Option Aéronautique

Spécifiques Option Aéronautique

CONFÉRENCES

LESSON AND CONFERENCES

Lecturers: **Jérôme BOUDET, Olivier DESSOMBZ**

| Lecturers : 20 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

The conference cycle aims to provide a broader view of the different sectors and professions of aeronautics.

Keywords : Aeronautics, energy, sector, professions, challenges.

Programme

Cycle of 10 conferences of 2 hours, delivered by engineers working in different sectors / professions of aeronautics, energy, etc.

Learning outcomes

- To have a broader vision of the aeronautical field.
- Identify the challenges in the field of aeronautics.
- To know the opportunities offered by the aeronautical option.

Independent study

Objectifs :

Méhodes :

Core texts

Assessment

Attendance

PROJET AVION

AERONAUTICS PROJECT

Lecturers: Damien CONSTANT, Jérôme BOUDET, Olivier DESSOMBZ, Olivier

| Lecturers : 2 | TC : 34 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : MI

Objectives

This project concerns the preliminary design of a business jet, with given specifications (number of passengers, range, runaway length...). The interactions of the global design choices are investigated with simplified models, using an iterative approach. This project is supported by Dassault Aviation.

Keywords : business jet, preliminary design

Programme

This project consists of two phases:
Phase 1: analyse and complete a pre-design tool, then use it to design an aircraft with given specifications.
Phase 2: deepening. For example: realization of a wing model and evaluation in wind tunnel, improvement of pre-design models, study of sensitivities...

Learning outcomes

- Identify the influence of the aircraft design parameters on the performance.
- Elaborate and implement a multi-disciplinary design process.
- Propose and assess models for preliminary design.

Independent study

Objectifs : Progress in the pre-design of the aircraft.

Méhodes : Each group of four students uses the documents provided, the software provided and the skills of the management team.

Core texts

D.P. Raymer., *AIRCRAFT DESIGN: A CONCEPTUAL APPROACH*, AIAA, 2012
L. Jenkinson, J. Marchman. *AIRCRAFT DESIGN PROJECTS.*, Elsevier, 2003
J.D. Anderson.*AIRCRAFT PERFORMANCE AND DESIGN*, McGraw-Hill, 1999

Assessment

Evaluation of the intermediate and final deliverables, including spreadsheets and oral presentation.

PROJET SPÉCIFIQUE

SPECIFIC PROJECT

Lecturers: **Jérôme BOUDET, Olivier DESSOMBZ**

| Lecturers : 0.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

Keywords :

Programme

Learning outcomes

Independent study

Objectifs :

Méhodes :

Core texts

Assessment

OPTION AÉRONAUTIQUE

Filière Acoustique et Vibrations

ACOUSTIQUE ET VIBRATIONS

AERONAUTICS

Lecturers: Olivier DESSOMBZ, Sebastien BESSET, Vincent CLAIR

| Lecturers : 0.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

The purpose of the project is to evaluate the vibratory and acoustic disturbances related to the aircraft, by distinguishing the nuisances produced by the aircraft around the airports, that is to say the external noise, and the nuisances suffered by the aircraft in terms of internal noise or mechanical strength.
One of the objectives of this project is to obtain a dimensioning integrating several constraints related to the environment and / or safety, without neglecting the performance and robustness of the aircraft.

Keywords :

Programme

The proposed studies, which will be defined according to the sensitivity of the students, will use a strong interdisciplinarity in order to highlight the origin of the nuisances, and to examine realistic dimensioning solutions. Below are some project topics that have been realized in recent years:
Impact studies near airports for take-off and landing.
Optimization of traffic and trajectories to reduce the ground track of noise.
Estimation of the noise and vibration levels induced by the flow in cruising flight for the internal noise.
Location of surface acoustic sources from the knowledge of noise in the cabin.

Learning outcomes

Independent study

Objectifs :

Méhodes :

Core texts

Assessment

Participation, written report and defense

OPTION AÉRONAUTIQUE

Filière Guidage et Pilotage

GUIDAGE ET PILOTAGE

AERONAUTICS

Lecturers: Anton KORNIIENKO, Laurent BAKO, Olivier DESSOMBZ, Paolo MASSIONI

| Lecturers : 10 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 10 | Project : 54 | Language : MI

Objectives

The development of unmanned flights (aerospace) has led to the development of powerful control methods adapted to the strong constraints of this field: multi-actuators multi-sensors with important performance requirements. These methods were very quickly deployed in the military aeronautics (reactivity) before massively broadcast in the civil aeronautics. With the reinforcement of competition, it is crucial to manage energy as efficiently as possible in order to limit costs while ensuring the comfort and safety of passengers, which makes control systems indispensable. The objective of this project is to train in the methods of design and validation (robustness) powerful control systems, essential in the aerospace industry.

Keywords : Automatic, Multi-actuator multi-sensor control (multivariable), Flight mechanics, Robustness

Programme

We can break down the work to be done in three phases:
A first step of bibliographic study in which it will be necessary to become familiar with some notions of dynamics of flight, to understand the model of lateral movement, to formalize the specifications for the design of the laws of control. A series of lectures will be dedicated to flight
mechanics.
A second stage of actual design correctors. Depending on the specifications, students are asked to choose from a set of multivariable methods (placement of poles, H-infinity, LQG, ...), a suitable method for the calculation of the corrector.

Learning outcomes

- Know how to formalize the specifications of a control system
- Know how to design a multivariable control algorithm answering a complete specification
- Know how to analyze the robustness of a control system
- Know how to apply the skills above on a civil transport plane

Independent study

Objectifs :

Méhodes :

Core texts

Daniel Alazard, Pierre Apkarian, Christelle Cumer, Gilles Ferreres, Michel Gauvrit, *ROBUSTESSE ET COMMANDE OPTIMALE*, Cépaduès éditions, 1999
A. E. Bryson *CONTROL OF AIRCRAFT AND SPACECRAFT*, Princeton University Press,, 1994
S. Skogestad and I. Postlethwaite*MULTIVARIABLE FEEDBACK CONTROL: ANALYSIS AND DESIGN*, Wiley- BlackWell, 2005

Assessment

Participation, written report and defense

OPTION AÉRONAUTIQUE

Filière Matériaux et Structures

MATÉRIAUX ET STRUCTURES

AERONAUTICS

Lecturers: **Olivier DESSOMBZ**

| Lecturers : 0.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

The project will focus on a particular system to carry out an in-depth study based on the functional specifications.
For example :
Aircraft fuselage assembly (Mechanics of Structures + Materials).
Damping of sandwich panels for aircraft floor (Mechanics of Structures + Materials).
Bonding assembly of aerospace composites: non-destructive testing and characterization (Materials).

Keywords :

Programme

Learning outcomes

Independent study

Objectifs :

Méhodes :

Core texts

Assessment

Participation, written report and defense

OPTION AÉRONAUTIQUE

Filière Propulsion

PROPULSION

AERONAUTICS

Lecturers: **Jérôme BOUDET, Laurent BLANC, Olivier DESSOMBZ**

| Lecturers : 0.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : AN

Objectives

Design of a turbojet engine, with aerodynamic and mechanical specifications. Multi-disciplinary project organization.

Keywords : turbojet engine, compressor, turbine, aerodynamics, thermodynamics, structural mechanics, shaft dynamics

Programme

The thrust determined during the aircraft project being specified, thermodynamic cycle calculations are used to define the overall architecture of the jet engine. A one-dimensional analysis then leads to the definition of the number of sub-components. 'Zooms' on particular components are finally made as practical and in-depth examples of expertise. For example:
- Detailed design of compressor stages, from 3D mechanical and aerodynamic simulations. Definition of a compromise between aerodynamics and mechanics.
- Analysis of the overall dynamics (tree, disks, links...).

Learning outcomes

- Formulate an engineering problem.
- Use knowledge and know-how for the detailed design of a system.

Independent study

Objectifs : Progress on design.

Méhodes : Simulations with different levels of fidelity.

Core texts

N.A. Cumpsty, *COMPRESSOR AERODYNAMICS*, Krieger Pub, 2004
B. Lakshminarayana *FLUID DYNAMICS AND HEAT TRANSFER OF TURBOMACHINERY*, John Wiley and Sons, Inc., 1996
F. F. Ehrich*HANDBOOK OF ROTORDYNAMICS* , 2004

Assessment

Participation, report and oral presentation.