



Faculty of Health, Science and Technology
Construction Engineering

Syllabus

Structural Mechanics

Course Code:	BYGA10
Course Title:	Structural Mechanics <i>Byggnadsmekanik</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
BYA (Building Technology)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2015-02-19, and is valid from the Autumn semester 2015 at Karlstad University.

Prerequisites

Mathematics for Engineering I and II (MAGA44 and MAGA46) 15 ECTS cr., or TGHBY enrollment, or equivalent,

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

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 written exams, hand-in assignments and lab reports. Each thematic component is concluded with a written exam at the Pass grade level. All examination tasks must be completed for each theme 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.

Attendance is mandatory for laboratory sessions.

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 evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other

data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

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.