

MASTER OF SCIENCE IN AERONAUTICS & SPACE

Aeronautical Mechanics and Energetics (AME)



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▶ AIMS

The Master of Science in Aeronautical Mechanics and Energetics offers a common-core syllabus with elective majors:

- Energetics and Propulsion
- High Temperature Materials

After completing the first year, students have basic knowledge on propulsion systems and materials and structures from aeronautical and space engineering.

At the end of the first year, students choose a major with a specialization either in energetics or materials for turbine engines.

At the end of the two years, students have thorough knowledge in the major they have chosen on theoretical, numerical and experimental aspects, getting the latest advances on these research areas.

Individual research projects and internships (particularly the thesis) allow students to put skills into practice and get ready for labour market.

▶ ORGANIZATION & CONTACTS

Duration of studies: Two-year full time

Beginning of classes: September

Location: ISAE-ENSMA

Address:

1 avenue Clément Ader - Téléport 2 - BP 40109
86961 Futuroscope Chasseneuil Cedex

Course Director:

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International Office:

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www.isae-ensma.fr

Teaching language: ENGLISH

▶ PROGRAM ORGANIZATION

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.
Year 1	SEMESTER 1 COMMON PART				SEMESTER 2 COMMON PART, MAJOR AND RESEARCH PROJECT								
Year 2	SEMESTER 3 MAJOR AND RESEARCH PROJECT							SEMESTER 4 MASTER THESIS				Master thesis defense	



The two-year program is entirely taught in English, with a total of 120 ECTS credits (30 ECTS credits for each semester). After a common-core syllabus, students choose among 2 majors: propulsion or high temperature materials. The last semester is dedicated to the master thesis. Students have to carry out a 5-month internship in a company or a laboratory, in France or abroad.

The training program is composed of lectures, conferences, class works, laboratory sessions and projects. It also offers compulsory French as a Foreign Language courses.

SYLLABUS

SEMESTER 1: 30 CREDITS

Core courses - 250 h

Thermochemistry, Propulsion 1, Basics of thermal sciences, Structural mechanics, Numerical methods, Flight mechanics, Foreign languages, French and European culture

SEMESTER 2: 30 CREDITS

Core courses - 330 h

Research project, Foreign languages, French and European culture

Major 1: Aerodynamics-Propulsion - 125 h

Fluid mechanics, Gas dynamics, Propulsion 2, Metrology

Major 2: Structures-Materials - 125 h

Vibrations-Finite element method, Project in structures and materials, Materials science, Helicopters

SEMESTER 3: 30 CREDITS

Core courses - 160 h

Research project, Foreign languages

Major 1: Energetics and Propulsion (EPROP) - 250 h

Turbulence, Combustion, Atomisation and two-phase flow, Two-phase combustion, Turbulent combustion, Turbomachinery, Rocket propulsion, Radiation in semi-transparent environment, Turbulent heat exchange, New combustion mode for propulsion, Numerical combustion for engines

Major 2: High Temperature Materials (HTM) - 250 h

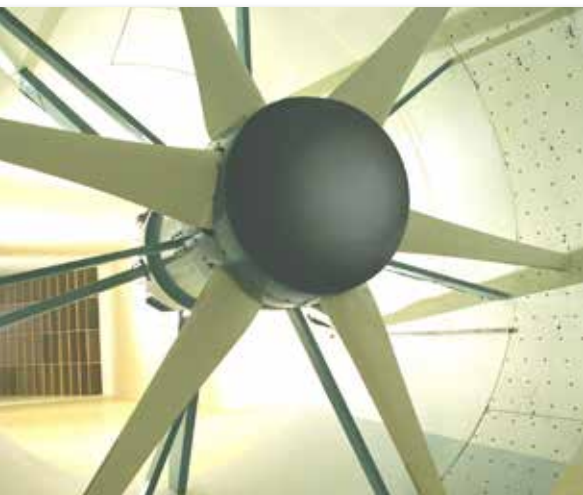
Finite element modelling, Plasticity-viscoplasticity, Materials mechanical properties, Fracture mechanics, Fatigue, Atomic diffusion and applications, High temperature alloys, Thermal barrier coatings for gas turbine engine, Materials processing, Engineering failure analysis, Corrosion of engineering materials, Creep

SEMESTER 4: 30 CREDITS

Master thesis - 5 to 6 months



Vulcain 2 - Safran Group



Fan of the concrete wind tunnel

MASTER THESIS

Students conduct a thesis in a company or a laboratory from aeronautical area, in France or abroad. The project is supervised by a tutor from the host organisation and from ISAE-ENSMA. The Master thesis is concluded by the preparation of a report and a public defense.



Graduates of the MSc AME can join R&D and R&T departments from the leading transportation and energy industries (mainly aeronautical engineering). The aeronautical area is strongly expanding and new markets are emerging, mainly in Asia. One of the issues of transportation area is the design of cleaner and less expensive systems. It is possible thanks to an optimization process of propulsion systems and structures, but also thanks to important advances in technology. Using new combustion methods and new materials - lighter and higher temperature resistant - as well as the optimization, the design of systems have to come up to these issues.

The students will be able to work either in international companies or in a research laboratory to carry on with a PhD program.

ADMISSION PROCEDURE

Admission requirements:

Applicants must have a Bachelor's degree or equivalent degree in aerospace, mechanical engineering or mechatronics.

Tuition and Registration fees :

7 000 euros per year for non-European students

3 500 euros per year for European students

Scholarships may be awarded on merit.

Tuition waivers awarded within exchange programs.

Students are selected and admitted by an admission committee:

Possible interviews can be organized if necessary.

Deadlines for application:

Several admission committees are scheduled from December to June

Language qualification requested:

TOEFL (paper-based): 550

TOEFL (IBT): 79

TOEIC: 750

IELTS: 6.0

ONLINE APPLICATION TO MSc AME:

<http://www.ensma.fr/en/admission/other-degrees/>



Falcon X (Dassault Aviation) et Airbus A380



Ariane 5 rocket (ESA/CNES/Arianespace/CEP)



E-FAN flight



Founded in Poitiers in 1948, ISAE-ENSMA has been located since 1993 next to the site of Futuroscope, a famous European theme park. In **70** years, our school has acquired a reputation for excellence by training close to **6 000** high level engineers, supported by a world famous research program. The school has multiple partnerships with large companies, which hire many of our graduate students. The academic training given at ISAE-ENSMA enables graduate engineers to choose jobs in engineering design departments, research and development mainly in the aeronautical and space industries, and more generally in the ground transportation, mechanics and energy industries.



TEACHING DEPARTMENTS

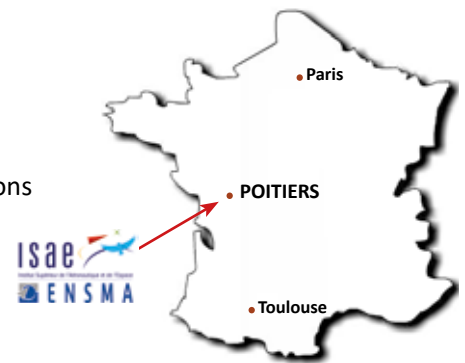
- ▶ Fluid mechanics and Aerodynamics
- ▶ Computer science and Automatics
- ▶ Energetics and Heat transfer
- ▶ Engineering of industrial systems
- ▶ Materials and Structures
- ▶ Management and liberal studies

KEY FIGURES

- ▶ **700** engineering students
- ▶ **100** PhD students
- ▶ **200** permanent staff
- ▶ **50** international academic partnerships
- ▶ **20 %** of international students
- ▶ **3** Masters programs (taught in French):
Air and Ground Transportation
High Performance Materials
Computer Science

LIFE ON CAMPUS

- ▶ University residences
- ▶ University restaurants
- ▶ Many student clubs and associations
- ▶ Sport facilities



RESEARCH

The P' Institute (UPR 3346) www.pprime.fr

P' is composed of six laboratories in combustion and detonation, aerodynamics, heat transfer, mechanics and physics of materials and mechanical engineering. A technological platform called the CEAT (research center in aerodynamics and heat transfer), from the University of Poitiers and ENSMA, gathers heavy research facilities also used for teaching related to supersonic test benches.

Laboratory of Computer Science and Automatic Control for Systems www.lias-lab.fr

The laboratory is based on four axes (or teams):

- Data and model engineering
- Real-time embedded systems modeling
- Modelling, identification and diagnosis of systems
- Systems analysis and control



ISAE GROUP

The ISAE Group gathers French engineering schools under the ISAE brand (Institut Supérieur de l'Aéronautique et de l'Espace) and thus contributes to the valorization of the engineering training in the aeronautical and space fields. The ISAE Group enhances the schools' attractiveness, optimizes the adequacy between the training and the employers' needs and develops research of excellence and international opening. The schools (ISAE-ENSMA, ISAE-SUPAERO, ESTACA and French Air Force Academy) from the ISAE Group deliver high-level engineering trainings, masters, specialized masters and PhD programs.

INTERNATIONAL NETWORKS



For further information about these networks, please visit:

