



AERONAUTICAL AND SPACE STRUCTURES

ADVANCED MASTER

ONE YEAR FULL TIME

- 6 months of courses
- 6 months of professional thesis or internship.

TEACHING LANGUAGE

- English

START OF CLASSES

- End of September

LOCATION

- ISAE-SUPAERO, Toulouse, France

KEY POINTS

- Unique in Europe to acquire state-of-the-art aerospace structures knowledge.
- More than 200 alumni engineers.

HEAD OF PROGRAM

- ISAE-SUPAERO: Prof. Yves GOURINAT
yves.gourinat@isae-supaero.fr

PRE-REQUISITES

- A Master's Degree or an equivalent degree in science
- Or a Bachelor's Degree with at least 3 years of professional experience
- International degree equivalent to the aforementioned degrees.
- These programs can also be accessed from 5 years of professional experience (VAPP)

CONTACT

- Young graduates with less than 1 year of professional experience:
info-programmes@isae-supaero.fr
- Experienced professionals:
info.exed@isae-supaero.fr
- People with disabilities, assistance is available at
laurence.ballarin@isae-supaero.fr



[More information](#)



• The Advanced Master's® Aeronautical And Space Structures accredited by the Conférence des Grandes Ecoles (under number 287)

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 aeronautical and spacecraft sectors.

WHAT? Prepares engineers with a future career:

- in design,
- research and Development,
- certification,
- testing and qualification.

HOW?

- growing expertise in numerical calculation for the most advanced structures,
- growing knowledge in materials,
- understanding of their interactions 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 an industrial context.

LEARNING APPROACH

It should finally be noted that contemporary structures as they are treated in this training - i.e. in connection with the latest research advances - constitute a major contribution to the environmental performance of systems

1st semester: Academic semester from September to March.

Courses dispensed by tenured ISAE-SUPAERO faculty and visiting lecturers from industry providing the latest industrial expertise including:

- lecture courses,
- design offices,
- lab work,
- digital,
- simulations,
- CAD,
- lab sessions,
- industrial visits.

2nd semester: Students are required to conduct a 4 to 6 months professional thesis or internship.

- with an aerospace company or in a laboratory,
 - in France or Abroad,
- supervised by the host organisation and ISAE-SUPAERO.

The thesis concludes with the submission of a report and an oral dissertation in front of a jury.

CAREER OPPORTUNITIES

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.



SYLLABUS

**Part 1: Aerospace structures methods & tools for engineering & dynamics**

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

Part 2: Aerospace systems architecture

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

Part 3: Aerospace structures: dynamics & physics

- 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

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

Time project:

- Team Innovative Management for Evolved Strategies

CAREER OUTCOMES

- engineer for calculation, design, test and certification in an industrial design office
- scientific manager for system architecture in integrated structural certification
- expert with airworthiness and public authorities for materials and structures
- assistant researcher in thermodynamics of solids and structural modeling
- dynamician for optimal structures in civil and maritime engineering
- product manager in active and passive control of structures
- expert for composite and hybrid lightweight structures.

TESTIMONIES

LUCAS RICOUX-EXUBIS*Class of 2021-2022*

I decided to do MS at ISAE-Supaero last year after 2 years of research on the «doors» that would be opened to me after my engineer diploma. I had different experiences in fluid mechanics but also in materials or simulations and I wanted to make the synthesis between all those things. The other aspect was that my engineering school was not specialized in aeronautics or aerospace while I wanted to study those fields.

The aeronautical and space structure (MS-AES) advanced master made me discover new fields such as fluid-structure interaction, space mechanics... **It allowed me to increase my knowledge in the «how to design and produce» aeronautics structures and space launchers field.** I also appreciated the courses on **real applications that helps you to better understand the courses making the information more tangible.**

INES LEBOUTEILLER*Class of 2021-2022*

I chose ISAE-SUPAERO to do my MS because of the reputation of the school and because of its fields of specialization. I applied to the MS AES because it teaches both about aeronautical and space structure. **My objective when applying for this MS was to have a specialization in space structures to be able to work at ESA (European Space Agency).** **Thanks to this MS I now have the chance to go work there as I have been recruited.**

The strong assets of the Advanced Master are :

- the people in the class with whom we get a chance to work with for 6 months
- the teachers who are experts in their fields
- the diversity of the courses