

# Aerospace Summer Program Syllabus 2024

## Module 1 in Paris



## Launchers System

<b>Location:</b>	ESTACA
<b>Objectives:</b>	The purpose of this course is to be able to understand the system approach for the development of a launcher
<b>Prerequisites:</b>	Basis of mechanics and orbital mechanics
<b>Contents:</b>	<ul style="list-style-type: none"><li>- Bases on mission and architecture of a launcher,</li><li>- Propulsion systems principles,</li><li>- Guidance and control algorithms and equipment</li><li>- Workshop for evaluation.</li></ul>
<b>Details on the Workshop:</b>	2 exercises will be proposed: <ul style="list-style-type: none"><li>- Sizing of the gambling angle and speed of a launcher's engine during the 1st stage flight, with atmospheric part, and of the corresponding simplified control law.</li><li>- Sizing of the gambling angle of a launcher's engine after the 3rd stage separation, without atmosphere, and of the corresponding simplified control law.</li></ul>
<b>Duration:</b>	15 hours: 4 sessions of 3 hours (class) + 1 sessions of 3 hours (Workshop)
<b>Professors from ArianeGroup:</b>	Alain Dufour, Gerald Pignie, Charles Vallet, Didier Gignac
<b>Bibliography:</b>	Given on the courses supports
<b>Evaluation:</b>	Attendance and exercises evaluation

# Module 2 in Poitiers



## Radiative Heat Transfer applied to Thermal Control of Satellites

<b>Location:</b>	ISAE-ENSMA
<b>Objectives:</b>	The purpose of this course is to simulate and control thermal behavior of satellite during its life
<b>Prerequisites:</b>	Basis of conductive and radiative heat transfer
<b>Contents:</b>	Generalities on radiative heat transfer, Monte-Carlo simulation, instationary heat transfer from nodal description, orbital description, thermal control strategies by using heat pipes. Conference: End-of-life management of the satellite and potential space debris
<b>Duration:</b>	15 hours: 1 session of 3 hours (class) + 2 sessions of 3 hours (lab works) + 4- hour Small Sat Workshop + conference from Airbus Defense and Space
<b>Professors:</b>	Gildas Lalizel
<b>Bibliography:</b>	Spacecraft Techniques and Technology, CNES, CEPADUES EDITIONS.
<b>Evaluation:</b>	Written exam (quiz)

## Module 3 in Salon de Provence



### Aerospace Military Applications

<b>Location:</b>	<p>ÉCOLE DE L'AIR ET DE L'ESPACE</p> <p>Located in the very heart of Provence, the “École de l’Air et de l’Espace” is the only French Academy dedicated to the training of the future officers of the French Air Force.</p>
<b>Objectives:</b>	<p>This course gives an overview of the military applications. The aim is to study both geopolitical and technical aspects of systems such as supersonic aircrafts, missiles or satellites, on all major fields (telecommunications, ground observation, space monitoring...).</p> <p>The final aim is to realize the preliminary design of a small remote sensing satellite taking into account a product specification.</p> <p>It also includes several technical and cultural visits and a presentation on fighter aircrafts.</p>
<b>Prerequisites:</b>	Mathematics and signal processing basics
<b>Contents:</b>	Geopolitical issues in Space surveillance Space communications, Remote sensing Continuous teamwork: study of a space system Cultural visit (wine producer and soap producer)
<b>Duration:</b>	12 hours (plus 4-hour Small Sat Workshop)
<b>Coordinator:</b>	Major Corentin JIMENEZ
<b>Bibliography:</b>	Satellite Communications Systems, G. Maral & M. Bousquet, Wiley 2010 Remote Sensing: Models and Methods for Image Processing, Robert A. Schowengerdt, Academic Press 2006
<b>Evaluation:</b>	Multiple-choice questionnaire and oral presentation

## Module 4 in Toulouse



# Introduction to Project Management in Aerospace Programs

<b>Location:</b>	ISAE-SUPAERO
<b>Objectives:</b>	This module aims to provide an introduction to the aerospace sector, including for the space sector the issues & perspectives in the context of the "New Space", for the aeronautics sector an introduction to sustainable aviation, and finally for both sectors an introduction to aerospace program management.
<b>Prerequisites:</b>	3 <sup>rd</sup> year of Bachelor in Science or Engineering
<b>Contents:</b>	<p>The module consists of four parts:</p> <ol style="list-style-type: none"><li>1. Stakes &amp; perspectives in the NewSpace context Considering the technical and historical evolutions occurred during sixty-five years of space adventure (since Sputnik 1) we will explore the main current programs of access to space and discovery of new missions. The main objective here is to integrate the stakes in terms of public-private complementarity, of spinoff-spinin relations, and also to understand the opportunities that are opening up, associating the "traditional" space with the approach proposed by the new industrialists of the sector.</li><li>2. Introduction to Sustainable Aviation In 2019, air transport was responsible for 2 to 3% of global CO2 emissions, to which must be added non-CO2 climate effects such as contrails. Transition scenarios must therefore be put in place. The objectives of this class are:<ul style="list-style-type: none"><li>- Understand the specific climate impacts of air transport and the methodologies for evaluating sustainable scenarios (notion of carbon budget)</li><li>- Discover the different levers of action available to decarbonize air transport</li><li>- Be aware of the limits of the transition (e.g. availability of energy resources)</li></ul></li></ol>

	<p>3. Introduction to Aerospace Program Management An introduction to project management tools, techniques and approaches, with dedicated focus on aeronautics and space projects and programs. Examples from the space sector, to enable review and practice some very key concepts. Session one is intended to first review standards, and professional baselines (generic standards and aeronautics and space standards for project management).</p> <p>4. Visits Several visits are scheduled: industrial visits (AIRBUS DS) and museums (Aéroscopia, Cité de l'Esace).</p>
<b>Duration:</b>	18 contact hours
<b>Academic Coordinator:</b>	Emmanuel Zenou
<b>Bibliography:</b>	<p>NASA Space Flight Program and Project Management Handbook  NASA systems engineering handbook  Aircraft Design Project (Lloyd Jenkinson, Jim Marchman)  Aviation Project Management (Dennis Lock and Triant G. Flouris)</p>
<b>Evaluation:</b>	Online MCQs