



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Byggnadsmekanik

Structural Mechanics

VSMA05, 8 credits, G1 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED V

Date of Decision: 2023-03-21

General Information

Main field: Technology.

Compulsory for: V2

Language of instruction: The course will be given in Swedish

Aim

The aim of the course is to give an introduction to structural mechanics with application to types of structures that are common in buildings and infrastructure.

The course is built upon previous courses in especially mechanics, mathematics and material science and is intended as basic general knowledge for a MSc in Civil Engineering and to give necessary prerequisites for further studies in structural and geotechnical engineering and more advanced structural mechanics.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- Be able to explain basic concepts and relations within the area.
- Be able to describe the mode of action of some important structural elements.
- Be able to describe the general appearance of the deformed shape and section forces for simple structures and loadcases.
- Be able to describe the general appearance of the stress distribution caused by axial load, bending or torsion in a beam.

Competences and skills

For a passing grade the student must

- Be able to choose a suitable model for analysing a simple structure.
- Be able to calculate section forces, stresses and deformations for bars, trusses, beams, simple frames, shafts and simple composite structures.
- Be able to determine principal stresses and directions for a two-dimensional stress state.
- Be able to analyse columns with respect to buckling and second order theory.
- Be able to analyse free-vibration response and response to harmonic loading for a single-degree-of-freedom system.
- Be able to present a clear and correct written solution to a problem (given data, assumptions, calculations, results, conclusions).
- Be able to orally present the solution of a problem in front of a group of students and teachers.

Judgement and approach

For a passing grade the student must

- Be able to assess the reasonableness in an obtained result.

Contents

The course starts with a revision of free-body diagrams and equilibrium, with application to trusses, and introduction of the concepts stress and strain.

- Free-body diagrams and equilibrium. Trusses. Stress, strain and stress-strain relationships.

After that follows a comprehensive treatment of Bernoulli's beam theory:

- Section forces in beams. Normal stress and shear stress for elastic bending of beams. Plastic bending of beams. Deflection of beams. Statically indeterminate beams.

Finally, some further subjects within structural mechanics are introduced:

- The mode of action of some important structural elements. Columns; buckling and second order theory. Torsion of circular cross sections. Transformation of stress and strain, principal stresses, yield criteria. Dynamics; free vibrations and response to harmonic loading for simple structural elements.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Two hand-in assignments (one of which is also presented orally), one laboratory assignment and one written examination.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: VSM010 Mechanics or VSMA25 Mechanics

The number of participants is limited to: No

The course overlaps following course/s: VSM140, VSM141, VSMA10, VSMA20, VSMA11

Reading list

- Heyden, S., Dahlblom, O., Olsson, A., Sandberg, G.: Introduktion till strukturmekniken. Studentlitteratur, 2017, ISBN: 9789144084060.
- Språkrådet: Svenska skrivregler. Liber, 2017, ISBN: 9789147111497. Reference.
- Programledning V: Anvisningar för rapporter på V-programmet. 2015. Available on the programme's website.

Contact and other information

Course coordinator: Universitetslektor Susanne Heyden,
susanne.heyden@construction.lth.se

Course homepage: <http://www.byggmek.lth.se/utbildning/kurser>

Further information: In addition to the hours given in the time plan there is a 3 h seminar and some consultations.