



SPACE SYSTEMS ENGINEERING

OPTIONAL PATHWAY

«SPACE EXPLORATION» (SEEDS)

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
- SEEDS option:
 - Toulouse, France
 - Leicester, England
 - Turin, Italy

KEY POINTS

- Multidisciplinary: space project management and technical aspects linked to satellites and Launchers.
- SEEDS option to combine research and academic project coordination (1 semester).

HEAD OF PROGRAM

- ISAE-SUPAERO:
Prof. Stéphanie LIZY-DESTREZ
stephanie.lizy-destrez@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®** Space Systems Engineering accredited by the Conférence des Grandes Ecoles (under number 710)

OBJECTIVES

The TAS Astro - Space Systems Engineering Advanced Master program is a one-year professional course of study. The TAS Astro Advanced Master enables students to develop a high level of multidisciplinary skills in space science, space systems engineering and space project management. It provides students with access to work opportunities and numerous career openings in aerospace projects, in space agencies, research agencies, or industrial companies in an international environment.

The program is designed for students who wish to start immediately after they complete their graduate degree and for employees who have enrolled through their companies continuing education programs. The TAS Astro curriculum includes a broad spectrum of subjects with the following objectives:

- develop specific skills applied to the space sector:
 - Space systems engineering and management of space projects
- acquire a high level of interdisciplinary knowledge related to the technical, economic and legal issues involved in space projects.
- acquire a high level of interdisciplinary knowledge related to the technical, legal and economic aspects of international space programs

LEARNING APPROACH

1st semester: academic session provided by ISAE-SUPAERO's tenured professors and various experts from research centers (ONERA), space agencies (CNES, ESA), or European aerospace companies (Thales Alenia Space, Airbus Defense & Space, ArianeGroup).

The 1st semester includes:

- lectures and exercises,
- engineering and design study seminars,
- laboratory sessions,
- written reports and oral presentations,
- practical sessions, team work and industrial visits.

2nd semester: students are required to conduct a 4 to 6 months professional thesis or 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 concludes with the submission of a report and an oral dissertation in front of a jury.

CAREER OPPORTUNITIES

The TAS Astro Advanced Master program leads students to technical employment either in international industries or in research centers in the aerospace world.

Current positions are: Space program project managers, Space Systems engineers, Experts in industry or public research laboratories, in Consulting or services companies.

Companies recruiting our students

Altran, Airbus Defense & Space, Aéroconseil, Astek, Atos Origin, Bertin, Eutelsat, Nexeya, Safran, Sopra Group, Thales Alenia Space, CNES, ESA, DLR (Germany), Instituto Mexicano de Comunicaciones (Mexico), GTD International (Spain)...



SYLLABUS



Part 1: Missions and Systems

- Mission analysis and orbital mechanics;
- Space environment & effects;
- Space systems architecture: Ground segments, satellites & sub-orbital planes;
- Launchers architecture
- Space communication systems;
- Satellite based localization systems;
- GNS (Global Navigation Satellite System);
- Human Spaceflight: History of space exploration, medical aspects & human factors;

Part 2: Space Programs

- Space programs calls for tender;
- Space programs & projects;
- Systems engineering in space programs;
- Systems dependability;
- Integrated team project;
- Financial & legal aspects: debris situation, new space (nanosatellites & launchers);
- Spacecraft operations

Part 3: Sub-systems: Satellites & Launchers

- Advanced control & applications;
- Estimation and filtering;
- Satellite AOC (Attitude & Orbit Control System);
- Launchers guidance and control;
- Real time control of a space system;
- On board data handling sub-systems: functions and architecture;
- Satellite electrical systems;
- Satellite thermal control systems- satellite propulsion: chemical & electrical;
- Mechanical architecture: Space structures & mechanisms;

Space Exploration and Development Systems

SEEDS

The SEEDS (Space Exploration and Development Systems) international placement is an optional extra project. The student will work in multidisciplinary teams on space exploration research projects, designed in collaboration with advisors from the space industry.

ISAE-SUPAERO's partners in SEEDS are the Politecnico di Torino in Italy and the University of Leicester in UK. All three institutions have strong links with the space industry, a heritage of space research and exploration, and high-level expertise in teaching. The student will spend two months at each institution and will be required to cover basic travel and subsistence costs. The course is taught in English at all three sites.

The international SEEDS program is supported and endorsed by the Italian (ASI), French (CNES) and UK Space Agencies, as well as Thales Alenia Space, ALTEC and numerous other companies and institutions, ESA (European Space Agency).

TESTIMONIES

ANTHONY FAURE-GIGNOUX

Class of 2021-2022

👂 To launch my career in the space sector, which school can be better than the world famous ISAE-SUPAERO school? The one which has trained multiple ESA's astronauts such as Thomas Pesquet or Luca Parmitano. Thus, I have applied to the TAS ASTRO program. This advanced master offers a **good overview of the space sector and the engineering work behind.**

The TAS ASTRO program has 3 main assets: the accessibility, the level of the classes and the teachers. Accessibility does not mean that the advanced master is just basic level classes. During the training, we have started with a high level view and we have gone deep into the technical part, making TAS ASTRO also interesting for students with a space training background. Indeed, **the program goes through the project view, with the different aspects involved in the production of a spacecraft from the funding to the operations, including the design, the industrialisation, the launching, and all the constraints linked to these;** then it shifts to the systems view to examine the design and the configuration of a spacecraft, ending up studying the subsystems.

On top of that, TAS ASTRO has prestigious speakers & experts with incredible background coming from the space agencies (CNES and ESA), the science laboratories (ONERA, Laplace, ...) or the industries (Thalès, Airbus, ...). For instance, we have had classes with Dr. Bernard COMET who was the head of the ESA medical board on the manned space flight. All these points make the advanced master an incredible experience that was totally up to my expectations!

CLARA MORICEAU

Class of 2019-2020

👂 At the end of my studies, during which I specialized in applied mathematics and computer science, I was lucky enough to do an internship at CNES, the French Space Agency, in their orbital mechanics section. I therefore decided to pursue my studies in order to expand my knowledge in this sector and open up more possibilities.

The TAS ASTRO was the perfect opportunity to discover a wide range of subjects as the courses cover topics from satellites & launchers to space project management. In addition, this Advanced Master offers the possibility to join the SEEDS program, an international project held with 2 other universities in Europe on the topic of space exploration, which I was very curious about. In my experience, the strongest asset of the Advanced Master is its multidisciplinary approach!

After the 6-month courses, we gain a formidable overview of space systems in general, it gives an understanding of a space project as a whole. In order to materialize the courses, the students are asked to run a project for a couple of months which consists of designing a satellite or a space system. This really enables the link between the theory and its application to be made.

Moreover, **the SEEDS program is an incredible opportunity to work with students from Europe and learn about human and robotics exploration** for another 6 months. Both projects also help the students to learn how to cooperate as part of a team and to work with industrial partners and space agencies, a real asset when seeking a job afterwards!