



# FSE3046 Paper Mechanics 6.0 credits

## Pappersmekanik

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

## Establishment

Course syllabus for FSE3046 valid from Autumn 2013

## Grading scale

## Education cycle

Third cycle

## Specific prerequisites

Basic course in solid mechanics and paper techniques

## Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

## Intended learning outcomes

Material is an essential component of design. Working as an engineer, you will deal with various types of materials. Despite being simple in use, paper constitutes one of the most

complex materials among those you encounter in your daily life. Paper can be easily tested mechanically and exhibits a whole range of behaviours during its end use. Therefore, studying paper mechanics is an excellent opportunity to train your skills in analysing various aspects of mechanical behaviour of material.

To start with, paper and paperboard are composite materials, which are produced by a continuous process at unprecedented speeds of up to 100 km/h by a complex but yet extremely cost-efficient process. Paper is inhomogeneous and anisotropic. In a number of applications, it is used beyond its elastic limit. The strength of paper is size dependent and is different in tension and compression. Furthermore, paper absorbs water, which changes its mechanical properties and dimensions.

In this course, you will be exposed to the intricate mechanics of paper through a number of case studies, in which we will investigate real problem and learn how to solve them.

At KTH, we have a world-leading expertise in Paper Mechanics and contributed to the book that will be used in the course. We will also use the expertise available at Innventia AB, a recognized research institute dealing with paper and paperboard related problems.

On completion of the course, the students should be able to

- describe and analyse important paper technical issues with correct terminology from the solid mechanics
- relate the results from methods for testing of paper and cardboard stiffness and strength to relevant units within the solid mechanics,
- describe important aspects that must be observed at constitutive modelling for the analysis of conversion of paper and box and paper products, and
- demonstrate the advantages of mathematical modelling and numerical calculations in analysis of paper technical applications.

## Course contents

Lectures:

Paper as construction material, the mechanical properties of packaging, biging, folding of cardboard, track dynamics in paper transporting systems and statistical aspects on failures in paper products, fracture properties, moisture induced deformations, creep, relaxation and pressure pinch mechanics for paper, cardboard and micro mechanics, wooden bio composites

## Course literature

Niskanen et al., Mechanics of Paper Products, de Gruyter GmbH & Co. KG, Berlin, ISBN 978-3-11-025463-1, 2012

## Examination

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

## Other requirements for final grade

Home assignments (1 credits)

Written examination (5 credits)

## Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.