Method of asymptotic analysis in mechanics

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Cursus  | Sem.  | Type
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Mécanique |       | Obl.

Language  | English
Credits   | 2
Session   | Oral presentation
Exam      | Oral presentation
Workload  | 60h
Hours     | 28
Lecture   | 21
Exercises | 7
Number of positions | 60h

Frequency  
Every 2 years

Remarque  
Next time: Spring 2021 / Min 8 participants

Summary  
The introduction to asymptotic analysis provides the basis for constructing many simplified analytical models in mechanics and for testing computations in limiting cases.

Content  
The following topics are covered:

• Problem solutions in terms of series and asymptotic series
• Ordering parameters and asymptotic analysis
• Asymptotic approximation of integrals (methods of stationary phase and of steepest descent applied to Fourier inversions, etc.)
• Singular perturbations - Matched asymptotic expansions (generalized boundary layer approximation) with examples (correction to Stokes drag of a sphere, etc.)
• Multi-scale methods with examples (flows with “slow” streamwise evolution such as developed flow in a tube with variable properties, waves evolving in slowly varying media, etc.)

Keywords  
asymptotic expansions, singular perturbations, multiple scales, WKB

Learning Prerequisites  
Important concepts to start the course
Analysis