

## Computational Dynamics: invariant manifolds and beyond. 7.5 hp

The course Computational Dynamics: invariant manifolds and beyond consists of 10 lectures.

### Course literature

Simo, C. *On the Analytical and Numerical Approximation of Invariant Manifolds*".

Canadell, M. and Figueras, J-L and Haro, A and Luque, A. and Mondelo, J.M. *Computation of Invariant Manifolds with Parameterization Methods*.

### Course contents

This course aims at an exposition of the basic techniques for the computation of invariant manifolds in Dynamical Systems. The examples under study will range astronomy, astrodynamics, mathematics, electronic circuits, chemical reactions.

The contents would contain a selected subset of the following topics:

- Numerical methods for the solution of zeros of nonlinear systems. The continuation method.
- Fixed and periodic points and their stability.
- Analytical and numerical approximation of attached invariant manifolds.
- Computation of homoclinic and heteroclinic points. Global bifurcation curves.
- Computation quasi-periodic orbits.
- Invariant objects in infinite dimensional systems (Delay equations, PDEs): Fixed points, travelling waves, periodic orbits, invariant tori.
- Computation of nonsmooth invariant objects. Chaotic objects.

### Examination:

No final exam. The student will be asked to handle during the course 3 computer assignments covering the points in the content.

Uppsala, 2th of May 2015.

Jordi-Lluís Figueras  
figueras@math.uu.se