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.

■ Syllabus

Part 1: Aerospace structures: methods & tools for engineering & dynamics - 60 h
- Flight dynamics: an introduction
- Aerodynamics: an introduction
- MATLAB standards
- Structural dynamical control: an introduction
- Structural shells-analysis & modeling
- 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, ...
Why did you choose ISAE-SUPAERO and apply for our master? What were your objectives?

I choose ISAE-SUPAERO because I wanted to integrate a school that was already well implemented in the industrial aeronautical environment; I wanted to have a strong first contact with industrial and scientific actors of the aeronautic and space domain. With my background in materials physics, I wished to have a strong training in structures, with the most used tools and methods in these fields, the roadmap and the state of the art of the specialties of aeronautics and space.

My previous school was a general engineering school. Although it gave me a good overview of the engineering world, it left me a taste of unaccomplishment in the field I liked: structure. I came out of my previous engineering degree with a pretty good file and recommendations, so I applied for the master’s degrees at ISAE-SUPAERO with the objectives of acquiring more technical and specialized knowledge on aerospace structure and gain a recognize expertise in this field.

Which are your career plans?

After an internship at CNES, I had the opportunity to integrate Airbus for a mission in airworthiness certification processes; it is the chance for me to know aeronautic environment in details, its particularities, its constraints and its roadmap. I would like then going on about materials and structures fields, particularly in research and development for that I have already skills and 5-year-background.

Working in Airbus in the Structure engineering field. Currently I’m starting to work as an Aircraft Stress Solution Engineer for the A350 XWB program, supporting the use of new Finite Element Model softwares.

PIERRE GAMBIER
France, Aircraft Stress Solution, engineer at Airbus, graduated in 2011

According to your experience, which are the strong assets of the Master you did?

First the complete and global training of all the disciplines that are studied: it gives us a strong basis to adapt and success at all industrial and academic subjects proposed in the field of structures. The second asset is the fields where are the experts from, who are introduced to us and taught their disciplines: they are from industrial and/or academic environments, or even research laboratories.

The first strongest asset is the uniqueness and quality of the teaching and the teachers. We had access to the knowledge of former or current renown industrial specialists in each topic we studied, turning each lesson into a very special moment where we could learn from the very best!! The second strongest asset is the renown of the school. Having ISAE-SUPAERO on a resume really makes a difference in the recruitment process, and the expertise we gain during the formation is really recognized by the recruiters.

Which are your career plans?

VIRGINIE VERRIERE
France, Navigability and process Engineer at Airbus, Graduated in 2014

Testimonies

Aeronautical and Space Structures

© Dassault Aviation - DR
## 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

Tuition fees: see our website


### Language requirements for Masters in French

Language qualification requested
Score B2-Common - European Framework of Reference for Languages

### Language requirements for Masters in English

<table>
<thead>
<tr>
<th>TOEFL (IBT)</th>
<th>TOEIC</th>
<th>IELTS</th>
<th>CAE/FCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>85 points</td>
<td>785 points</td>
<td>6.5 points</td>
<td>170 points</td>
</tr>
</tbody>
</table>

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

## Selection and admission

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

**Deadlines for application:**
Several admission committees scheduled from January to July, see schedule on our website

## Your contacts

**Caroline ARMANGE**
Senior Admission Advisor / Advanced Masters
Phone: +33 (5) 61 33 80 25
info-master@isae-supaero.fr
www.isae-supaero.fr

**Catherine DUVAL**
Senior Admission Advisor/Aerospace sector
Phone: +33 (5) 61 33 80 37

## Funding

Information on tuitions fees and funding can be found on our website