

**KURSPLAN**

# **Dimensionering av konstruktioner för förnybara energisystem 5 högskolepoäng S7007B**

**Design for renewable energy systems**

**Kursplan antagna: Höst 2012 Lp 1 - Höst 2015 Lp 2**

**BESLUTSDATUM  
2012-03-14**

# Dimensionering av konstruktioner för förnybara energisystem 5 högskolepoäng S7007B

## Design for renewable energy systems

### Avancerad nivå, S7007B

Utbildningsnivå	Fördjupningskod	Betygsskala	Ämne	Ämnesgrupp (SCB)
Avancerad nivå	A1N	U G#	Stålbyggnad	Byggteknik

### Ingår i huvudområde

Väg- och vattenbyggnad

## Behörighet

Vara antagen till Suscos programmet

## Urval

Urvalet grundas på 30-285 högskolepoäng

## Examinator

Milan Veljkovic

## Mål/Förväntat studieresultat

The aim of this course is to give students an understanding of the behaviour of steel tubular towers for wind turbines, using analytical and numerical methods and to practice design calculations. In addition other lattice towers and different types of concrete towers combination will be discussed. The Eurocodes are used throughout the course to calculate the structural resistance. The "International version of the codes" will be used in the course and students will have opportunity to borrow prepared compendiums which will be returned afterwards. This version of the Eurocodes is prepared by the international experts and is not nationally adjusted. The course describes different part of the tower: foundation, instability phenomena which are limiting for the resistance of a tower, different types of connections, as well as load analysis and safety strategy based on partial safety factors, tower production and maintenance. Understanding of economical and technical aspect involved in planning, design and construction of the wind farm, onshore and offshore will be provided. The aim is to have an understanding of theoretical background and engineering (design) models, and the resistance according to codes. Design concerning instability, assembling connections, foundations, design of details prone to fatigue load are based on theoretical models and design standards for wind tower certification and Eurocodes. Exercises using FE method, using commercially available software, are optional and may be performed to compare analytical and numerical results. Previous experience in FE analysis is not requested but it is advantageous.

## Kursinnehåll

Seven topics, listed below are covered in the course. Design loads, including background of the approximation of external loads to design values of the crosssection forces, and resistance of the tower, including the foundation are main topics of the course. Basic theory of practical methods used to approximate cyclic loading is given. Assembling connections of the towers are considered focusing on design of bolts. One of the most important parts of structural design is to identify the engineering model and define different failure modes that may occur for a chosen design load of a tower. The design resistance is checked for each failure mode. In the compulsory assignments students practice use of the structural codes and engineering models for calculation of cross section forces, critical forces and the design resistance. Elastic stability of circular cylindrical shell, considering axial load and combination of axial load and bending moment will be given. Postbuckling behaviour of a perfect and imperfect shell will be analysed to understand background of the design rules. Finite element method is used to calculate resistance of the tower for axial force and combination of axial force and bending moment, and to estimate design force in the bolts of the flange connection ("unsymmetrical Tstub connection")

## Genomförande

Kursens undervisningsspråk samt undervisningsform anges för varje kurstillfälle och framgår av kurssidans på Luleå tekniska universitets hemsida.

Frontal lessons, seminar and home work

## Examination

Om det finns beslut om särskilt pedagogiskt stöd, i enlighet med Riktlinjen Studentens rättigheter och skyldigheter vid Luleå tekniska universitet, finns möjlighet till anpassad eller alternativ examinationsform.

Approved compulsory assignments will be necessary to prepare a public presentation at the end of the course on the work performed during the course.

Grading system. Passed or not passed. A certificate awarding ECCS credits after the course accomplishment may be provided upon the request.

## Litteratur. Gäller från Höst 2012 Lp 1

Tutorial examples will be prepared in due time in format of handouts in following areas sustainability assessment, costs analysis, shell stability, flange connection-one half of the T-stub. Peer reviewed papers from journals and different web sources will be provided. Background material of research projects developed by the teachers  
Chosen chapters related to selected topics of theory of stability and connections

Eurocodes

ECCS recommendations

Guidelines,

Standards

## Kursgivare

Institutionen för samhällsbyggnad och naturresurser (SBN)

## Prov

Provuppsättning saknas

## Kursplanen fastställd

av Eva Gunneriusson 2012-03-14