

Embedded Systems

(ISAE-SUPAERO / ENSEEIHT)

■ Objectives

Embedded Systems are an essential part of almost every aspect of our daily lives from transportation (aeronautics, space, road, rail and sea) to energy and taking in communication systems.

As part of the AeroSpace Valley project, Toulouse has become a key centre in the design of advanced critical embedded systems. Toulouse has one of the highest concentrations of Embedded System industries in Europe with leading aerospace and equipment manufacturers working for the aeronautical, space or car industries, including the Airbus Group and its subsidiaries, CNES, Continental and Thales.

The Embedded Systems Master Program provides comprehensive training for engineers seeking to be a part of this challenging environment. The Embedded Systems Master Program is a one-year professional course, designed by INP-ENSEEIH and ISAE-SUPAERO partners with the support of the embedded systems industry to prepare students for challenging aerospace projects.

This program addresses the real need for a multidisciplinary approach and prepares students by passing on in-depth and comprehensive knowledge of the technologies underpinning embedded systems. The program focuses on both theoretical and concrete aspects. It aims at:

- developing Embedded-Systems engineering design skills at both system level and function level, built on a solid foundation of complementary subjects: electronics, computer science, energy conversion and management, automatic control, telecommunications and networks;
- developing a system approach through integrated projects to master specific methods and tools as applied to the following domains: aeronautics, space and the automotive industries. The curriculum is multidisciplinary. It covers hardware (electronics, energy), software (computer science, network links, modeling, analysis and certification) and such issues as Embedded Systems control from an integrated system perspective.

■ Organization

Head of program

- Prof. Jérôme HUGUES
jerome.hugues@isae-supaero.fr
- Prof. Jean-Luc SCHARBARG
jean-luc.scharbarg@enseeiht.fr

Course duration

One year full time

Course start date

September

Location

ISAE-SUPAERO and INP-ENSEEIH

Teaching language

English

■ Learning approach

First semester:

an academic session of 546 hours of teaching, provided by the tenured professors at ISAE-SUPAERO and INP-ENSEEIH and industry experts with their up to the minute knowledge and experience. Teaching activities include lectures, tutorials, and lab work, a one-month multidisciplinary project aimed at integrating the academic session into an industrial case study.

Second semester:

students have to prepare a professional thesis in the aerospace industry or in the laboratory, in France or abroad, supervised by a tutor from the host organization and from ISAE-SUPAERO or INP-ENSEEIH. Once completed, the thesis is submitted to a jury in an oral presentation.

■ Syllabus

Embedded Systems require a collaborative training approach across a broad spectrum of knowledge involving experts from all fields concerned: electronics, energy, science, networks and control systems.

Hence, the academic part of the Master program consists of a 546 hour long program covering all five disciplinary fields that focuses on architectural aspects through a set of application-oriented lectures and seminars.

Part 1 - Embedded Systems - Core - 180 h

Real-time languages - DES Design and Validation - Feedback control - Signal processing - Microprocessor and DSP architecture - Architecture, design and Synthesis of hardware systems - RF Front-end Architecture - Electromagnetic compatibility

Part 2 - Energy - 63 h

Actuator and converter control - Electromechanical and static energy converters - Autonomous energetic systems - Embedded electrical networks

Part 3 - Networks - 67 h

Embedded networks: an introduction - Specific buses and networks - Real time networks - Design and validation of real-time protocols - Architecture of fault-tolerant buses - Scaling an avionics network.

Part 4 - Embedded Systems Design - 160 h

Real time and control - Hybrid Systems - Model-Based System Engineering and Architecture - Real time control of a mechatronic system - System Dependability - Certification - Embedded systems and IT Security - Optimization

Part 5 - Embedded Systems Applications - 50 h

Aircraft technics - Introduction to Space Systems - Automobile technics - Workshops

Part 6 - ISAE-SUPAERO Information system user - 2h30

Part 7 - Multi-disciplinary project - 4 weeks



© Dassault Aviation - C. Cosmao

■ Career opportunities

Embedded Systems offer challenging career opportunities. The course is designed for both young graduates and experienced engineers seeking a postgraduate program to enhance their technical and managerial skills. The skills acquired in this Master's course can be applied to any industrial sector in which embedded systems are used: aeronautics, space, road, rail and sea, energy industry, communication systems, etc.

Career opportunities in this area are numerous and on the increase in large and small companies alike. This Embedded Systems Master's course qualifies students for employment as designers, developers, research engineers and project managers in the design and development of innovative embedded systems.

Companies recruiting our students

Accenture, Airbus Group and its subsidiaries, Altran, Astek, Atos Origin, CS Communications & Systèmes, DCNS, Motorola, Realix, Safran, Seditec, Sogeti High Tech, Sopra Group, ESA, GE HEALTHCARE TECHNOLOGIES (India), Indian AirForce, Philips R&D (Netherland), Thales Alenia Space, SIGFOX, ...

INCOSE

INCOSE certification in ISAE-SUPAERO

At the end of the first semester, all EMS students are encouraged to participate in a one-month complementary program in preparation for the ASEP* level of INCOSE (International Council on System Engineering) certification. INCOSE certification consists of an exam which has internationally recognized value to validate knowledge and skills in systems engineering.

*Associate Systems Engineering Professional



Testimonies

I have had a passion for aerospace subjects for a very long time. After graduating from the École Centrale d'Electronique in Paris, I decided to round out my training with a sector of expertise at ISAE-SUPAERO. The embedded systems used in the aerospace field are complicated and complex, and to be able to envisage my engineering career in this field with peace of mind, I needed high-level training. The close ties that this institution has forged with research centers and contracting companies in the aerospace sector give us opportunities to talk to many key individuals. These discussions have been rewarding for me as they have encouraged me to take an innovative approach to designing aerospace systems, and later I hope to become a player in innovation for these future systems.

I was lucky to have found a job before completing my studies at ISAE-SUPAERO. Today, I work as an embedded systems engineer at Thales. My training has enabled me to take on my first job with peace of mind and to quickly become operational.

ISLAM ANOUAR

India, Embedded systems engineering, Graduated in 2017

Why did you choose ISAE-SUPAERO and apply for our master? What were your objectives?

I worked for 5 years in an aerospace industry, I wanted to leap forward towards international career. I choose ISAE-SUPAERO, because of its reputation, position among the top institutions of France and its excellence in aeronautics and space domain. Moreover, I considered the Embedded Systems Advanced Master would help add competitive skills to my Electronics Engineer background.

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

The course provided me end-end competencies to build embedded system. The courses are taught by experts from both industries (Airbus, Thales, etc) and research establishments (ONERA, etc). Indeed, it was interesting to learn from their experiences and contributions. The innovative assignments and application oriented lab sessions provided opportunities

HARIPRASATH SHANMUGASUNDARAM

India, Graduated in 2016, Cockpit Design Engineer at ALTRAN



© Dassault Aviation - C. Cosmao

■ 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-supaero.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



© Dassault Aviation - C. Cosmao

■ *Your contacts*

Philippe GALAUP,
Head of recruitment and Contractual
Relations
Phone: +33 (5) 61 33 80 27

Catherine DUVAL,
Senior Admission Advisor/Aerospace
sector
Phone: +33 (5) 61 33 80 37

info-master@isae-supaero.fr
www.isae-supaero.fr