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

**Highlights**

- Flexible structure modeling
- Lagrange equations
- Experimental case study

**Prerequisites**

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

**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.

**Key elements**

- **Period:** November
- **Estimated duration:** 20 hours
- **For whom:** recent graduates, jobseekers and experienced employees
- **Location:** ISAE-SUPAERO, Toulouse
- **Language:** English

**Information and registration**

info.exed@isae-supaeo.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-supraero.fr/IMG/mpeg/film_bamoss_ve.mpg
- reduction of an aircraft model for the synthesis of lateral flight controls

Teaching methods

<table>
<thead>
<tr>
<th>Teaching methods</th>
<th>Yes</th>
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<tbody>
<tr>
<td>Lectures / tutorial</td>
<td>X</td>
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<tr>
<td>Collaborative learning</td>
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<td>Flipped classroom</td>
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<td>Blended learning (online and face to face)</td>
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<td>Learning by doing</td>
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<td>Project-based</td>
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<td>Simulation</td>
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Assessment

Marked seminar