Steel Structures

Code: MK3TAR2S6SX17-EN

ECTS Credit Points: 5 credits

Evaluation: mid-semester grade

Year, Semester: 3rd year, 5th semester

Its prerequisite(s): Construction Materials, Theory of Design & Approximate Calculations

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 4+0

Topics:

Steel usage in structural building. Fabrication and installation of steel structures. Failure forms of steel structures. Tensile, compressive, shear and combined resistance of the cross-sections. Stability of structural elements. Design of bars under compression. Design of structural elements under bending. Lateral torsional buckling. Bolted joints of steel structures. Welded joints of 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

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:** Introduction. Steel as structural material. Method of choosing the right steel grade. Frequently used cross –section in steel structures. Fabrication and installation of steel structures. Repetition: Calculation of cross-sectional properties and stress distributions.	**3rd week:** **Lecture:** Study tour: Steel structure manufacturing plant + steel structures
4th week: **Lecture:** Interpretation of cross-sectional classes. Methods of determining effects and resistances depending on the cross-sectional classes. Classification of cross-sections with simple-, or complex loading. Determination of effective cross-sectional area for class4 structural elements.	**5th week:** **Lecture:** Structural elements under tension and compression. Cross-sectional resistance. Buckling resistance.
6th week: **Lecture:** Structural elements under bending. Cross-sectional resistance. Lateral torsional buckling resistance (normal and simplified method).	**7th week:** **Lecture:** Structural elements under shear. Shear stresses in thin-walled sections. Shear center. Shear resistance of the cross-section. Shear buckling. Torsion.
8th week: 1st drawing week	

9th week: **Lecture:** Cross-sections under complex loading. Structural elements under complex loading. (simple cases)	10th week: **Lecture:** Failure modes of steel structures. Service limit state. Design task (part 1): clarification of the structure, determination of internal forces.
11th week: **Lecture:** Design task (part 2): design of the structural elements. (Cross-sectional checks, stability checks, checking of SLS.)	12th week: **Lecture:** Simple bolted joints. Design task (part 3): design of bolted joints.
13th week: **Lecture:** Simple welded joints. Design task (part 4): design of welded joints.	14th week: **Lecture:** Test. Consultation.
15th week: 2nd drawing week	

Requirements

Participation at **lectures** is **compulsory**. Students must attend lectures and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures 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. Active participation is evaluated by the teacher in every class. Students' active participation is required. Students have to **submit the test and the design task** as scheduled minimum at a sufficient level.

A, for a signature:

Student has to reach at least 30 points from the 60 points on the test.

B, for a grade:

Beyond the above a student has to get at least 20 points from the 40 points on the design task. The design task has to be handed in personally. One will get questions about the design task.

The course ends with a mid-semester grade. Based on the summa points of the test and the design task, the mid-semester grade is defined in the following way:

Test:	Maximum:	**60 points**	Minimum:	**30 points**
Homework:	Maximum:	**40 points**	Minimum:	**20 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)