



# Advanced Manufacturing Processes for Aeronautical Structures

(ISAE-SUPAERO/IMT MINES ALBI-CARMAUX)



## ■ Objectives

The Aeronautical industry market is facing a rapid and continuous increase worldwide as shown by the record breaking contracts recently signed by both Airbus and Boeing. These two industry leaders forecast an increase of close to 5% in activity over the next years. Estimations indicate that the annual increase of large commercial airplanes will induce a doubling of the number of aircrafts by 2030. Nearly sixty percent of the turnover is subcontracted all over the world and concerns mostly production and manufacturing activities. As a consequence, most aeronautical subcontracting companies will have to increase their production rates but also to keep up to date with technological changes; moving from metallic processes toward composite materials processes. Moreover the aircraft manufacturers have changed their supply chain structure in the last years, and subcontractors are now required to manage more complex parts and to take over, on their own, the qualification processes.

The Advanced Master course AMPAS, is designed by IMT Mines Albi and ISAE with the support of aeronautical industry partners. It will give a specialization to master level students allowing them to take over high level responsibilities in airframe structure manufacturing plants. It is especially well suited to students who have followed general studies in mechanical engineering, material science or equivalent and who would like to gain a major chance to be recruited by aeronautical industry.

## ■ Organization

### Head of program

- Prof. Jean-José ORTEU  
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- Prof Anis HOR  
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### Course duration

One year full time : 6 months of courses and 6 months of professional thesis or internship.

### Course start date

September

### Location

IMT Mines Albi -Carmaux, Campus Jarlard, (70% of classes)  
ISAE-SUPAERO, Toulouse (30% of classes)

### Teaching language

English

## ■ Learning approach

### First semester:

Academic term of 520h, provided by permanent professors of IMT Mines Albi and ISAE-SUPAERO and expert practitioners from aerospace industry to bring current knowledge and experience. The teaching, balancing academic lessons with more applied practice, includes:

- lectures and exercises
- process simulation sessions
- laboratory sessions
- practical sessions
- industrial conferences
- industrial and workshop visits
- multidisciplinary project of 100h
- written report and oral presentation

### 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 IMT Mines Albi or ISAE-SUPAERO. The thesis is concluded by the preparation of a report and an oral dissertation in front of a jury.

## ■ Syllabus

The academic course consists of modules aiming to provide a deep knowledge of the three main material families used in airframe structures (i.e. aluminum, titanium and long fiber reinforced polymer composites) and their related forming routes in aeronautical industries. It is also devoted to gain knowledge in aircraft architecture, on aeronautical supply chain specificities, lean manufacturing, quality management and certification requested to be able to take over technical and organisational responsibilities in industry.

A team project (100 hours) will demonstrate the ability to address an aeronautical part processing following the theoretical and professional skills.

### Part 1: Aircraft, material and process basic scientific knowledge - 130 h

Flight Dynamics AMPAS - Aircraft and airframe architecture AMPAS - Computer Aided Design (CATIA)- Aluminium and titanium alloys - Epoxy and thermoplastic composites - Assembly processes - Material and processes qualification - NDT for metallic and composite materials - Optical techniques for assembly aid

### Part 2: Composite structure forming and machining processes - 100 h

Physical phenomena description and modelling related to thermoset based manufacturing - Raw material and composite quality control - LCM/RTM processes - Autoclave Vacuum Bagging (monolithic - sandwich) processes - Composite material trimming, drilling and assembly - RTM/Infusion Simulation

### Part 3: Metallic structure forming and machining processes - 106 h

Material behaviour and mechanical models - Cold and hot sheet forming processes - Surface treatments - Subtractive and additive manufacturing - Sheet forming simulation

### Part 4: Industrial Organisation and management - 84 h

Supply chain structure and Organisation - Materials management and Lean manufacturing - Supply chain improvement and collaborative processes - Quality requirement, management and tools

### Part 5: Integrated Team Project - 100 h



## ■ Career opportunities

The Advanced Manufacturing Processes for Aeronautical Structures Master course offers challenging career opportunities for young engineers or more experienced engineers, who require a postgraduate program to enhance and/or focus their technical and management skills towards aeronautical industry sector.

Career opportunities are numerous and growing over the world, in tier 1 and tier 2 subcontracting companies, as well as in aircraft manufacturers, aeronautical maintenance companies. Graduated AMPAS students can find employments as process, industrialization, production, quality, research and innovation engineer, product, project and production manager...

## Companies recruiting our students

AIRBUS GROUP EFW (Dresde), AIRBUS OPERATIONS SAS, ALTEN, AKKA Engineering Process, ARMINES, AVIC COMAC, Fabrica Argentina de Aviones, FORMTECH (Breme), SAFRAN Power Unit, SAFRAN Helicopter Engines, VENG SA (Argentina), P3 GROUP, SAFRAN Aircraft Engineering, SAFRAN Electronics and Defense, SAFRAN Nacelles, DUQUEINE Atlantique.



## Testimonies

### Why did you choose this Advanced Master?

THÉO LE BOULAIRE

Cohort 2019/2020

Intern engineer in Manufacturing Engineering Methods - Airbus

“ I chose the AMPAS Advanced Master because, due to previous experiences, I knew that I wanted to work with manufacturing processes. I always have been passionate about aeronautics and the choice of this master became logic. In addition to that, **the reputation of ISAE and IMT Mines-Albi for their relation with companies and the quality of their training** were elements that strengthened my choice.

JULIETTE BERGE DOLET

Cohort 2019/2020

Intern - CRT Airbus

“ I chose the AMPAS master because I was looking for industrial and technical knowledge in the field of aeronautics with an international level. ISAE-SUPAERO is a very renowned institute in France, which certifies to obtain a quality education.

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

The biggest quality of the AMPAS training is the professional-oriented mindset it has. A lot of teachers are people from Airbus, Safran and there are a lot of practical sessions that links the theory to the real world.

The strong assets of the AM, regarding my opinion, is the large number of courses given by industrial stakeholders, thus allowing **to obtain a very technical and representative vision of the current industrial world.**

### What are your career plans ?

I am planning to search for method or industrialization engineer positions.

My career plans are to work as technical support in the field of the of aeronautical repair.



## 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 ALL MASTERS

<b>TOEFL (IBT)</b>	or	<b>TOEIC</b>	or	<b>IELTS</b>	or	<b>CAE/FCE</b>
						
<b>85 points</b> (Inst. code: 9820)		<b>785 points</b>		<b>6.5 points</b>		<b>170 points</b>

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 2020 for intake in september 2021.  
Several admission committees scheduled from January to July,  
see schedule on our website

#### Application website :

<http://admissionsmasters.isae-supaero.fr>



#### Funding

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

[https://www.isae-supaero.fr/en/academics/  
advanced-masters/financing/](https://www.isae-supaero.fr/en/academics/advanced-masters/financing/)

### Your contacts

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