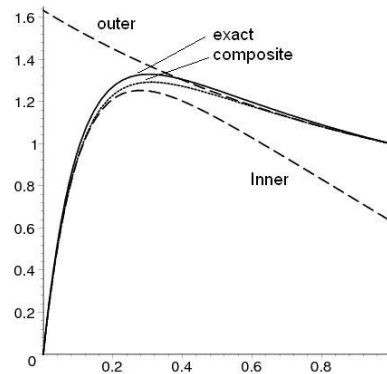


Perturbation methods in mechanics

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Course description

The course is designed to provide the students familiarity with perturbation methods, with special focus on how these methods provide useful insight in mathematical problems encountered in physics and engineering. The solution of ordinary differential equations with one small/large parameter will be analyzed, both within the framework of regular- or singular-perturbation theory, with special attention on boundary-layer theory and multiple-scale analyses.

Course disposition

The graduate course will be given on Teams on the following dates:

- April 28th 9-11
- April 29th 9-11
- May 3rd 9-11
- May 4th 9-11

Learning outcomes

Once the course will be completed, the student should be able to:

- Explain basic concepts of perturbation techniques, such as order relationships, asymptotic sequences, asymptotic expansions and convergence issues.
- Propose a solution method for regular perturbation problems.
- Explain the difference between a regular and a singular perturbation problem.
- Analyze a singular problem by means of a balancing method and boundary-layer theory.
- Determine inner and outer solutions for singular perturbation problems by means of boundary-layer theory and the composite form.
- Perform a multiple-scale analysis on linear and non-linear problems.

Eligibility

Basic knowledge of ordinary differential equations, Mechanics and Python.