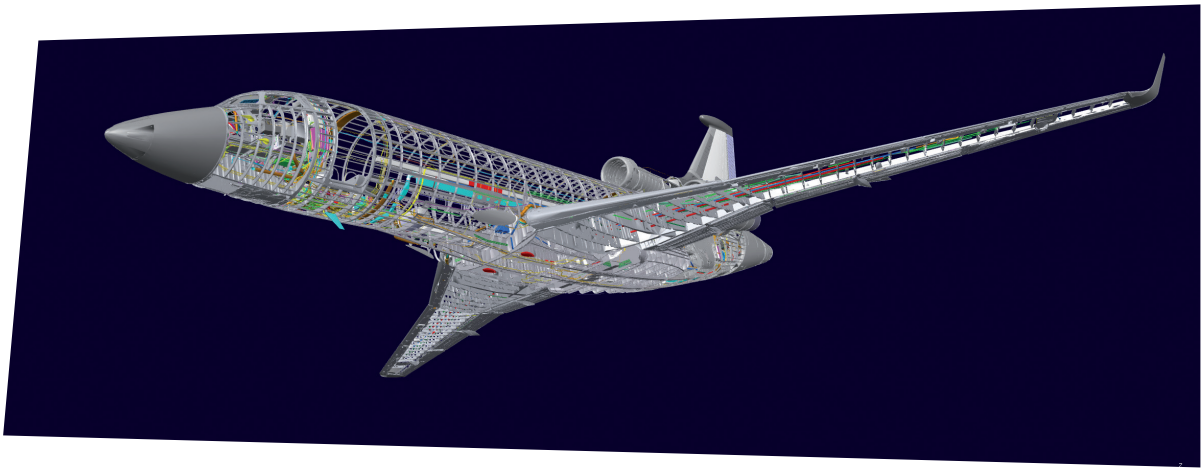
MSc-AESS

Master of Science in Aeronautical and Space Systems

National Master Degree Accredited by the Ministry of Higher Education



Aims

To support its steadily growing and to maintain business competitiveness, the global aerospace industry needs high qualified engineers or researchers to innovate to new technologies taking into account environmental constraints more and more demanding. Design complex aerospace systems involve multinational geographically disseminated teams of project managers or various experts working in collaborative environment through integrated development platform tools. The Master Aeronautical and Space Systems (AESS) is an evolution of the former MSc Aeronautical Engineering and Space Technology and is intended to educate graduate students in subjects relevant to these demanding challenges and needs of the industry. The MSc ASSE is designed to be multidisciplinary preparing future engineers to easily and efficiently work on aeronautical systems, space systems and their applications or embedded systems, with emphasis on the complete life cycle of the system. With a large spectrum of knowledge the MSc AESS allows students to tackle various aspects from design to operations of systems either in a research organism or in an aerospace company in a multinational environment. The MSc AESS consists of a total of 4 semesters of 30 ECTS each, ie 120 ECTS credits for the whole program. The MSc AESS starts with a first semester emphasizing aerospace engineering fundamentals, and then continues toward two main majors during semester two: «Electronics and computer sciences», «Aircraft control - Guidance». During semester three students emphasize on one major in depth among four: major Aircraft systems, major Embedded Systems, major GNSS, major space systems.

Students have strong opportunities to develop practical skills through personal research projects in ISAE's laboratories and professional thesis during internships in aerospace industry.

Organization

Head of program major Aircraft Systems
✈ Prof. Valérie BUDINGER
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Head of program major Embedded Systems
✈ Prof. Janette CARDOSO
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Head of Program major Space Systems
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Head of program major Global Navigation Satellite Systems
✈ Prof. Michel BOUSQUET
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Duration of studies: Two-year full time

Beginning of classes: September

Location: ISAE, Campus SUPAERO

Teaching language: English

Pedagogical approach

ISAE Master's programs are designed with a combination of lectures, personal project and assignments and thesis projects to be performed in industrial environment or in ISAE's laboratories. They are taught in English. Interweaving the teaching of both Masters, they offer several options enabling graduates to envisage their professional career with confidence in accordance with their wishes and interests.

Syllabus

Semester 1: 30 credits (in English)

Common part - 113 h
Mathematics - Foreign languages - Matlab standardisation - MATLAB complements - Programming - Mechanics

Aerospace engineering (210 h)
Sensors and measuring systems - Aircraft and airframe architecture - Flight Dynamics - Automatic control - Design and validation of DES - Signal processing and DSP - Introduction to mathematical logic - Architecture and design of integrated electronics function - Launcher and space vehicles - Aeronautical Thermopropulsion - Engines-Propulsion - Data transmission - Avionics systems

Semester 2: 30 credits

Common part - 320 h
Foreign languages - European cultures and Research Project in ISAE's laboratories (250 h)

Students have to select one major among:

Major 1: Electronics and computer sciences - 120 h
Modelling and simulation - Antenna and radars - Hardware and software co-design - Distributed and parallel computing - Network architecture and programming

Major 2: Aircraft control - Guidance- 119 h
Control implementation – Flight characteristics- Aircraft control - guidance – Navigation

Semester 3: 30 credits

Common part (150 h)
Foreign languages – Research Project in ISAE's laboratories (100h)

Students have to select one major among:

Major 1: Aircraft Systems - 238 h
Computer Safety - Hybrid Systems - System Engineering- System Dependability- Optimization

Converters- Hydraulic, Electromechanical and EHA actuators- Actuators control- Electromagnetic compatibility

- Airframe-linked systems - Avionics systems- Safety analysis- Avionics and systems trouble shooting maintenance

Major 2: Space Systems - 246 h
Advanced control and applications - Satellites guidance and control - Launchers guidance and control - Space environment and effects - Mission analysis and orbital mechanics - Space communications systems - Space project and systems - Satellite electrical systems - Satellite engineering and design - Satellite thermal control systems - On board systems and data handling - Space projects economy - Space projects legal aspects

Major 3: Embedded Systems - 230 h
Real time language - Architecture description language - Real time operational systems - Real time control of a space system - Certification - Computer Safety - Hybrid Systems - System Engineering - System Dependability - Optimization - Electromagnetic compatibility - Estimation and Kalman filter - Energetic constraints - Avionics and data buses

Major 4: Global Navigation Satellite Systems (GNSS) - 316 h
Digital communications - Spread spectrum techniques - Orbits and satellites plateforms - Radiofrequency links and propagation - Computer Safety - Hybrid Systems - System Engineering - System Dependability - Optimization - Estimation

and Kalman filter - Positionning determination and reference systems - Navigation and localization systems by satellite - Communication and navigation satellite payload - GNSS systems

Application of GNSS - Navigation digital receivers - GNSS receivers - Legal and economic aspects

Common part: Seminars and conferences

Seminar «Vehicle design: system aspects of atmosphere re-entry»

«Electrical propulsion» conference

«Space mechanisms» conference

«History of Space Exploration» conference

Semester 4

Students conduct a thesis in aeronautical industry or organisation, in France or abroad and supervised by a tutor from the host organisation and from ISAE. The Master thesis is concluded by the preparation of a report and an oral dissertation in front of jury.

Career opportunities

Toulouse is at the hub of the European aerospace industry, and accommodates leading European engineering and postgraduate institutions.

The majority of graduates find positions in the major aerospace industry or consulting companies (aircraft, spacecraft, engine, launcher, and engine), equipment manufacturers and government agencies.

They have senior positions in industry as researchers, experts, and heads of projects or managers.

Companies recruiting our students

AIRBUS, EADS, ASTRIUM, EUROCOPTER, ALENIA, EMBRAER, CNES, MECACHROME Canada, MTU, SAFRAN, ROLLS ROYCE, THALES ALENIA SPACE, ESA, INDRA, ALTRAN…

Witnesses
Masters of Science MSc AESS and MSc AMA

Vladimir COCA, Spain, Master AEST- Aero, and EuMAS recipient, working at INDRA

Why did you choose ISAE for your master?

«After some years working in industry, I decided I needed a reorientation of my professional career. I was convinced I needed international experience to evolve and improve at my job, and I wanted to do it in the aeronautical sector, so I began searching for a Master. I tried to make a list with the best Aeronautics European schools, and so ISAE was my first option, but had the language issue. I was kindly surprised when I read about the opportunity to pursue my course in English while learning French and so I didn't need to think anymore, I applied instantly. I came from another area of study, but as I had already begun Aeronautical Courses, I decided to apply for the MsC in Aeronautical and Space Engineering».

What has the course brought you, what have you gained through (doing) the masters' course?

«I insist on the International aspect of the Master. I improved my English, and learned French. The school is also very well-known worldwide and the course contents are amazing for those having a passion to Aerospace. I learned Aeronautics while working in a multinational team with stunning projects. The internship gave me the opportunity to make one of my dreams come true by working some months in one of the best aeronautics industries worldwide while discovering the amazing city of Toulouse».

Has this master helped you in your current or past job?

«Not in the past, which I quit before joining Master's, but It helped indeed in my current job. International experience was the key asset to get my job because company works in projects worldwide, and School is also one of the best considered institutions to study Aeronautics. Now I work in one of the most important European Projects for the next decade, and I think the Master gave me the chance to advance some steps further than before taking it».

What's your professional situation today?

«I'm currently Consultant in a leading European company working in International ATM, Airlines and Airport projects, while doing it at my home city, which is not easy due to a lack of companies working in Aeronautics, and ISAE Master's Programme helped indeed to achieve my objective».

Moulya KUMAR, India, MSc AMA 2009, selected for EADS PROGRESS program

Why did you choose ISAE for your master?

«I have been interested in the fields of Aerospace and Aeronautics since an early age. Since ISAE is one of the acclaimed institutions in the Aerospace domain, known for imparting quality education and providing effective learning opportunities to its students, I was enthusiastic to be a part of this school. Also, since Toulouse is the hub of Aeronautical activities in Europe, I felt that graduate study in ISAE will be the most logical extension of my academic pursuits and a major step towards achieving my objectives».

What advice would you give to someone considering the MSc AMA in order to succeed in their studies?

«I feel that the effective way of learning is through practical experiences and exposure to industrial world. Hence, my main advice to the students of ISAE who are pursuing the Masters degree course, is to utilize the fact that there are several Aeronautical industries in and around Toulouse which gives them the opportunity to broaden their classroom knowledge and learn professional etiquettes. The students must grab every opportunity that ISAE provides for this and also make their own path to gain insight to cutting-edge technology. Build a vision and work towards reaching it!».

What has the MSc AMA brought you, what have you gained through the masters' course?

«I got exposed to the current trends in the Aeronautical society and the numerous opportunities available for young engineers such as myself to build up my professional path. Also it gave me an excellent opportunity to interact with people of different cultures both at my school as well as in the day-to-day activities. I found this experience very rewarding as it helped me grow as an individual with a better perspective towards life».

Has the MSc AMA helped you in your current or past job?

«Working in an industrial atmosphere is completely different from a classroom study, both professionally and personally. Especially, when you are exposed to an international working culture, you have to learn to understand other's orientation and work for the group objectives. The 5 month internship which I undertook in France helped me develop these abilities which are very essential to one's own development and necessary to start my professional career».

What's your professional situation today?

«I have been selected to work for EADS Group through 'PROfessional and GRaduate Entry Support Scheme (PROGRESS)', a program in the EADS».