



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Metal Structures

### Course

Field of study

Year/Semester

Civil engineering

1/1

Area of study (specialization)

Profile of study

Structural Engineering

general academic

Level of study

Course offered in

Second-cycle studies

english

Form of study

Requirements

full-time

compulsory

### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

30

0

0

Tutorials

Projects/seminars

0

30

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

Responsible for the course/lecturer:

dr inż. Robert Studziński

email. robert.studzinski@put.poznan.pl

tel. 0-61 665 2091

Wydział Inżynierii Lądowej i Transportu

ul. Piotrowo 5, 60-965 Poznań

### Prerequisites

Has knowledge of structural mechanics and strength of materials in the Civil Engineering field of science. Knows the methods of designing metal structures according to Eurocodes subjected to compression, tension and bending. Is able to verify the capacity of the cross-section subjected to various internal forces. Knows the design method of the welded and bolted connections (Eurocode rules). Knows the principles of designing trusses and roof bracings.

Uses basic formulas in the field of structural mechanics and strength of materials. Is able to adopt appropriate construction and technological solutions in the field of corrosion and fire protection. Is able to propose a construction solution using an appropriate calculation procedure, uses building standards



(Eurocodes) for loads acting on building structures, as well as for static calculations and dimensioning of steel structure elements.

Understands the need for lifelong learning and is able to interact and work in a group, taking on different roles in it. Is aware of the responsibility of the profession he is learning.

### Course objective

Acquiring knowledge and skills in the construction and dimensioning of: frame systems, bracings, eccentrically compressed columns, frame joints, trusses, skeletal buildings, and spatial trusses. Acquiring knowledge of types of global analysis. Understanding the essence of second order analysis and imperfections in steel structure design.

### Course-related learning outcomes

#### Knowledge

1. Know in detail the principles of analysing, constructing and dimensioning elements and connections in selected building structures
2. Have extended and detailed knowledge of material strength, modelling and constructing; have knowledge of using finite element method as well as non-linear calculations of engineering structures
3. Have advanced and detailed knowledge of the theoretical principles of structure analysis and optimization as well as design of selected building units

#### Skills

1. Can prepare an evaluation and statement of strengths influencing both simple and complex building units
2. Can design elements and connections in complex building units, working both individually and in a team
3. Are able to correctly define a computational model and carry out an advanced linear analysis of complex building units, their elements and connections; are able to apply basic nonlinear computational techniques together with a critical evaluation of numerical analysis results
4. Utilizing the obtained knowledge, they can select appropriate (analytical, numerical, simulation, experimental) methods and tools to solve technical problems .

#### Social competences

1. Take responsibility for the reliability of working results and their interpretation
2. Can realise that it is necessary to improve professional and personal competence; are ready to critically evaluate the knowledge and received content

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Completing the lecture - colloquium in the last class. Design exercises - the project and its oral defense.



Grading scale:

5.0 - the student has obtained over 90% of points from the test or project defense,

4,5 - the student obtained from 80% to 90% of points from the test or project defense,

4.0 - student obtained from 70% to 80% of points from the test or project defense,

3.5 - the student has obtained from 60% to 70% of points from the test or project defense,

3.0 - the student has obtained from 50% to 60% of points from the test or project defense,

2.0 - the student has obtained less than 50% of the points from the test or project defense

### Programme content

Lecture

Methods for constructing and dimensioning frame systems (static diagrams, loads, dimensioning of eccentrically compressed columns and frame transoms, connection details). Principles of construction and dimensioning of concentrations in hall buildings. Types of global analyzes in the dimensioning of steel structures. Imperfections. Basic information on the design of spatial steel structures.

Teaching method:

lecture: information lecture, problem lecture, demonstration

Project

Implementation of the portal hall design. 3D static analysis of the hall. Collecting surface loads. Dimensioning of hall elements. Designing connections. Preparation of drawing documentation.

Teaching method:

- projects: design and demonstration method

### Teaching methods

Form of classes: Lectures - problem lecture / seminar lecture / lecture with multimedia presentation.

Test.

Form of classes: projects - oral defense of the project. Steel hall design.

### Bibliography

Basic

1. Design of Steel Structures, Luís Simões da Silva, Rui António Duarte Simões, Helena Gervasio, Publisher: ECCS Press and Ernst&Sohn, ISBN: 978-3-433-02973-2



2. Structural Stability of Steel: Concepts and Applications for Structural Engineers, Theodore V. Galambos, Andrea E. Surovek, John Wiley & Sons, 2008

3. Design of Steel Structures to Eurocodes, Vayas Ioannis, Ermopoulos John, Ioannidis George, ISBN 978-3-319-95474-5, DOI 10.1007/978-3-319-95474-5, Publisher: Springer International Publishing

4. Structural Design of Steelwork to EN 1993 and EN 1994, Lawrence Martin, Elsevier, 2007

#### Additional

1. EN-1993-1-1 / EN-1993-1-3 / EN-1993-1-5 / EN-1993-1-8

3. EN-1990

4. EN-1991-1-1 / EN-1991-1-3 / EN-1991-1-4

#### Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	40	1,5

<sup>1</sup> delete or add other activities as appropriate