



# AF2004 Concrete and Steel Structures 7,5 hp

Concrete and Steel Structures

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

## Fastställande

Kursplan för AF2004 gäller från och med HT10

## Betygsskala

A, B, C, D, E, FX, F

## Utbildningsnivå

Avancerad nivå

## Huvudområden

## Särskild behörighet

180 credits Academic studies in Engineering, Science, Economics or Planning including documented proficiency in English B or equivalent (TOEFL, IELTS e g).

AF2003 Structural Engineering, advanced course or equivalent

## Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

# Lärandemål

The overall goal of the course is to give detailed knowledge about analysis and design of common structural elements of steel and concrete. After having passed the course the student should be able to:

- Explain the effect of shear and patch loading on the resistance of steel beams.
- Explain the static behaviour of different types of welded joints in steel structures.
- Understand how fatigue can affect the load bearing resistance of structural elements in steel.
- Explain how torsion of thin walled steel sections is carried.
- Calculate the load bearing resistance of beams subjected to lateral torsional buckling.
- Understand specific problems related to the design of thin walled steel beams, especially the interaction between local buckling, distortional buckling and global buckling.
- Calculate the load bearing resistance of integrated structures consisting of a concrete slab interacting with an underlying beam of steel or concrete.
- Explain the theoretical background to the yield line theory and the strip method for the analysis of reinforced concrete slabs.
- Calculate the load bearing resistance of rectangular reinforced concrete slabs on walls according to the yield line theory, table method and strip method.
- Calculate the load bearing capacity of rectangular reinforced concrete slabs on columns according to the strip method.
- Explain punching of a concrete slab on a column.
- Explain the causes of cracking of newly cast, coarse concrete structures and being able to assess the risk of crack formation and to recommend actions for crack reduction.
- Explain cracking strength, residual strength, ductility index and the residual strength factor.
- Explain the modes of action of bonding shotcrete, rock anchored shotcrete and shotcrete arches.
- Explain the mode of action of a shotcrete drain.
- Calculate the load bearing resistance of bonding shotcrete and rock anchored shotcrete in some simple cases.

# Kursinnehåll

- Design of steel beams with regard to shear and patch loading
- Welded joints, analysis and design
- Fatigue of steel components
- Saint Venant and warping torsion of beams
- Design of steel beams with reference to lateral torsional buckling
- Technology of thin walled steel profiles, especially instability problems

- Composite structures of concrete and steel
- Concrete slabs
- Coarse concrete structures
- Fibre concrete and shotcrete

## Kurslitteratur

Will be announced at the beginning of the course.

## Examination

- TEN1 - Examination, 4,5 hp, betygsskala: A, B, C, D, E, FX, F
- ÖVN1 - Exercises, 3,0 hp, betygsskala: P, F

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

## Övriga krav för slutbetyg

Passed written exam (4,5 cr)

Passed exercises (3 cr)

## Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.