

The Department of Structural Engineering and Building Technology at Aalto University School of Science and Technology is organising an intensive postgraduate course on contact mechanics. The course is a part of the program of the National Graduate School in Engineering Mechanics.

The course will be lectured by professor Anders Klarbring from Linköping University. The lectures will be given in the Department of Structural Engineering and Building Technology, address: Rakentajanaukio 4A, Espoo.

All the inquiries can be directed to Reijo Kouhia tel: +358 (0)9 47023755, or email: [Reijo.Kouhia@tkk.fi](mailto:Reijo.Kouhia@tkk.fi). Registrations for the course will be taken care by the secretary Elsa Nissinen-Narbro tel: +358 (0)9 47023701, or fax: +358 (0)9 47023826, or email: [Elsa.Nissinen@tkk.fi](mailto:Elsa.Nissinen@tkk.fi),

If accommodation services are needed, please, ask for the information from the secretary.

## Course program

Lectures 9.15-12.00  
from Monday to Wednesday in the lecture hall R1, Thursday in R9 (third floor) and Friday in R3 (second floor).

## Content

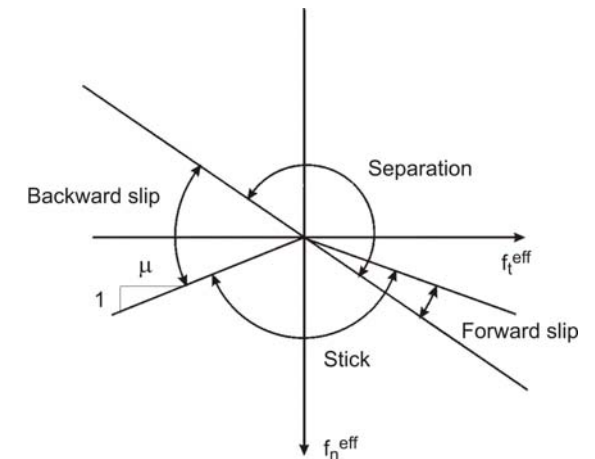
1. Modelling large displacement contact and friction problems, linearization
2. Discrete contact problems
  - a. Dynamic
  - b. Quasi-static
  - c. Incremental
  - d. Steady sliding
3. Stability, uniqueness and existence properties based on mathematical programming
4. Numerical methods
5. Miscellaneous
  - a. Structural optimization and contact problems
  - b. Thermoelastic instability
  - c. Shakedown

*Aalto University School of Science and Technology  
Department of Structural Engineering and Building Technology*

Graduate school of Engineering Mechanics  
Ph.D. course on

## Contact mechanics

15<sup>th</sup> – 19<sup>th</sup> March, 2010



A course given by

**Anders Klarbring**

*Division of Mechanics  
Linköping University*

## Background

Contact mechanics has its application in many engineering problems. No one can walk or drive a car without frictional contact. However, contact mechanics is not usually included in engineering curriculum. This is most probably due to the inherent non-linearity and non-smoothness of contact problems, which complicates the solution.

The aim of the course is to provide a modern introduction to contact mechanics, principles, modeling and solution techniques. The presentation follows the paradigm of non-smooth mechanics, meaning that contact and friction phenomena are treated by means of multi-valued and non-smooth relations. Mathematical programming and optimization theory are important mathematical tools.

## Study material

A. Klarbring. Contact, friction, discrete mechanical structures and mathematical programming. CISM courses and lectures No 384, pp. 55-100, Springer 1999.

A. Klarbring. Contact, friction and discrete mechanical structures: Analogies and dynamic problems. CISM courses and lectures No 421, pp. 147-174, Springer 2000.

A. Klarbring. Stability and critical points in large displacement frictionless contact problems. CISM Courses and Lectures No 457, pp 39-64, 2002.

The study material will be e-mailed to the participants.

## Participants

The participants are assumed to have a background in continuum and structural mechanics. Some background in the finite element method and optimization theory is also desirable, although not mandatory.

## Requirements and credits (ECTS)

Attending lectures and successful completion of home exercises will give 5 credit points.

## Further information

The lectures will be given in the Department of Structural Engineering and Building Technology, Rakentajanaukio 4A, Espoo. (Number 4 in the map below).

Up to date information available at:

<http://buildtech.tkk.fi/fi/ajankohtaista/uutiset/>

## Arriving to Otaniemi

Buses from the centre of Helsinki  
102, 102T, 103 (Line T via Lauttasaari)  
194, 195 via Munkkiniemi

From the centre of Tapiola  
2, 4, 4T, 10, 15, 52, 194, 195, 505, 510, 512, 550

Bus 103 stops at the library (24) on Otaniementie and both 194 and 195 stops opposite the library on Vuorimiehentie. Bus 102 stops on Otaniementie and Otakaari.

**Aikataulut/Timetables** <http://www.ytv.fi/>

