Major	Mechanical Engineering		
Master's programme	ADVANCED MANUFACTURING AND MATERIALS SCIENCE		
Master's Code	AM2S		
Qualification awarded	**Master in mechanical engineering**		
Programme director	**Sébastien JÉGOU sebastien.jegou@ensam.eu**		
Mode of study	*Level of qualification*	*Field of study*	*Language of study*
Full time	**Master ISCED 7**	**Engineering ISCED-F-07**	**English**
ECTS	*Campus*	*Length of programme*	*Specific arrangements for recognition of prior learning*
60	**Aix-en-Provence**	**1 year**	**Yes (VAE or VAP)**
Keywords	**Mechanical Engineering**		

Admission requirements

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

Applicants interested in the AM2S programme must follow the online procedure and adhere to the schedule.

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

Overall objectives

The objectives are :

- To to propose to the future engineers or researchers the base knowledges and skills to understand, use and develop the 4.0 concept base on smart approaches including the digital revolution.
- To increase of the knowledges of the manufacturing processes and the material by a multiphysical and multiscales approach including smart and digital notions.

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 have experienced or been exposed to the current and future challenges for the manufacturing industries and the technologies related for advanced and smart manufacturing.
2) To be able to participate in and contribute to develop a transversal approach coupling materials, mechanics, manufacturing in the context of the future industry 4.0
3) To be able to understand and explain the relationships between the Material Science and the Manufacturing Processes using multiphysic and multiscale approaches to better understand the coupling.
4) To be skilled in the practice or implementation of i) the numerical tools for optimizing the design of structures and high values-added parts, ii) the choices and uses of materials and manufacturing processes in the field of transport or energy.
5) To be able to lead or innovate in the new technologies based on smart digitalization, big-data, numerical simulations.

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 AM2S programme are as follows:

Programme structure

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

The AM2S programme is a one-year Master programme that spreads on two semesters

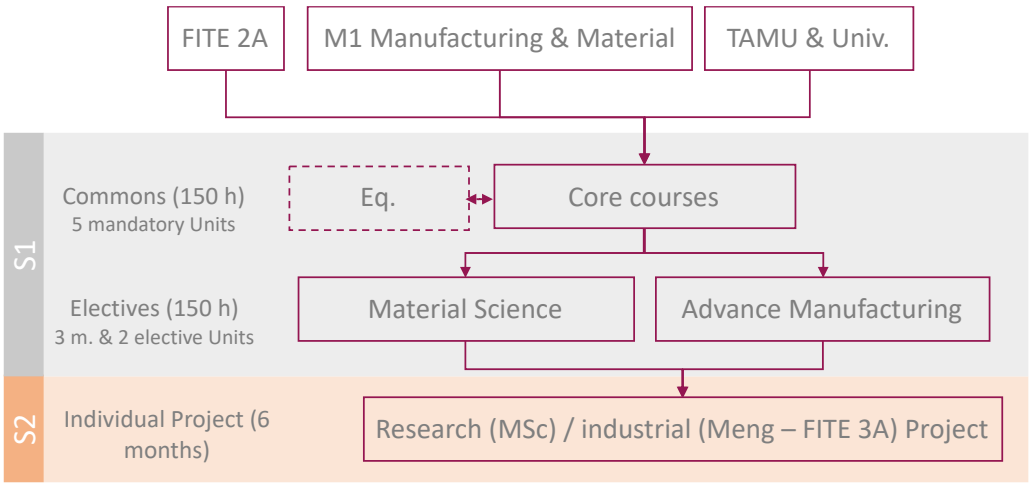

Figure 1 : Structure of the AM2S programme.

Code Teaching Unit (TU)	Code Teaching Module (TM)	Title	Sem.	Year	Coefficient	Hours	Compulsory/ Optional	Teaching modalities
CSB (Common Scientifics Background) 9 ECTS	MMM	Multiscale and Multiphysic Manufacturing	S3	M2	3	30	Compulsory	Course/exercise
	KIN	Kinetic Processes and Mechanical Behavior in Materials Science	S3	M2	3	30	Compulsory	Course/exercise
	NMME	Numerical Methods for Mechanical Engineering	S3	M2	3	30	Compulsory	Course/exercise
PRO (Professional) 6 ECTS	SP	Scientific project	S3	M2	3	30	Compulsory	Bibliographic study
	COM	Scientific communication in foreign language	S3	M2	3	30	Compulsory	Bibliographic study
MS (Materials Science) 15 ECTS	AM	Advanced materials	S3	M2	3	30	Compulsory/Optional	Course/exercise
	MECAMAT	Mechanics of materials	S3	M2	3	30	Compulsory	Course/exercise
	INT	Surface Integrity	S3	M2	3	30	Compulsory	Course/exercise
	EXP	Experimental methods for material and mechanical characterization	S3	M2	3	30	Optional	Course/exercise
	FM2	Fracture Mechanics and Fatigue of Material	S3	M2	3	30	Optional	Course/exercise

Code Teaching Unit (TU)	Code Teaching Module (TM)	Title	Sem.	Year	Coeffi-cient	Hours	Compulsory/ Optional	Teaching modalities
	EXTREM	Mechanical Behavior of Materials in Ex-treme Conditions	S3	M2	3	30	Optional	Course/ex-ercise
	COR	Corrosion	S3	M2	3	30	Optional	Course/ex-ercise
AM (Advanced Manufactur-ing) 15 ECTS	SMART	Smart Manufacturing	S3	M2	3	30	Compulsory	Course/ex-ercise
	TRIBO	Tribology for Manu-facturing	S3	M2	3	30	Compulsory	Course/ex-ercise
	METRO	Metrology for Manu-facturing	S3	M2	3	30	Compul-sory/Optional	Course/ex-ercise
	INOV	Innovative Manufac-turing Processes	S3	M2	3	30	Optional	Course/ex-ercise
	PREC	Precision manufactur-ing	S3	M2	3	30	Optional	Course/ex-ercise
	CAST	Advanced Casting	S3	M2	3	30	Optional	Course/ex-ercise
	DIGIT	Digital Manufacturing	S3	M2	3	30	Optional	Course/ex-ercise
MT	MT	Master Thesis	S4	M2	30	6 months	Compulsory	Research intern-ship

Table 1 : Detail of the modules of the AM2S programme over the two semesters.

Study and assessment rules

Each teaching module (TM) 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 TM is evaluated between 0 and 20.

The control of knowledge and the evaluation of acquired skills are done by traditional examinations and continuous control.

- Notes acquired in continuous review are not subject to a second session. The precise control rules are validated each year by the steering committee.
- An exam is organized at the end of each TM. A catch-up session is organized at least 15 days after the exam.

Each teaching unit is marked from 0 to 20 and the validation procedures of the TMs are those in force in the ENSAM Pedagogic Rules.

- The control procedures are specified by each TM manager. For lessons in the form of lectures, the test may include one or two written exams, at the discretion of the TM managers.
- Training, projects, courses, are evaluated both based on continuous monitoring and a restitution (report and / or defence).

Retake exams are organized at least 15 days after the exam and prior to the beginning of the research internship (2nd semester).

Graduation requirements

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

Master 2

- 1st Semester: Validation of TU for 30 ECTS (15 ECTS (9 CSB + 6 PRO + (15 MS or 15 AM or (9 MS +6 AM))

- 2nd Semester: Validation of internship (MT-Master thesis) for 30 ECTS

Careers of graduates and access to further studies

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

- The AM2 MSc will allow students to continue in all programs requiring this level of study and the enrolment in a phD thesis in science is a continuation of studies to be favored