Waves in mechanics

ECTS credits
2 credits

Semester
Fall

In brief

Course langage: French

Presentation

Prerequisites

Continuum mechanics (1st year Mechanics course)

Learning objectives

- Discover the wide range of common phenomena related to waves and vibrations
- Be able to understand dynamic phenomena in mechanics (solid, fluid and acoustic)
- Know how to distinguish between the notions of wave and vibration and know the formalisms involved
- Master the basic theoretical tools related to these notions
- Know how to use numerical tools to solve different types of problems

Description of the programme

- Lecture review and introduction to wave and vibration phenomena in different media
- Introduction of the time dimension in continuum mechanics and consequences
  -- Notion of wave
  -- Wave formalism
  -- Different types of wave equations and solutions
- Introduction of boundary conditions
  -- Standing waves, vibrations
  -- Eigenmodes
- Tools and methods
  -- Buckingham's Pi theorem and applications

-- Fourier transform, DFT, Shannon criterion
-- CFL condition
- Introduction to nonlinear acoustics
-- Constitutive equations in the nonlinear non-viscous case
-- Constitutive equations in the viscous nonlinear case
-- Applications of nonlinear acoustics

Generic central skills and knowledge targeted in the discipline

- Know how to model dynamic problems
- Know how to identify the characteristic parameters of a problem
- Know how to define the methodology to solve a dynamic problem
- Know how to identify complex dynamic phenomena such as instability or chaos

How knowledge is tested

- CC1: Reports on practical works (50%)
- CC2: Scientific report on a given subject (50%)

Bibliography

- Billingham, J., & King, A. (2001). Wave Motion (Cambridge Texts in Applied Mathematics). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511841033
- G. B. Whitham, "Linear and Nonlinear Waves," John Wiley & Sons Inc., Hoboken, 1999. doi:10.1002/9781118032954
- Sirven, Les ondes : du linéaire au non linéaire, Dunod, 1999.

Teaching team

- Bruno Cochelin
- Daniel Mazzoni

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

Useful info

Name responsible for EU

Lead Instructor

Daniel Mazzoni

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