SA402 - Flexible structure dynamics: modeling and control

From the Advanced Master AES
(Aeronautical & Space Structures)

Key elements

Period: **Early December to Mid-December**

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

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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