Steel Structures for Buildings

Code: MK3TAR5S6SS17-EN

ECTS Credit Points: 6 credits

Evaluation: exam

Year, Semester: 3rd year, 6th semester

Its prerequisite(s): Steel structures

Further courses are built on it: No

Number of teaching hours/week (lecture + practice): 4+2

Topics:

Design of trusses. Design of frames. Design of bracing systems. Moment resistance of beam-to-column joints. Stiffness of beam-to-column joints. Moment resistance and stiffness of base connections. Second order effects on frame structures. Fire design. Design of second order structural elements. Composite structures. Design of special steel structures.

Literature:

Compulsory:

- EN 1993-1-1: 2009 Design of steel structures Part 1-1: General rules and rules for buildings
- EN 1993-1-8: 2005 Design of steel structures Part 1-8: Design of joints
- EN 1993-1-2: 2005 Design of steel structures – Part 1-2: General rules- Structural fire design

Recommended:

- Claudio Bernuzzi, Benedetto Cordova, Structural Steel Design to Eurocode 3 and AISC Specifications, Wiley Blackwell, 2016, ISBN 978-1-118-63128-7
- Jean-Pierre Jaspart, Klaus Weynand, Design of joints in Steel and Compoite Structures, Ernst&Sohn, 2016, ISBN 978-3-433-02985-5

Schedule

1st week Registration week

2nd week:

Lecture: Trusses. Design rules for trusses. Trusses used in frame structures. Bracing system for trusses. Buckling lengths in trusses. Resistance of the rods of the truss.

Practice: Introduction of the truss design task.

3rd week:

Lecture: Welded connections of chord and braces. Failure modes. Gap-, and overlap type connections, T connections.

Practice: Connections in truss.

4th week:

Lecture: Design of welded connections under complex loading.

Practice: Design of welded connection between chord and braces. Design of welded connection between column and base plate.

5th week:

Lecture: Beam-to-column connections. Component method. Failure modes of the "T" element. Column flange under bending. Bolt failure. End plate under bending.

Practice: Beam-to-column connection design.

6th week:

Lecture: Component method. Column web under tension. Column web under compression. Column web under shear. Beam web under tension. Beam flange under compression. Defining the moment resistance. Stiffness of the connection.

7th week:

Lecture: Design of base joint with the component method. Defining the moment resistance and the stiffness.

Practice: Base joint design.

Practice: Beam-to-column connection design.	
8th week: 1st drawing week: Deadline for truss design task	
9th week: **Lecture:** Frames. Structural elements with variable cross-sections in frames. Cross-sections under complex loading. Structural elements under complex loading. Defining buckling lengths and support stiffness for stability checks. **Practice:** Introduction of the frame design task.	**10th week:** **Lecture:** Second order effects. Imperfections. The effect of the stiffness of the connections on the moment distribution. Design of the bracing system. **Practice:** Second order effects on a frame.
11th week: **Lecture:** Fire design of Steel Structures. Design of class4 structural elements. Design of second order structural elements. **Practice:** Frame under fire. Second order structural elements.	**12th week:** **Lecture:** Composite structures. Design of composite beam and column. **Practice:** Design of composite beam and column.
13th week: **Lecture:** Design of special steel structures **Practice:** Test. Consultation.	**14th week:** **Lecture:** Study tour - Implementation of a steel structure **Practice:** Study tour - Implementation of a steel structure
15th week: 2nd drawing week: Deadline for frame design task	

Requirements

Participation at **lectures and practice classes** is **compulsory**. Students must attend lectures and practices may not miss more than three lectures during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. The attendance will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring calculator and the printed materials of the lectures with them to each lecture and practice. Active participation is evaluated by the teacher in every class. Students active' participation is required.

Students have to **submit the test and the design tasks** as scheduled minimum at a sufficient level.

A, for a signature:

A student has to reach at least 25 points from the 50 points on the test.

A student has to get at least 10 points from the 20 points on the truss design task.

Frame calculation has to be handed in.

B, for a grade:

The course ends with exam grade. The exam consists of a test and an oral part about the frame design task.

A student has to get at least 5 points from the 10 points on the test part of the exam.

A student has to get at least 10 points from the 20 points on the truss design task.

Based on the summa points of tests and design tasks, the exam grade is defined in the following way:

Test:	Maximum:	**50 points**	Minimum:	**25 points**
Homework tasks:				
Homework 1:	Maximum:	**20 points**	Minimum:	**10 points**
Homework 2:	Maximum:	**20 points**	Minimum:	**10 points**
Exam test:	Maximum:	**10 points**	Minimum:	**5 points**

Summa points:	Maximum:	100 points	61 points

Score	Grade	
0 – 60 points:	fail	(no sign)
61 – 70 points:	pass	(2)
71 – 80 points:	satisfactory	(3)
81 – 90 points:	good	(4)
91 –100 points:	excellent	(5)