

# Structural dynamics



ECTS credits  
2 credits



Semester  
Spring

## In brief

> **Course language:** French

## Presentation

### Prerequisites

- Continuum mechanics, linear elasticity (1st year [Mechanics](#) course)
- If possible, introduction to dynamics ([S7/MECAPHY](#) or [S8 DMC](#))

### Learning objectives

Acquire the fundamental notions around oscillations in continuous media (solids and fluids) and use them to solve industrial problems:

- Know how to determine and exploit the eigenmodes of a linearized continuous medium
- Know how to calculate vibration levels for large structures
- Know the main dynamic instabilities

### Description of the programme

- Eigenmodes: definition and application to the case of linear elastic solids, acoustic modes, sloshing modes of fluids
- Forced responses: introduction of damping, calculation of forced responses, model reduction by truncation and substructuring
- Some practical issues: rotor vibrations, dynamic absorbers
- Dynamic instabilities induced by flows or friction: presentation of the mechanisms of divergence, floating, galloping
- Nonlinear vibrations: limits of linearization, frequency-amplitude dependence, stability

### Generic central skills and knowledge targeted in the discipline

- Know how to analyze complex structures
- Master the dimensioning methods in linear dynamics
- Know how to anticipate complex phenomena of instability
- Propose reduced representations to minimize computational costs

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## How knowledge is tested

- DS : written assessment, 2h (80%)
- CC : reports on practical work (20%)

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## Bibliography

- Course handout (pdf)
- M. Géraudin et D. Rixen, Théorie des Vibrations, Application à la dynamique des structures, Masson, 1993
- M. Lalanne et G. Ferraris, Rotordynamics Prediction in Engineering. 2nd ed. Wiley, 1998

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## Teaching team

- Bruno Cochelin
- Emmanuelle Sarrouy

<b>Total des heures</b>		<b>24h</b>
CM	Master class	16h
TD	Directed work	2h
TP	Practical work	6h

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## Useful info

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### Name responsible for EU

#### Lead Instructor

Emmanuelle Sarrouy

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