Linnæus University

Jnr: 2021/2378-3.1.2.2

Course syllabus

Faculty of Technology
Department of Building Technology

4BY374 Stålkonstruktioner, 5 högskolepoäng
Steel Structures, 5 credits

Main field of study
Civil Engineering

Subject Group
Building Technology

Level of classification
Second Level

Progression
A1F

Date of Ratification
Approved 2019-06-10
Revised 2021-06-10 by Faculty of Technology. Prerequisites and literature list are revised.
The course syllabus is valid from autumn semester 2022

Prerequisites
Analysis of structures 7,5 credits, Finite element method 7,5 credits, Energy efficient and sustainable construction, 7.5 credits, Conceptual structural design 10 credits, or the equivalent.

Objectives

Knowledge and understanding
To pass, the student is expected to

- distinguish between statically determined and overdetermined structures and describe their ability to redistribute loads,
- be able to describe in detail the differences between different cross-sectional classes and
- understand why high-cycle fatigue occurs, and how details should be design to prevent fatigue failure.

Competence and skills
To pass, the student is expected to

- be able to determine design sectional forces in statically overdetermined structures in ultimate and service limit states,
- be able to use finite element programs to determine sectional forces for a single load case as a basis for dimensioning,
- be able to perform load combination analyses in a finite element programs in order to define dimensioning sectional forces

- be able to interpret the result from a buckling analysis of individual structural elements as well as a complete structural system,
- be able to design details such as screw and weld joints based on both simple hand calculations and FE analyses and
- be able to design steel structures with regard to fatigue.

Judgement and approach
To pass, the student is expected to

- be able to select structural elements suitable for a FE analysis of a structural system to determine sectional forces in different members.

Content
The course is based on the fundamental course in steel and wood structures and the course in conceptual structural design. In the course by hand, the focus lies on using and interpreting results from FE analyses to determine design sectional forces. More precisely, the course deals with:

- Static overdetermined structures and the possibility of redistributing loads at the ultimate limit state.
- Determination of sectional design forces based on FE analyses.
- System stability, global (buckling, lateral buckling) and local stability (web buckling, flange buckling, buckling of stiffeners).
- Design methods for high cycle fatigue and practical design of details with regard to fatigue.

Type of Instruction
The teaching consists of lectures where the theory is introduced, exercises where the students practice the application of different methods, supervision of assignments and possible some laboratory work. Laboratory work and seminars are compulsory elements in the course.

Examination
The course is assessed with the grades A, B, C, D, E, Fx or F.
The grade A represents the highest grade on the scale and the remaining grades follow in descending order, where the grade E is the lowest grade on the scale that will result in a pass. The grade F means that the student's performance is assessed as fail (i.e. received the grade F).

The course includes assignments and a written exam, which constitute examination. The students will individually report on the assignments and how these have been carried out.

The course is assessed through individual written examination and assignments.
The examination of the course is divided into the following parts
• Written exam, 3 hp, A-F• Assignments, 2 hp, A-F
The final grade is mainly determined by the grade on the written exam.

Repeat examination is offered in accordance with Local regulations for courses and examination at the first and second-cycle level at Linnaeus University.

If the university has decided that a student is entitled to special pedagogical support due to a disability, the examiner has the right to give a customised exam or to have the student conduct the exam in an alternative way.

Course Evaluation
During the implementation of the course or in close conjunction with the course, a course evaluation is to be carried out. Results and analysis of the course evaluation are to be promptly presented as feedback to the students who have completed the course.

Students who participate during the next course instance receive feedback at the start of the course. The course evaluation is to be carried out anonymously.

Other

Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

The course material is presented on a web study site that the students reach via the Internet. Access to the Internet and computers is available in the university's computer rooms and at the university library.

Required Reading and Additional Study Material

Required reading

- Al-Emrani, M., & Åkesson, B. (2020). Steel Structures (Lecture notes). Department of Civil and Environmental Engineering, Chalmers University of Technology, approx. 450 pages.
- Al-Emrani, M. (latest edition). Excerpt of Eurocode 5 – Design of Steel Structures. Department of Civil and Environmental Engineering, Chalmers University of Technology.

Additional study material (e.g. lecture notes, exercises, formulary, beam tables as well as tutorials and handouts for assignments) are provided.

Reference Literature

- Davison B. and Owens G.W. (eds.) (2016). Steel Designers' Manual, 7th edition, John Wiley & Sons, ISBN: 9781119249863, approx. 1400 pages.
- SS-EN 1993-1-1:2005. Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings.
- SS-EN 1993-1-5:2005. Eurocode 3: Design of steel structures - Part 1-5: General rules - Plated structural elements.
- SS-EN 1993-1-8:2005. Eurocode 3: Design of steel structures - Part 1-8: Design of joints.
- SS-EN 1993-1-9:2005. Eurocode 3: Design of steel structures - Part 1-9: Fatigue.

Corrections and amendments as well as national annexes may be available.