Major	Mechanical Engineering		
Master's programme	MECHANICS & ENERGETICS		
Master's Code	ME-INAES		
Qualification awarded	**Master's degree in Mechanical Engineering**		
Programme director	**Prof. Azita AHMADI-SENICHAULT (Azita.ahmadi@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	**Bordeaux**	**1 year (from September to September)**	**Yes (VAE or VAP)**
Keywords	**Mechanics, energetics, Transfer phenomena, aeronautics, space, composite materials, additive manufacturing**		

Admission requirements

Type	Level	Way
French proficiency	**Level B1**	**Certificate**
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 ME-INAES programme must follow the online procedure and adhere to the schedule.

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

Overall objectives

The ME-INAES programme aims at training future engineers and researchers to evolve in academic and industrial environments related to aerospace applications.

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 acquire knowledge in the major mechanical and energy engineering fields (transfer phenomena, solid mechanics, design, etc.) and their application to additive manufacturing
2) To understand the complexity of the aerospace industry
3) To develop skills in the major fields of mechanics applied to the aerospace industry
4) To experience a structured research methodology to be used as a template to address a wide range of Industry 4.0 related research challenges

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 ME-INAES programme are as follows:

- Taking place in the center of Bordeaux University Campus, the Master benefits from a dynamic research environment: contribution of Bordeaux University staff, support from the TREFLE, DuMAS, MPI, IMC Departments of the Institute of Engineering and Mechanics (I2M) of Bordeaux http://i2m.u-bordeaux.fr/

- It benefit from the presence of an active industrial landscape namely AEROSCAPE VALLEY competitiveness cluster, and numerous enterprises (SME and large groups) which develop projects on the creation and elaboration of tomorrow's aerospace technology and science
- The program includes conferences and invited lectures given by industrials
- Transversal adaptation, integration, analysis, critical thinking, self-learning, communication, valorisation and organizational skills gained when confronting to both academic and industrial multi-disciplinary projects
- Some of the courses are taught in English and the first semester's research project includes a literature survey to be reported and defended in English

Programme structure

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

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

- **First semester (S3): From September to January**
  This semester is composed of an English language module, a management module, 3 general scientific modules of 20h each, 3 specialized modules dedicated to aeronautics and space and a long research project of 90h, for a total of 30 ECTS
- **Second semester (S4): From February to September**
  The second semester is dedicated to the Master thesis of 6 months for 30 ECTS. The internship will be made in a research structure (laboratory or company) in France or abroad.

Code	Title	Sem.	Year	ECTS	Hours	Compulsory/ Optional	Teaching modalities
L1	Engineer & the world (English)	S3	M2	2	20	Compulsory	Course/exercise/project
M1	Management, strategy, innovation	S3	M2	2	35	Compulsory	Course/exercise/project
GS1	Physics of Transfer Phenomena	S3	M2	3	20	Compulsory	Course/exercise/project
GS2	Complements of structure mechanics	S3	M2	3	20	Compulsory	Course/exercise/project
GS3	Additive manufacturing	S3	M2	2	20	Compulsory	Course/exercise/project
MS1–INAES	Evolution of the design of propulsion systems	S3	M2	4	42	Compulsory	Course/exercise/project
MS2–INAES	Aeronautical materials and structures: elaboration and dimensioning	S3	M2	5	66	Compulsory	Course/exercise/project
MS3–INAES	Products & processes of the aerospace industry	S3	M2	4	42	Compulsory	Course/exercise/project
LRP	Long research project	S3	M2	5	90	Compulsory	Long project
MT	Master Thesis	S4	M2	30	N/A	Compulsory	Internship

Table 1 : Detail of the modules of the ME-INAES 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 organized at the beginning of the second semester.

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 ME-INAES programme, the final average is calculated based on the ECTS distribution, and 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 aeronautics and space, in academia or in industry (CIFRE) to become a recognized expert;
- R&D engineer/researcher in large companies or start-ups, in numerous sectors (manufacturing, services, consultancy, etc.) and fields (aerospace, automotive, etc.)