsory	Internship

Table 1: Detail of the modules, terms, and credits of the KIMP\_CII 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.

For the 4 professional and language modules (noted (P) in Table 1): The final mark of each professional/language module must be  $\geq 10$ , and there is no compensation between the modules.

For the 8 scientific modules (noted (S) in Table 1):

- The final mark of each scientific module must be  $\geq 10$ , and there is no compensation between the modules.
- The student should select 4 specialization courses among the 5 proposed.

For master thesis:

- The final mark of the master thesis must be  $\geq 10$ .

Retake exams are organized as homework during the second semester to avoid disturbing the Master Thesis work. Only the first attempt is considered for ranking.



## Graduation requirements

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

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

At the end of the KIMP\_CII programme, the final average is calculated based on the ECTS distribution of only scientific courses, and mentions are awarded (very good, good, fair, passable) based on results and behaviour.

## Careers of graduates and access to further studies

Laureates of this Master of Science have access to a wide variety of possibilities to build their career:

- Careers mainly in medium and large companies in industry as engineer/researcher, in numerous sectors (manufacturing, product design, services, consultancy) and fields (aeronautics, automotive, IT, transportation, energy, construction, health, plastics, and metallurgy)
- Positions: project and process manager, consultant, researcher, head of R&D department
- PhD positions in France or abroad in academia or in industry (CIFRE).