

Internationell svetskonstruktör, IWSD - Kursprogram

Module 3: DESIGN OF WELDED STRUCTURES

Modul 3: Utformning av svetsade konstruktioner

3.1 Basic theory of structural systems/Grundläggande konstruktionsteori, 4 tim

Objective:

The student should understand the basic classes of structural elements and how these elements are combined in a simple structure.

Scope:

Tension elements
Compression elements
Beam elements
Truss and frame structures
Plate elements
Joining and connections

As appropriate a suitable design guidance document, e.g., EN 1993 Eurocode 3: Design of Steel Structures, may be used

Expected result at comprehensive and standard levels:

Explain the basic features of different structural elements and how these are used in design.
Explain the structural differences between moment bearing and non-moment bearing connections.

Explain the potential failure modes associated with the different structural elements.

Compute ultimate strength of tension members.

Compute shape factor, plastic limit load and elastic limit load for beam element.

Understand the basic difference in load transfer mechanism for a beam element constructed of plates and one constructed of tension/compression truss elements.

3.2 Loads on structures/Laster på konstruktioner, 4 tim

Objective: The student will understand the important distinction between different classes of loads acting on a structure and be aware of how to compute loads for design.

Scope:

Dead loads
Live loads
Distributed and concentrated loads
Partial safety factors for loads
Design loads
Statistical load variation

As appropriate a suitable design guidance document, e.g., EN 1991 Eurocode 1: Actions on structures, may be used

Expected result at comprehensive and standard levels:

Explain possible sources for dead loads and live loads that can act on a structure.

Understand how static and moving loads affect a structure.

Compute the design load for a structure based on partial safety factors and load class.

Explain some of the sources for variation of loads.

Explain the concept of partial safety factor and how these are used in the design of structures.

Interpret appropriate standards with respect to computation of design loads.

Interpret appropriate standards with respect to load classification and partial safety factors for loads.

3.3 Introduction to the design of structures/Introduktion till konstruktionsutformning, 8 tim

Objective:

The objective is to provide an introduction to the philosophy and process of design for welded structures.

Scope:

Design goals and constraints
Safety, economy, durability and serviceability
Proportioning of members
Analysis and evaluation
Partial safety factors
Sources of variation in design loads and strength of structural components

Ultimate and serviceability limit states

Expected result at comprehensive and standard levels:

Clarify the set of design objectives that are placed on a structure.

Illustrate the design process first concept to detail design and final evaluation.

Introduce the concepts of optimisation with respect to performance, manufacturability, life cycle cost, etc.

Demonstrate the set of limit states that are placed on a structural system.

Illustrate the possible influences of manufacturing tolerances on the final design of a structure.

Explain the basic aspects of limit state design.

Illustrate the use of partial safety factors in calculations.

Compute loading combinations required in limit state design method.

Explain sources of load variation for welded structures.

3.4 Analysis methods for structures/Analysmetoder, 5 tim

Objective:

The student will be introduced to the use of simple and more sophisticated analytical tools in the design of structures.

Scope:

Spreadsheet tools

Finite Element Analysis

Design guideline formulas

Expected result at comprehensive and standard levels:

Demonstrate use of a spreadsheet based calculation system in the design of a structural system.

Explain the basis for selecting an appropriate analysis method for a design situation.

Explain the advantages, disadvantages and uses of different analysis methods.

Explain the use and interpretation of finite element results for steel structures design.

Correctly interpret and understand the use of design guideline formulas for calculation of design strength and design load.

3.5 Design guidance documents, codes and standards/Konstruktions-standards och riktlinjer, 4 tim

Objective:

The student will become familiar with the appropriate use of design guidance documents in the design of fabricated structures.

Scope:

Dimensioning

Partial safety factors

Design load

Design strength

Limit state design / allowable stress design

As appropriate, a suitable design guidance document, e.g., EN 1993 Eurocode 3-part 6: Design of Steel Structures: Crane supporting structures, EN 1993 Eurocode 3-part 2: Design of Steel Structures: Steel bridges, EN 13445: Unfired pressure vessels, etc., may be used.

Expected result at comprehensive and standard levels:

Understand the procedures recommended in one design guidance document for fabricated structures.

Compute design strength of a simple structural component using procedures outlined in one design guidance document.

Compute the needed design load for a structure considering both static and changing loads.

Identify from the design guidance document other related codes and standards related to materials, manufacturing, and calculation methods, etc.

Explain the basic features of the design guidance document being used.

Explain possible sources of exceptional / accidental loads on the structure being considered.

Understand the relationship between design strength and design load for a structure and failure probability.