Structural Mechanics and Strength of Materials

Programme course

12 credits

Byggnadsmekanik och hållfasthetslära

TNBI24

Valid from: 2017 Spring semester

Determined by
Board of Studies for Mechanical Engineering and Design

Date determined
2017-01-25

Offered for the last time
Spring semester 2021

Replaced by
TNBJ17 till dels

Main field of study
Civil Engineering

Course level
First cycle

Advancement level
G1X

Course offered for
- Civil Engineering, B Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Calculus

Intended learning outcomes

The aim of the course is to give the students knowledge within structural mechanics and strength of materials as a basis for abilities within structural design. For areas included in the course, the students should be able to:

1. Use proper terminology; Use proper denotations; Describe sectional entities and types of stress;
2. Define used concepts, like normal and shearing force, bending and torsion moment, stress, strain, elongation, deflection; Describe various elements of structure and types of structures;
3. Explain the function of structures; Calculate external and sectional entities as well as deflections for standard cases; Calculate external and sectional entities as well as deflections for combinations of standard cases; calculate stresses for typical loads and simple elements of structure; By exceeding determinations judge the correctness of calculations done; Carry through and report on a structural design assignment according to conventions; Use a computer program for the calculation of structural mechanics;
4. A structure given, suggest a proper model of calculation considering loads as well as design; Calculate external and sectional entities as well as deflections for other than standard cases; By proper approximations or otherwise judge the reasonableness of calculations done ; Calculate stresses for combined loads and non standard structural elements; Optimize a structure for a given load;

Course content

Load analysis according to the European standrads "Eurocode". Two- and three-dimensional force systems. Trusses. Statically determinate structures. Stresses. Calculations of the tension, compression, bending, combined bending and normal force, shear, buckling, and torsion, using the elastic theory. Statically indeterminate structures. Plastic theory and second order theory. Structural dynamics

Teaching and working methods

The course contains lectures and hand-in assignments. The lectures consist of theoretical parts and the solution of typical problems. The assignments are designed as calculation tasks, two of which are carried out in combination with a computor laboration.
The course runs over the entire spring semester.

Examination

UPG1	Hand-in exercises	3 credits	U, G
TEN2	Written examination	4.5 credits	U, 3, 4, 5
TEN1	Written examination	4.5 credits	U, 3, 4, 5

For pass (mark 3) on the whole course the student has to show the ability to meet the requirements specified under “Aim”, level 1-3.

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses: Timber and Steel Structures; Concrete Structures and Geo Construction

Department

Institutionen för teknik och naturvetenskap

Director of Studies or equivalent

Dag Haugum

Examiner

Osama Hassan

Course website and other links

http://www2.itn.liu.se/utbildning/kurs/index.html?coursecode=TNBI24

Education components

Preliminary scheduled hours: 88 h
Recommended self-study hours: 232 h

Course literature

1. Heyden, S., Dahlbom, O., Olsson, A., Sandberg, G.: Introduktion till strukturmekaniken, Fjärde upplagan (2008 eller nyare), Studentlitteratur, ISBN 978-91-44-05125-3. 2. Johannesson P., Vretblad, B. Byggformler och tabeller. Liber ISBN 978-91-47-10022-4 (Utgåva. 11, 2011). 3. Isaksson, T., Mårtensson, A. Byggkonstruktion: regel- och formelsamling: baserad på Eurokod. 2 uppl. (2010). Lund: Studentlitteratur. ISBN 978-91-44-07032-2 4. Kompletterande material. Under kursgången delas ett antal häften/PM ut.

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.