Syllabus for

Academic year 2011/2012 >

MHA063 - Strength of materials

Syllabus adopted 2011-02-22 by Head of Programme (or corresponding)
Owner: TKDES
7,5 Credits
Grading: TH - Five, Four, Three, Not passed
Education cycle: First-cycle
Major subject: Mechanical Engineering
Department: 42 - APPLIED MECHANICS

Teaching language: Swedish

Credit distribution

Course module	Sp1	Sp2	Sp3	Sp4	Summer course	No Sp	Examination dates
0105 Examination 7,5 c Grading: TH			7,5 c				Fri 09/03-2012 pm M, Fri 13/01-2012 am M, Fri 24/08-2012 am M

In programs
TKDES INDUSTRIAL DESIGN ENGINEERING, Year 2 (compulsory)

Examiner:
Bitr professor Anders Ekberg

Replaces
MHA062 Strength of materials

Eligibility:
For single subject courses within Chalmers programmes the same eligibility requirements apply, as to the programme(s) that the course is part of.

Course specific prerequisites
Mathematics (linear algebra, differential equations and integrals) and mechanics (statics).

Aim
The main aim is to give the student a fundamental engineering knowledge about the design of constructions. Therefore an understanding of terminology, methods and limitations used in the engineering discipline strength of materials is needed as well as a capability to solve smaller design problems. Further, it is important to judge whether the solution of the problems are reasonable and to be able to predict function and reliability of constructions.

Learning outcomes *(after completion of the course the student should be able to)*

- understand fundamental quantities such as forces, deformations, stresses, strains, compatibility, critical forces
- understand the importance of constitutive equations and apply elasticity, thermo-elasticity and ideal plasticity
- evaluate forces, stresses, deformations and strains on the whole and parts of constructions made up of basic elements such as bars, shafts, beams and pipes
- estimate the risk of failure, in particular due to buckling, fatigue, plastic deformation and fracture
- evaluate and explain the importance of principal stresses/strains and effective stresses/strains
- design and evaluate mathematical models of the reality simplified to basic elements such as bars, shafts, beams and pipes
- estimate the accuracy of these models, in particular regarding if all possible failure modes that are captured, and judge whether a more sophisticated model is needed
- understand basic concepts of more advanced topics in solid mechanics, such as finite element simulations, dynamic systems, design philosophies etc

Content
The course contains the following parts:

- determination of deformations, strains, internal forces and stresses for: tension/compression of bars, torsion of circular shafts and thin-walled cross-section, bending of beams
- instability of columns
- constitutive equations such as Hooke¿s law in uniaxial and multiaxial conditions, thermoelasticity and ideal plasticity
- multiaxial stress and strain conditions; in particular principal stresses and effective stresses
- stresses and strains in thin-walled cylindrical and spherical pressure vessels
- fatigue and fracture analysis
- an overview of more advanced topics in the field of solid mechanics

Organisation
Lectures, tutorials, and supervised problem-solving including design excercises

Literature
H. Lundh, Hållfasthetslära, KTH, Stockholm, 2000.

P. Möller, Exempelsamling i hållfasthetslära, Skrift U77, Institutionen för hållfasthetslära, Chalmers, 2000.

M. Ekh and P. Hansbo, Formelsamling i hållfasthetslära, Institutionen för tillämpad mekanik, Chalmers, 2007.

Handout of additional handbook cases and presentations on advanced topics

Examination
Written exam with problem-solving and theory