COURSE DESCRIPTION CARD - SYLLABUS

Course name
Metal structures [S2Bud1-IPB>KM]

Course

Field of study
Civil Engineering

Year/Semester
1/1

Area of study (specialization)
Construction Engineering and Management

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
30

Number of credit points

3,00

Coordinators

dr hab. inż. Robert Studziński prof. PP
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Lecturers

Prerequisites

Knowledge: student has knowledge of structural mechanics and strength of materials in the area of structural engineering. Knows the basic design method of industrial halls. Presents the design issues of spatial steel truss structures. Skills: student uses the design standards for structural analysis and dimensioning of steel structural elements and joints. Social competencies: student understand the need for lifelong learning and knows how to interact and work in a group, taking the different roles.

Course objective

Gaining of knowledge and skills in the field of design (construction and dimensioning) of roof structure elements (lattice trusses, purlins, bracings), simple steel hall structures. Understanding the basic principles of designing cold-formed thin-walled steel structures and modern steel structures cooperating with the building envelope.

Course-related learning outcomes

Knowledge:
appropriate for the studied specialization in the field of steel roof structures. Knowledge of selected computer programs supporting the calculation and design of steel structures. Has knowledge of

modeling and designing thin-walled steel structures, including cooperation with the building envelope.

Skills:
list any loads acting on building structures. Is able to design elements and connections in complex construction objects appropriate for the studied specialization in the field of steel roof structures. Can dimension complex construction details in selected building units. Can correctly define computational models for computer structure analysis. Uses specialized tools to find useful information. He can read construction drawings and can develop a project and prepare technical documentation in a CAD environment.

Social competences:
Social competencies: Understand the need for lifelong learning; able to inspire and organize the learning process of others. Able to interact and work in a group, taking the different roles. Correctly identifies and resolves dilemmas associated to his profession.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Evaluation of:
Lectures - test in the . (1 per semester - 1.5 hours)
Project - individual student projects combined with an oral defense of the thesis, based on: - substantive assessment of the project documentation made, - regularity of work (entries in the consultation card and attendance at the classes), - project defense (written or oral form). assessment of individual student projects combined with oral defense of work
Credit above 50%.

Programme content

Form of teaching: Lecture
Basic information of a steel roof structure on the example of a hall. Cladding system selection and purlin design. Basics of designing bar girders - trusses (assumptions, selection of the geometry of the truss, collection of loads, numerical modeling and calculation of internal forces, rules for selecting the cross-section of bars, shaping nodes and assembly connections). The function and types of bracings in the roof structure. Shaping the geometry of bracings and dimensioning. The structure of the hall building, components. Selection of the static scheme of the transverse and longitudinal structure of the hall. Hall building loads (including supported transport loads). Dimensioning of hall components (girders, columns, bracings, anchors and connections, in short and encyclopedic terms, crane beams). Information on the principles and recommendations of construction regarding static schemes of purlins (overlaps or inserts), shaping the top and ridge nodes. Design solutions of bracings and anti sag bars. Types and classification of nodes. Types of mechanical fasteners. Welded and glued connections. Failure mechanisms and procedures for determining the load capacity of connections and their vulnerability. Design solutions and recommendations. Manufacturing technology and corrosion protection of thin-walled structures. Overview of the manufacturing process, material and equipment requirements. Types of anti-corrosion protection: materials, technology. Principles of shaping thin-walled structures increasing their corrosion resistance.
Design exercises: design of a steel roof structure with cold-formed purlins cooperating with the sheathing.

Course topics

Form of teaching: Lecture
Basic information of a steel roof structure on the example of a hall. Cladding system selection and purlin design. Basics of designing bar girders - trusses (assumptions, selection of the geometry of the truss, collection of loads, numerical modeling and calculation of internal forces, rules for selecting the cross-section of bars, shaping nodes and assembly connections). The function and types of bracings in the roof structure. Shaping the geometry of bracings and dimensioning. The structure of the hall building, components. Selection of the static scheme of the transverse and longitudinal structure of the hall. Hall building loads (including supported transport loads). Dimensioning of hall components (girders, columns, bracings, anchors and connections, in short and encyclopedic terms, crane beams).

Information on the principles and recommendations of construction regarding static schemes of purlins (overlaps or inserts), shaping the top and ridge nodes. Design solutions of bracings and anti sag bars. Types and classification of nodes. Types of mechanical fasteners. Welded and glued connections. Failure mechanisms and procedures for determining the load capacity of connections and their vulnerability. Design solutions and recommendations. Manufacturing technology and corrosion protection of thin-walled structures. Overview of the manufacturing process, material and equipment requirements. Types of anti-corrosion protection: materials, technology. Principles of shaping thin-walled structures increasing their corrosion resistance.
Design exercises: design of a steel roof structure with cold-formed purlins cooperating with the sheathing.

Teaching methods

Teaching methods Monographic lecture with a multimedia presentation with elements of a problem-solving lecture.
Auditorium exercises based on the method of demonstration and instruction? presentation and discussion of a computational example partly with the practical participation of students. Credit on the basis of systematic participation in classes and a positive assessment of the test.
Design exercises - practical implementation of an engineering task. Preliminary discussion of the task, gradual preparation of calculations and drawing documentation by students, consulting and approval of work stages, explaining recurring doubts by the tutor to all students. The basis for passing the exam is a systematically (confirmed entries from the consultations) correctly made project and its defense (oral or written form). 1 Introduction to the design of thin-walled steel structures.
Monographic lecture with a multimedia presentation with elements of a problem-solving lecture.
Design exercises - practical implementation of an engineering task. Initial discussion of the task, gradual preparation of calculations and drawing documentation by students, consultation and approval of work stages, clarification of recurring doubts by the tutor to all students. The basis for the credit is a systematically (confirmed entries from the consultations) correctly made project and its defense (oral or written form).

Bibliography

Basic
1. Z. Kurzawa, K. Rzeszut, M. Szumigała, Stalowe Konstrukcje Prętowe cz III wyd. PP 2015.
2. Biegus Antoni: „Stalowe budynki halowe”; Wydawnictwo ARKADY Sp. z o.o., Warszawa 2008.
3. Kozłowski Aleksander, Konstrukcje stalowe. Przykłady obliczeń według PN-EN 1993-1. Część 3. Hale i wiaty, Wydawnictwo: Politechnika Rzeszowska.
Additional
1. Łubiński, Filipowicz.: Konstrukcje metalowe cz.1 i 2, Żółtowski, Arkady, Warszawa, 2000.

Breakdown of average student's workload

	Hours	ECTS
Total workload	85	3,00
Classes requiring direct contact with the teacher	60	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00