

Mastère Spécialisé® / Advanced Master

Space systems engineering

OPTIONAL PATHWAY «SPACE EXPLORATION»

(SEEDS)



■ Objectives

The TAS Astro - Space Systems Engineering Advanced Master program is a one-year professional course of study. The TAS Astro Advanced Master allows students to develop a high level of multidisciplinary skills in space science, space systems engineering and space project management. It enables the students to access work opportunities with numerous career opening 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 the completion of 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:

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

■ Organization

Head of program

- Prof. Stéphanie LIZY-DESTREZ
stephanie.lizy-destrez@isae-supero.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: Missions and Systems - 155 h

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 - 160 h

Space programs bid for tender – Space programs & projects – Systems engineering of space programs – Systems dependability – Integrated team project – Financial & legal aspects: debris situation, new space (nanosatellites & launchers) – Spacecraft operations

Part 3: Sub-systems: Satellites & Launchers - 190 h

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

■ Learning approach

First semester: academic session of 560h, provided by ISAE-SUPAERO's permanent professors and various experts from research centers (ONERA), space agencies (CNES, ESA), or European aerospace companies (Thales Alenia Space, Airbus Defense & Space, ArianeGroup).

This first semester includes:

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

Second semester: students have to conduct a professional thesis or perform 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.

■ Career opportunities

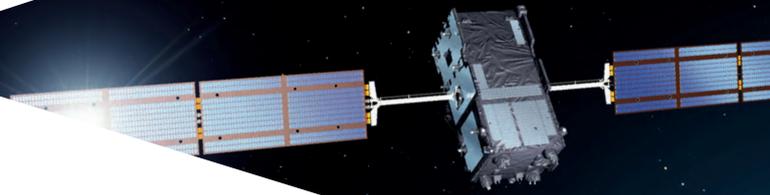
TAS Astro Advanced Master program leads students to technical employment either in international industries or in research centers in aerospace world.

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)...





SEEDS

Space Exploration and Development Systems

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 the delivery of 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

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

KEVIN DANANCIER
TAS ASTRO SEEDS 2021

R&D Engineer in Satellite Electrical Power Systems | Thales Alenia Space

My first contact with the space domain was during my end-of-study project for my first engineering school, Polytech. I was already passionate about space, but this internship strengthened my will to continue working in this field. I naturally headed towards ISAE-SUPAERO, as I knew from media, colleagues and relatives for being the best aerospace engineering school. I didn't even hesitate as my objectives were to become a system engineer and work on passionate and futuristic projects, which totally corresponds to the TAS ASTRO Advanced Master. But what caught my attention was the SEEDS program. A 6-month project with around 25 European students and many experts and researchers from space industry is the kind of experience you never forget. I personally worked as a system engineer on Human missions aiming to build sustainable habitats on the Moon and Saturn's natural satellite (Titan).

CLARA MORICEAU
TAS ASTRO SEEDS 2021

Project engineer | MEDES-IMPS

At the end of my studies in INSA Rouen Normandie, 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. This internship was amazing and confirmed my interest for the space area. I therefore decided to pursue my studies in order to expand my knowledge in this sector and open my possibilities. The Space Systems Engineering Advanced Master (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.

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

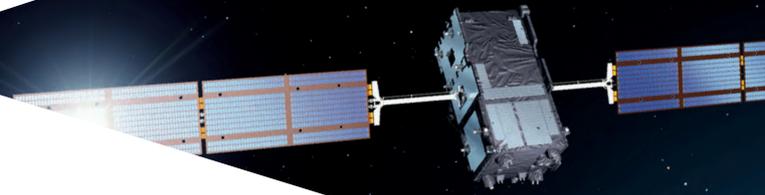
I came to this Advanced Master without any education in space systems. After only 6 months of courses, **I ended up having a huge wealth of knowledge and skills covering the whole space domain.** From ground segments to satellite sub-systems, through launchers, financial and legal aspects, operations, space environment,... This asset comes from the perfect organization of this Master and the proximity between ISAE-SUPAERO and space industry, without forgetting the omnipresence of English, opening the way to international opportunities.

In my experience, the strongest asset of the Advanced Master is its multidisciplinary approach! After the 6-month courses, one can have a very good overview of space systems in general, which is essential when being a systems engineer, but also for experts as 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. It really allows making the link between the theory and its application. Moreover, **the SEEDS program is an incredible opportunity to work with students from Europe and learn about human and robotics exploration during 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 to then find a job!

Which are your career plans?

I currently working as a R&D Engineer in Satellite Electrical Power Systems and thanks to the system engineering skills and knowledge from TAS ASTRO, I hope to become a system engineer, in a few years, working on future space projects in early phases, in relation with advanced concepts, space exploration or Human spaceflight missions, which is really the core of the TAS ASTRO Advanced Master.

Thanks to the SEEDS project and an internship at ESA on the topic of human spaceflight, I now have a strong interest for exploration! In the future, I hope I can contribute to it by working on projects which aim at increasing our knowledge about men and women living in space, for the future of space exploration but also for Earth applications, alongside with space agencies. I would also like to be an operations engineer for satellites, rovers or even astronauts, eventually for the upcoming lunar and mars missions!



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)

TOEFL (IBT) or **TOEIC** or **IELTS**
 **88 points**
(Inst. code: 9820)



785 points



6.5 points

or **CAE/FCE** or **Linguaskill**



170 points



170 points

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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