



## Mastère Spécialisé® / Advanced Master

# Aeronautical and Space Structures



### ■ Objectives

In an increasingly competitive international context, the research on innovative materials combined with optimization of calculation methods for structures, and their statistical, dynamic and thermal certification are major assets for industrial architects in the aircraft and spacecraft sectors. The «Aeronautical & Space Structures» prepares engineers with a future career in design, research and development, certification, testing and qualification, in-depth, multi-disciplinary know-how in mechanical engineering applied to structures. This Master program is the European reference in the field.

The program aims to grow expertise in numerical calculation for the most advanced structures, knowledge in materials as well as an understanding of their interferences with the environment (in particular loads and fluid-structure interactions).

The dynamics of flexible structures, modeling and active and passive structural control of complex elements are the core focus of this master program.

The goal of the AES Advanced Master program is to train specialists in the field of design, optimization and certification of light structures who have mastered methods of modeling and analysis of aircraft structures and space vehicles in the industrial context.

### ■ Learning approach

#### First semester:

380 hours of courses delivered from September to March on the premises of ISAE by permanent ISAE-SUPAERO faculty and visiting lecturers from industry providing the latest industrial expertise including: lecture courses, design offices, lab work, numerical simulations, CAD, lab sessions, industrial visits.

#### Second semester:

Students have to conduct a professional thesis or make an internship in an industry or in a laboratory, in France or abroad, supervised by a tutor from the host organization and from ISAE-SUPAERO. The thesis is concluded by the preparation of a report and an oral dissertation in front of a jury.

### ■ Organization

#### Head of program

- Prof. Yves GOURINAT  
yves.gourinat@isae-supaero.fr

#### Course duration

One year full time: 6 months of courses and 6 months of professional thesis or internship

#### Course start date

September

#### Location

ISAE-SUPAERO

#### Teaching language

English

### ■ Syllabus

#### Part 1: Aerospace structures: methods & tools for engineering & dynamics - 62 h

- Flight dynamics: an introduction
- Aerodynamics: an introduction
- MATLAB standards
- Structural dynamical control: an introduction
- Structural shells modeling and recycling
- Advanced numerical models

#### Part 2: Aerospace systems architecture - 82 h

- Aerodynamics loads
- Aircraft structural loads
- Architecture & structure of launch vehicles
- Helicopters: architecture & design
- Satellites: architecture & structures

#### Part 3: Aerospace structures: dynamics & physics - 138 h

- Finite elements: application to aeronautical structures
- Flexible aircraft: dynamics & aeroelasticity
- Dynamical active control of structures
- Advanced computation of aircraft structures
- Advanced structural dynamics

#### Part 4: Aerospace programs & technologies - 75 h

- Mechanics of aerospace materials
- Computer Assisted Design & Drawing
- Commercial aircraft: strategies for design & innovative programs

#### Times project - 25 h

- Team Innovative Management for Evolved Strategies

### ■ Career opportunities

This program, unique in Europe, has trained over 170 engineers. Today, graduates of the program are working as research or design engineers in international companies in the aeronautics, space and mechanical engineering sectors.

The advanced scientific level of the MS AES program also paves the way for career opportunities in research in solid mechanics and structures.

#### Companies recruiting our students

Aerazur, Airbus Group, Altran, Astek, ASSYSTEM, ATKINS, AXS Analyse de Structures, Air France, CLAIRIS TECHNOLOGIES, Dassault Aviation, DLR (Germany), ESA, Latecoere, SAFRAN Engineering Services, Segula, Sodern, Sogeti, Thales, Thales Alenia Space, Renault, PSA...





## Testimonies

### Why did you choose ISAE-SUPAERO and apply for this MS? What were your objectives?

HUGO DE BASTOS

Graduated in 2019

Engineer in Aerodynamic studies | ArianeGroup

👂 I Choose ISAE-SUPAERO because it's one of the most important school in aeronautic and aerospace engineering. **The proximity and the relation of the school with Aerospace industry also were an advantage I took in consideration.** I apply to the MS "Aeronautical and Space Structure", because it covers many aspect of mechanics in aeronautics and space domain. My objectives were to get a different view of engineering than my previous school, I also wanted to improve my knowledge in mechanics to have a complete education.

SIMON LEMAY

Graduated in 2020

Structures & mechanics engineer | CNES (French Space Agency)

👂 I first discovered space activities and products throughout my end-of-study mechanical engineering internship at the mechanical analyses department of Airbus Defence & Space in Toulouse. This experience fascinated me and enabled me to discover a whole new world that I didn't know before and even wouldn't have imagined to work in. It convinced me to have my career in that field. To do so, I first wanted to improve my theoretical knowledge about space structures and mechanics and graduate in that specific field to complete my general mechanical engineering degree. ISAE-SUPAERO's AES (Aeronautical and Space Structures) Advanced Master seemed to be the best way to do so and it was according to all the testimonies that I collected.

### According to your experience, what are the strong assets of the Master?

Firstly, this Advanced Master meets my expectations, because I learned a lot in mechanics and the way to approach engineering was different.

Then, the strongest assets of this Master are the personnel and the teachers. For many of them, the classes were a dialog with the teachers (for example during Yves Gourinat's lessons), which was very interesting and helpful for the young engineer we were. The quality of the courses also was a very good point and many of us discovered unexpected affinities for some of the disciplines in Aeronautics and Space engineering.

According to me the strongest assets are the teachers and the close-relations the school has with industrials in the aerospace field. Many of the teachers are engineers working in industry and giving classes specifically at ISAE-SUPAERO. This involves a very different approach of teaching compared to other schools. **Most of the courses are taught as they are applied currently in the industry**, which is great. On the other side, ISAE-SUPAERO's permanent professors are experts in their field and provide advanced theoretical knowledge.

### What are your career plans?

My first plan was to work in Space industry, in mechanics studies, which is a success. In the future I would like to see many different technical aspect, to try to work in a foreign country or/ and in French Guiana.

I had the chance to complete my professional master's thesis at the CNES in Toulouse, which was a great experience. I had even more chance to get a permanent contract in the same department after my internship. For sure having graduated from ISAE-SUPAERO helped me a lot to obtain that position. My plans now are to continue to work and learn my job as a Structures & Mechanics engineer at CNES and to make my best to contribute to the development of the great space industry that we have in France and Europe.



## Admission procedures

### ■ ADVANCED MASTERS

#### Academic requirements

A master's degree, or an equivalent degree in science or engineering (or in management for advanced masters in management), or bachelor degree completed by 3 years of professional experience

### LANGUAGE REQUIREMENTS FOR ALL MASTERS



(including for Masters taught in French)

<b>TOEFL (IBT)</b>	or	<b>TOEIC</b>	or	<b>IELTS</b>
				
<b>88 points</b> <small>(Inst. code: 9820)</small>		<b>785 points</b>		<b>6.5 points</b>
or				
	<b>CAE/FCE</b>	or	<b>Linguaskill</b>	
				
	<b>170 points</b>		<b>170 points</b>	

**NOTA BENE** : Volume of teaching hours and contents of the programs are provided for information only and are subject to change.

### LANGUAGE REQUIREMENTS FOR MASTERS IN FRENCH



#### Language qualification requested

Score B2-Common - European Framework of Reference for Languages

### ■ SELECTION AND ADMISSION

**Selection and admission are made by an admission committee :**  
Possible interviews can be organized if necessary

#### Deadlines for application:

**Applications open in October 2021**

for a start of classes in September 2022.

Several admission committees are scheduled from January to July, see schedule on our website

#### Application website :

<http://admissionsmasters.isae-superaero.fr>

#### Funding

Information on tuitions fees and funding on our website



### Your contacts

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