SYLLABUS

Course title: Steel Structures

Course title (in Polish): Konstrukcje stalowe

The syllabus is valid since the summer semester of the academic year 2025/26 and its content is not subject to changes during the semester.

Course details:

Unit offering the course: Faculty of Civil Engineering

Course designated for the unit: The Silesian University of Technology

Specialization: Structural Engineering

Didactic cycle: Summer semester 2025/2026 - the third year of first degree studies

Coordinator of the course: Grzegorz Gremza

Delivery mode: in-person/hybrid

Number of ECTS credits: 3

Language:
English
Course homepage:
https://platforma.polsl.pl/rb/course/view.php?id=380
Prerequisites:
Basic knowledge within the scope statics of beams and frames, technical drawing, sizing of steel structure members cross-sections.
Short description:
The aim of the course is to provide students with the knowledge and skills necessary in the design of steel structures. The technical content course complements and extends the range of knowledge and skills transferred within the Steel Structures course in the group of common subjects. The classes are the third semester (course) of classes, in the first-cycle studies in the field of construction, concerning steel structures. The issues of industrial halls and their elements design as well as frame systems with nodes and joints are discussed.
Description:
LECTURES: 15 hours 1) Design and shaping of multi-bay single-storey industrial buildings with supported and suspended transport. 2) Sawtooth buildings (buildings with sawtooth roofs, sawtooth roof halls) 3) Construction of two-stepped columns made of single and built-up members. 4) Anchoring of columns. Calculation of column bases in eccentric compression. Rotational stiffness of the column base to the foundation connection. 5) The head of the lower segment of the two-stepped column, the support of the crane (runway) beam. 6) The head of the upper segment of the column, the support of the lattice joist. Column shafts field connections. 7) Claddings of steel buildings, solutions and construction details. Cooperation of the cladding with the steel framework.

8) Frames, full-wall and lattice structures, single-bay and multi-bay structures. Static diagrams. Frame corners - calculation model of a strongly curved bar. Shaping the structure of frame corners - recommendations. Examples of welded constructions of frame corners (brackets).
9) Selected issues on bolted field joints.
10) Basic information about steel single-storey and multi-storey plane frames analysis.

CLASSES: 3 hours
Introduction to the design exercise (project).

PROJECT: 12 hours
Continuation of the design for the single-storey industrial building. Design for steel columns and wall braces – calculations and technical drawing.

Bibliography:

[1] Handbook of Structural Steelwork. Eurocode Edition. BCSA Publication No. 55/13.
[2] ECCS: Design of Joints in Steel Structures, Ernst & Son, 2017.
[3] M.E. Brettle, D.G. Brown: Steel Building Design: Concise Eurocodes In accordance with Eurocodes and the UK National Annexes. Steel Construction Institute SCI P362.
[3] Koschmidder D.M., Brown D.G.: Elastic design of single-span steel portal frame buildings to Eurocode 3. SCI Publication P397. Steel Construction Institute, 2012.
[4] Steel designers' manual, 7th edition. Buick Davison & Graham. W. Owens, eds. Wiley-Blackwell/Steel Construction Institute 2012. <note: the first scheme in the figure 4.8 needs lateral restraint; some of truss joints in the figure 4.17 are disputable for polish designers>
[5] Joints in steel constructions. Moment-resisting joints to Eurocode 3. SCI Publication P398 (so called "green book"), SCI/BCSA, 2013 <accessible in pdf format via SteelConstruction.info/The Green Books>
[6] publications available at https://constructalia.arcelormittal.com/en/news_center/articles/design_guides_steel_buildings_in_europe
Standards:
[7] EN 1993-1-1 Eurocode 3: Design of steel structures. Part 1-1: General rules and rules for buildings.
[8] EN 1993-1-8 Eurocode 3: Design of Steel Structures. Part 1-8: Design of Joints.
Software:
Any computer program enabling static analyses of frames.

Learning outcomes:

KNOWLEDGE:
(1) Student knows the principles of calculation and construction of steel structural elements of roof trusses, hot-rolled purlins and built-up columns, as well as the formation of the structural system of a typical single-storey industrial building [outcome K1A_W05].
(2) Student knows the standards and design guidelines for steel bar structures, including the basics of global analysis [outcome K1A_W06].

SKILLS:
(1) Student is able to perform a statement of loads acting on a typical single-storey industrial building and define appropriate load combinations [outcome K1A_U02].
(2) Student is able to design the structural elements of a steel roof with trusses [outcome K1A_U04].

Assessment methods and assessment criteria:

CONDITIONS FOR PASSING THE COURSE:
1) Lecture:
Test in the form of practical tasks or theoretical tasks in the form of short open questions (in case of doubts conversation is possible). It is required to pass each task.

2) Project:
Satisfactory completion and defense of the project; as a defense is considered an oral answer at the reception or a positive evaluation on the basis of discussions held during the project consultation. The project instructor may refuse to give credit in case of lack of regular, active participation in classes during the semester.

FINAL GRADE:
60% (lecture) + 40% (project)

In order to transfer partial grades, the student should contact the instructor within the first two weeks of the semester.

ECTS points: 3