

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 and estimations indicate that the annual increase of large commercial airplanes will induce a doubling of the number of aircraft 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. Fabrice SCHMIDT
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- Prof Anis HOR
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Course duration

One year full time

Course start date

September

Location

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

Teaching language

English

■ Learning approach

First semester:

academic term of 520,5h and 45 credits, 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:

Professional thesis in the aeronautical industry or in an academic research lab in collaboration with aeronautical industrial partners, in France or abroad. The duration is from 5 to 6 months and corresponds to 30 credits. Students are supervised by a tutor from the host Organisation and from IMT Mines Albi or ISAE. Thesis is concluded by the preparation of a final 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 and quality management requested to be able to take over technical and Organisational responsibilities in industry.

A team project (100 hours) will demonstrate the ability to address a 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 - 107.5 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 - 112 h

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

Part 4 - Industrial Organisation and management - 70 h

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



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■ Career opportunities

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



Testimonies

Hi, who are you? And where you come from?

Hi, my name is Katerina, I come from Czech Republic and arrived in France for my engineering studies. I studied in INSA Lyon Mechanical Engineer and Materials in general and after that I decided to pursue with the advanced Master AMPAS.

Why did you choose the Advanced Master AMPAS?

I am really passionate of aeronautic so I wanted to work in the aeronautical field and I chose the manufacturing sector because is where I wanted to develop my knowledge.

What are the strengths of the Advanced Master AMPAS?

I think the strength of this Advanced Master is that it covers the entire aspect of the manufacturing field. Actually, there is a good balance between theory and practical use, thanks to the several transverse projects, and a constant support from the teachers within a very friendly environment.

Where did you make your internship?

I made my internship in Safran Helicopter Engines on the optimization of the flow in assembly lines for helicopter engines. Basically, it was an internship in lean manufacturing and project management, and most of the time I was in the field with all the operators and assembly technicians.

How was your student life here in France?

It was great! Toulouse is a really nice student city, with a lot of events and good restaurants. This region in general is really pleasant to live in because the weather is nice and also Toulouse airport has a lot of connection with other cities.

Which job opportunities after the Advanced Master AMPAS?

After this Advanced Master you can work in any sector of the aeronautical industry. For example working with suppliers and aircraft components, like carbon fibre materials and metal sheets or you can work with companies, which produce engines and other semi-final aircraft components, such as Safran. You can also work in the aircraft manufacturing industry, with companies like Airbus, Boeing, Embraer and others, or helicopter industry as well. So there is a large choice in this field.

What did you do after your studies?

After my internship I wanted to stay in Safran, in the engine area, so I tried to find some similar job opportunities. But before I could apply for something, they asked me if I wanted to pursue my career with them. So, I stayed in Safran Helicopter Engines working in the field, and now I have just been moved to the Design Office.

What would you say to prospective students who want to apply for AMPAS?

If you apply for this Advanced Master it means that you really want to work in the aeronautical industry. AMPAS really opens to a lot of possibilities in the aircraft industry and if you are motivated and passionate, this makes you more interesting for the recruiters.

KATERINA HRADSKA

France, Project leader, SAFRAN Helicopter Engines, industrial development, graduated in 2017



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■ 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

Application website :

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

Selection and admission

Selection and admission are made by an admission committee :

Possible interviews can be organized if necessary

Deadlines for application:

Several admission committees scheduled from January to July, see schedule on our website

Language requirements for Masters in English

TOEFL (IBT)	or	TOEIC	or	IELTS	or	CAE/FCE
						
85 points		785 points		6.5 points		170 points

Language requirements for Masters in French

Language qualification requested

Score B2-Common - European Framework of Reference for Languages



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■ Your contacts

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