DCAMM SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS941 27 September 2018

A DCAMM seminar No. 730 will be presented by

Professor Alexander Fidlin
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The title of the lecture is

Nonlinear Resonance in strongly damped systems

Abstract:

For many decades, the passage through and capture into the resonance of rotating machines has remained an important topic of scientific research. Most analytical studies consider quasi-conservative systems and owing to the complexity of the mathematical analysis, are limited to describing the dynamics of systems with only one rotational degree of freedom. However, to describe the dynamics of many mechanical systems such as a rotating cylinder partially filled with liquid, automotive drivetrain elements with coaxial shafts, and various types of vibration exciters, it is necessary to consider at least two rotational degrees of freedom. On the other hand, it is often incorrect to consider the damping in such systems as small. Fortunately, taking into account the considerable (non-small) damping makes it possible to significantly reduce the effective order of the control system of equations, which enables a qualitative dynamic analysis of systems with a higher number of degrees of freedom.

The concept of averaging in partially strongly damped dynamic systems is introduced in the talk and then applied to the problem of capturing into / passage through the resonance in systems with gradually increasing complexity. Starting with the classical Sommerfeld effect (one unbalanced rotor – carrier system with one degree of freedom) we go further to vibro exciters (two coaxial unbalanced rotors – carrier system with one or two degrees of freedom) which demonstrate nontrivial dynamics on the slow manifold. Further effects can be find in the self-balancing devices exciters (three coaxial unbalanced rotors – carrier system with one degree of freedom).

The obtained results demonstrate some examples of global bifurcations (dynamical phase transitions) in very simple mechanical system.

DATE: **Thursday, 11 October 2018**

TIME: **15:00 – 15:45 + questions**

PLACE: **Room 065E, Building 414(027)**
DTU, Technical University of Denmark

Danish pastry, coffee and tea will be served 15 minutes before the seminar starts.

All interested persons are invited.

Niels Leergaard Pedersen