# SA402 - Flexible structure dynamics: modeling and control

From the Advanced Master AES
(Aeronautical & Space Structures)

## Key elements

Period: **Late October – Early November**

Estimated duration: **20 hours**

For whom:
**recent graduates, jobseekers and experienced employees**

Location:
**ISAE-SUPAERO, Toulouse**

Language: **English**

## Highlights

- Flexible structure modeling
- Lagrange equations
- Experimental case study

This course will bring you a unique insight in the modelling of flexible structures and the theory of linear servo-control.

## Learning objectives

After completing this course, participants will be able to:

- Apply the principles of linear servo-control and flexible structure modeling (aerospace vehicles).
- Analyze the vibratory behavior in open and closed loop on a control law.
- Implement them under MATLAB/SIMULINK.

## Prerequisites

- Good knowledge of general mechanics, vibration mechanics and linear algebra.

## Information and registration

info.exed@isae-supaero.fr

# SA402 - Flexible structure dynamics: modeling and control

From the Advanced Master AES

(Aeronautical & Space Structures)

## Course content

Modelling of flexible structures:

- Lagrange equations,
- notions of effective masses,
- Sub-structuring: connection of a flexible appendix to a central body,
- modal analysis of flexible structures,
- co-location of actuators/sensors,
- model reduction.

Theory of linear servo-control:

- transfer function/state representation,
- modal analysis, root location,
- frequency analysis, stability margins,
- gain/phase control of flexible modes.

Case studies:

- modelling and analysis of an experimental flexible structure: https://personnel.isae-supaero.fr/IMG/mpg/film_bamoss_ve.mpg
- reduction of an aircraft model for the synthesis of lateral flight controls

## Teaching methods

| Teaching methods | Yes |
|---|---|
| Lectures / tutorial | X |
| Collaborative learning | |
| Flipped classroom | |
| Blended learning (online and face to face) | |
| Learning by doing | X |
| Project-based | |
| Simulation | |
| Case study | X |

## Assessment

Marked seminar