COURSE DESCRIPTION CARD - SYLLABUS

Course name
Composite structures [S2Bud1-KB>KZ]

Course

Field of study
Civil Engineering

Year/Semester
1/1

Area of study (specialization)
Structural Engineering

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
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of the strength of materials and structural mechanics, metal and reinforced concrete structures. The ability to obtain information from the indicated sources, e.g., standards. Ability to design a typical steel and reinforced concrete structure. Awareness of the need to expand professional competences and take serious responsibility in designing.

Course objective

Acquiring skills in constructing and designing modern steel and concrete composite structures.

Course-related learning outcomes

Knowledge:
KB_W02 have advanced knowledge of the principles of descriptive geometry and technical drawing, recording and reading architectural drawings, P6S_WG (I)
KB_W04 have detailed knowledge of theoretical mechanics, knowledge of materials' strength and general rules of structure design; know the theories explaining complex relations of structures. P6S_WG (O/I)
KB_W07 knows detailed rules of constructing and dimensioning composite elements P6S_WG (I)

Skills:
KB_U01 are able to gather information from literature, databases and other properly selected information sources; can synthesize the obtained information, interpret and evaluate it, P6S_UW (O/I)
KB_U02 are able to use advanced information and communication technologies (ICT) appropriate to perform typical engineering tasks. P6S_UW (O/I)
KB_U03 when formulating and solving problems related to building engineering, they can notice their systemic and non-technical aspects, including ethical aspects. P6S_UW (I)
KB_U05 can classify buildings building structures. P6S_UW (O/I)
KB_U07 are able to correctly utilise numerical, analytical, simulation and experimental methods, in order to identify and solve problems in the field of building engineering. P6S_UW (I)
KKB_U10 are able to design selected elements and simple composite elements

Social competences:
KB_K01 are able to adapt to new and changing circumstances, can define priorities for performing tasks assigned by themselves and by other people, acting in the public interest and with regard to the purposes of sustainable development P6S_KK (O)
KB_K03 are ready to autonomously complete and broaden knowledge in the field of modern processes and technologies of building engineering. P6S_KR (O)
KB_K04 understand the need of team work, are responsible for the safety of their own work and team's work. P6S_KR (O)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - written test.
Credit of projects on the basis of:
- substantive evaluation of the prepared design documentation,
- regular work (design consultation and attendance at classes),
- project defense (written form)
Grading scale:
between 91 - 100% points - very good (A)
between 81 - 90% points - good plus (B)
between 71 - 80% points - good (C)
between 61 - 70% points - sufficient plus (D)
between 51 - 60% points - sufficient (E)
below 50% points - insufficient (F)

Programme content

Lecture:
At the lecture of Composite Structures the following are presented:
- general rules of composite structures designing (limit states, calculation schemes, failure modes),
- design methods of composite slabs, steel-concrete composite beams, bending and shear load-bearing capacity, load-bearing capacity of connectors, stiffness,
- design methods of composite columns.
Project:
Design of the steel-concrete composite ceiling with a composite slab and beams

Course topics

The lecture programme comprises the following topics:
1. Introduction to composite structures
2. Composite slabs
2.1. Composite slabs with profiled steel sheeting
2.2. Verification of profiled steel sheeting
2.3. Ultimate limit states of composite slabs
3. Composite beams
3.1. Resistances of cross-sections of steel-concrete composite beams
3.2. Shear connection

3.3. Deflections
4. Composite columns

The projects programme comprises the following topics:
Design of the steel-concrete composite ceiling with a composite slab and beams:
1. Composite slab
2. Composite beam
3. Steel-concrete composite girder

Teaching methods

Monographic lecture with a multimedia presentation with elements of a problem-solving lecture. The knowledge acquired during the lectures will be verified in a final written test.
Projects: practical solution of an engineering task (introductory discussion of the task, preparation of calculations by students, consulting and approval of work stages, clarification of doubts by the teacher). The knowledge acquired during the project classes will be verified through completing a project and its defence (written form).

Bibliography

Basic
1. PN-EN 1994-1-1 (2008) Eurokod 4, Projektowanie zespolonych konstrukcji stalowo-betonowych, Część 1-1: Reguły ogólne i reguły dla budynków.
2. Szmigiera E., Niedośpiał M., Grzeszykowski B. (2019), Projektowanie konstrukcji zespolonych stalowo-betonowych. Część 1: Elementy zginane, Warszawa, Wydawnictwo Naukowe PWN.
3. Kucharczuk W., Labocha S. (2008), Konstrukcje zespolone stalowo-betonowe, Warszawa, Wydawnictwo Arkady.
4. Kurzawa Z., Rzeszut K., Szumigała M. (2017), Stalowe konstrukcje prętowe. Cz. 3, Konstrukcje z łukami, elementy cienkościenne, pokrycia membranowe, elementy zespolone, dachy pierścieniowe i belki podsuwnicowe, Poznań, Wydawnictwo Politechniki Poznańskiej.

Additional
5. Giżejewski M. (2010), Budownictwo ogólne, Tom 5, Stalowe konstrukcje budynków, projektowanie według eurokodów z przykładami obliczeń, Warszawa, Arkady.
6. PN-EN 1990 (2004), Eurokod 0, Podstawy projektowania konstrukcji. Polski Komitet Normalizacyjny.
7. PN-EN 1991-1-1 (2004), Eurokod 1, Oddziaływanie na konstrukcje, Część 1-1: Oddziaływanie ogólne – Ciężar objętościowy, ciężar własny, obciążenie użytkowe w budynkach. Polski Komitet Normalizacyjny.
8. PN-EN 1993-1-1 (2006) Eurokod 3, Projektowanie konstrukcji stalowych, Część 1-1: Reguły ogólne i reguły dla budynków, Polski Komitet Normalizacyjny
9. PN-EN 1992-1-1 (2008) Eurokod 2, Projektowanie konstrukcji z betonu, Część 1-1: Reguły ogólne i reguły dla budynków.
10. Johnson R.P. (2012) Designers' Guide to Eurocode 4: Design of Composite Steel and Concrete Structures EN 1994-1-1, London, ICE Publishing.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00