Thin structures and instabilities

ECTS credits
2 credits

Semester
Fall

In brief

Course langage: French

Presentation

Prerequisites

Continuum mechanics, linear elasticity (1st year Mechanics course)

Learning objectives

Acquire the knowledge necessary to understand structural models (hypotheses and application framework), as well as the associated dimensioning methods:
- Know how to model and analyze structures based on beams and plates
- Master the dimensioning methods in linear elasticity and buckling

Description of the programme

- Recalls of three-dimensional elastodynamics (kinematics, sthenic, Hooke's law, local equations, integral formulations)
- Beam models:
-- Euler-Navier-Bernoulli and Timoshenko hypotheses
-- Establishment of models
-- Energetic theorems (Ménabréa and Castigliano)
-- Elasticity dimensioning
- Plate models (Kirchoff-Love and Reissner-Mindlin)
- Instabilities of thin structures in compression under moderate rotations (Euler buckling, von-Karmann model).

Generic central skills and knowledge targeted in the discipline

Thin structures and instabilities

- Know how to model and analyze complex structures
- Master the methods of dimensioning in elasticity
- Know how to anticipate complex phenomena of instability
- Propose reduced approaches to minimize computational costs

How knowledge is tested

DS : written assessment, 2h (100%)

Bibliography

- Course handout (pdf)
- P. Ballard et A. Millard, Poutres et arcs élastiques, Edition Ecole Polytechnique, 2009.
- C.R. Calladine, Theory of shell structures, Cambridge University Press, 1983.

Teaching team

Stéphane Bourgeois

Total des heures		**24h**
CM	Master class	16h
TD	Directed work	8h

Useful info

Name responsible for EU

Lead Instructor

Stéphane Bourgeois

stephane.bourgeois@centrale-marseille.fr