



## Course syllabus

Faculty of Technology

Department of Building Technology

4BY376 Betongkonstruktioner 2, 7,5 högskolepoäng

4BY376 Concrete structures 2, 7.5 credits

### **Main field of study**

Civil Engineering

### **Subject Group**

Building Technology

### **Level of classification**

Second Level

### **Progression**

A1F

### **Date of Ratification**

Approved by Faculty of Technology 2022-12-19

The course syllabus is valid from autumn semester 2023

### **Prerequisites**

Analysis of structures, 7.5 credits, The finite element method, 7.5 credits and Conceptual structural design, 10 credits, or the equivalent

## Objectives

### *Knowledge and understanding*

To pass, the student is expected to

- demonstrate methodological knowledge how to analyze and design state-of-the-art structural elements of reinforced concrete
- demonstrate deep insight in the mechanism of action of prestressed concrete structures
- understand how to design and implement precast concrete elements and structures of different kinds
- have knowledge of sustainability issues associated with concrete structures.

### *Competence and skills*

To pass, the student is expected to

- be able to describe, explain and use different methods for analyzing concrete structures and expressing their limitations,

- demonstrate the ability to carry out a design task for structural concrete using FE analysis,
- demonstrate the skills to verify the results obtained from FE analysis using simplified methods,
- to present methods and results in technical reports including theoretical framework, calculations, and technical drawings,
- demonstrate the skills required to present conclusions and argue for procedures used to analyze the tasks at hand, and
- show ability to critical review technical reports on design work and relevant scientific papers as well as to argue for and against various assumptions.

#### *Judgement and approach*

To pass, the student is expected to

- demonstrate insight into need of concrete structures' optimization regarding the environmental impact of their production, and
- demonstrate deep understanding of the responsibility relating to the design and execution of concrete structures.

### Content

The course comprises the following elements:

Analyses of reinforced concrete structures and concrete structural elements, both cast in situ and prefabricated. The analysis should include mechanisms such as pretension and posttensioning of the reinforcement and general structural handcalculations where elements based on Eurocode are discussed.

Phenomena linked to prestressing is given special attention as well as analysis of rheological phenomena.

Principles of designing buildings made of precast concrete elements are given.

Sustainability issues associated with concrete structures are important part of the course.

### Type of Instruction

The teaching consists of lectures where theory is introduced or exercises where application of different methods is discussed based on a problem and a project task where practical skills are practiced. The lectures where the projects are introduced are compulsory elements in the course.

The course also includes laboratories and practical activities (e.g. a technical excursion), where attendance is mandatory.

### Examination

The course is assessed with the grades A, B, C, D, E, Fx or F.

The grade A constitutes 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 examination is divided into the following

- Written exam 4 hp A-F
- Assignments 2,5 hp A-F
- Laboratory report 1 hp A-F

The assessment is based on an individual written exam, two assignments and the

laboratory report. The final grade is a weighted mean value of the different parts.

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.

### Credit Overlap

The course cannot be included in a degree along with the following course/courses of which the content fully, or partly, corresponds to the content of this course: 4BY373, 5 credits

### 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

SS-EN 1992-1-1:2005, Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings

Engström, Björn. Design and analysis of prestressed concrete structures. Chalmers University of Technology, Göteborg, Sweden, 2011.

Engström, Björn. Design and analysis of deep beams, plates and other discontinuity regions, Chalmers University of Technology, Göteborg, Sweden, 2011.

Engström, Björn. Design and analysis of slabs and flat slabs, Chalmers University of Technology, Göteborg, Sweden, 2011.

In total the basic literature consists of approximately 600 pages.

#### **Additional Literature:**

Nawy, E.G.: Prestressed Concrete. A Fundamental Approach, 2003

Elliott, K.S, Jolly, C.K: Multi-storey Precast Concrete Framed Structures, 2013

Toniolo, G.; di Prisco, M.: Reinforced Concrete Design to Eurocode 2, 2017

Lecture notes and slides.

