



Faculty of Technology and Science  
Construction Engineering

## Syllabus

### Course Approval

The syllabus was approved by the Faculty Board of Technology and Science on 12 March 2014, and is valid from the Spring semester of 2014 at Karlstad University.

**Course Code:** BYGA10

**Structural Mechanics, 7.5 ECTS Credits**

**(Byggnadsmekanik, 7.5 Swedish credit points)**

**Degree Level:** Bachelor

**Progressive Specialisation:** G1F (First cycle, has less than 60 credits in first-cycle course/s as entry requirements)

### Language of Instruction

Swedish

### Prerequisites

Upper secondary school Physics B, Mathematics D, and Chemistry A (field-specific eligibility 8) plus Mathematics for Engineering I and II (MAGA44 och MAGA46) 15 ECTS cr. or equivalent,  
OR

Physics 2, Mathematics 3c, and Chemistry 1 (field-specific eligibility A8) plus Mathematics for Engineering I and II (MAGA44 och MAGA46) 15 ECTS cr. or equivalent

### Major Field of Study

BYA (Building Technology)

### Learning Outcomes

The course is mandatory for students in the first year of the building and construction engineering programme. The aim is that students acquire basic knowledge of classical structural mechanics and understanding of load-bearing structures and their function in common building constructions, thus providing the necessary basics for further studies in strength of materials and design.

Upon completion of the course, a Pass grade (3) is awarded to students who are able to:

- correctly carry out simple calculations, based on given conditions, in all the thematic course components,
- give an account of the calculation principles used in thematic course components,
- give an account of the concepts and simple theoretical relationships applied in the course components,
- discuss and criticise the work of fellow-students in a constructive way.

Upon completion of the course a grade of distinction (4 or 5) is awarded to students who, in addition to the above, are able to:

- carry out more complex calculations based on assumed conditions,
- apply course theory when calculating problems unknown to the students,
- apply combinations of theories when making calculations.

### Content and Form of Instruction

The course is divided into four thematic areas. Instruction is in the form of lectures, calculation exercises, mandatory laboratory work and hand-in assignments. Every theme is concluded with a written examination for the pass grade level. At the end of the course, students have the opportunity to sit a written exam for a grade of Distinction.

The course comprises the following components:

Theme 1: Plane force system and coordinates of the centroid

- Units, terminology in mechanics
- Vector, vector operations, vector components, unit vector
- Vector magnitude forces, resultant force, point of application, line of action
- Plane force system, moment, force couple
- Free-body diagram, equilibrium, equilibrium equation
- Coordinates of the Centroid, centroidal axis, first moment of area, symmetry, axes of symmetry, equivalent load effects and moment effects.

Theme 2: Plane Trusses

- Different types of support, types of action, support reactions
- Stability conditions and static determination, determination of forces in the members using the method of joints and Ritter's method of sections respectively, qualitative analysis.

Theme 3: Statically determined beams and frames

- Simply supported beam, cantilever beam, combination beam, gerber beam, three-joints frame
- Section forces and sign conventions, free-body diagram, force equilibrium, moment equilibrium,
- Bending-moment, shear-force, and normal-force equations and diagrams, and relationships between general loading, shear and moment.

Theme 4: Load analysis and calculating cumulative loads on columns in multi-storey buildings

- Design regulations of the Swedish Board of Housing, Building and Planning, method of partial factors, resistance, effect of action, action, ultimate limit states, design combination of action, characteristic and design values of an action, safety classes
- Combination of action, permanent action, weight, fixed action, free action, variable action, imposed load: fixed and free action, load groups, snow load, wind action
- Calculating cumulative loads on columns in multi-storey buildings.

Reading List

See separate document.

Examination

Assessment is continuous and based on lab reports, oral presentation and written exams. Each thematic component is concluded with a written exam at the Pass grade level. All examination must be completed before a grade is issued. A final written exam is offered at the end of the course to students who aim for a grade of Distinction and for students who need a re-sit opportunity for a Pass grade.

Grades

One of the grades Fail, 3 (Pass), 4 (Pass with some distinction, or 5 (Pass with Distinction) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course assessment is based on student views and experiences as reported in written course evaluations and/or group discussions. Students will be informed of the result of the evaluation and of the measures to be taken.

## Course Certificate

A course certificate will be provided upon request.

## Additional Information

Students who enrolled before 1 July 2007 will complete their studies in accordance with the requirements of the earlier admission. Upon completion students may request degree and course certificates to be issued under the current ordinance if they meet its requirements.

The local regulations for studies at the Bachelor's and Master's levels at Karlstad University stipulate the obligations and rights of students and staff.

The course includes mandatory components and groupwork requiring students to be present beyond scheduled hours.

Karlstads universitet 651 88 Karlstad, Sweden  
Tel +46-54-700 10 00 Fax +46-54-700 14 60  
information@kau.se www.kau.se