COURSE DESCRIPTION CARD - SYLLABUS

Course name
Elective I: Composite Structures

Course

Field of study
Civil Engineering
Year/Semester
2/3
Area of study (specialization)
Structural Engineering
Profile of study
general academic
Level of study
Second-cycle studies
Course offered in
English
Form of study
full-time
Requirements
elective

Number of hours

Lecture
15
Laboratory classes
0
Other (e.g. online)
0
Tutorials
0
Projects/seminars
15

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:
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Prerequisites

Knowledge, skills and competences acquired during the education process in the field of structural design.
The ability to formulate and solve technical problems in the field of civil engineering.

Course objective

To acquaint students with the current problems of designing and implementing the composite structures.

Course-related learning outcomes

Knowledge

1. The student has knowledge of detailed and advanced issues of material strength, modelling of

materials and structures; have knowledge of the theoretical basis of the Finite Element Method as well as general principles of nonlinear analysis of engineering structures.
2. The student knows in detail the rules of design, construction and operation of selected building units.

Skills

1. The student is able to correctly define a computational model and carry out an advanced linear analysis of complex building units, their elements and connections; is able to apply basic nonlinear computational techniques together with a critical evaluation of numerical analysis results.
2. The student can dimension complex construction details in selected building objects.

Social competences

1. The student is ready to autonomously complete and broaden (extend) knowledge in the field of modern processes and technologies of building engineering.
2. The student can realise that it is necessary to improve professional and personal competence; is 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:

Assessment of the lectures: written test including 3-5 tasks checking the subject learning outcomes, the condition for passing is obtaining a minimum satisfactory mark.
Assessment of projects: Students are assessed on an ongoing basis according to the progress of work in modeling the structure and calculating tasks. The assessment concerns each of the given problems; the condition for passing is obtaining a minimum satisfactory mark.

Programme content

Lectures:
1. Introduction to composite structures.
2. Composite structures material properties.
3. Basis of design
4. Shear connections.
5. Composite slabs.
6. Composite beams.
7. Fire resistance of composite structures.

Projects:
1. Designing of a composite floor.

Teaching methods

Lectures: informative and problem lecture, case study method
Projects: project method, solving project tasks given by the teacher

Bibliography

Basic

1. EN 1990: Eurokod 0 - Basis of structural design
2. EN 1991: Eurokod 1 - Actions on structures
3. EN 1994: Eurokod 2 - Design of composite structures
5. Roger P. Johnson, Designers' Guide to Eurocode 4: Design of Composite Steel and Concrete Structures: EN 1994-1-1. ICE Publishing, 2012.
6. Roger P. Johnson, Composite Structures of Steel and Concrete: Beams, Slabs, Columns and Frames for Buildings, Wiley-Blackwell, 2018.

Additional

1. Łukasz Polus, Maciej Szumigała, An experimental and numerical study of aluminium-concrete joints and composite beams. Archives of Civil and Mechanical Engineering 19(2), p. 375-390, 2019.
2. Marcin Chybiński, Łukasz Polus, Theoretical, experimental and numerical study of aluminium-timber composite beams with screwed connections, Construction and Building Materials 226, p. 317-330, 2019.
3. Maciej Szumigała, Ewa Szumigała, Łukasz Polus, Laboratory tests of new connectors for timber-concrete composite structures, Engineering Transactions 66(2), p. 161-173, 2018.
4. Marcin Chybiński, Łukasz Polus, Wojciech Szwabiński, Patryk Niewiem, FE analysis of steel-timber composite beams, in: Paweł Baranowski, Piotr Kędzierski, Anna Szurgott (eds.), Computational Technologies in Engineering (TKI'2018), AIP Publishing, p. 020061-1-020061-6, 2019.
5. Marcin Chybiński, Łukasz Polus, Bending resistance of metal-concrete composite beams in a natural fire. Civil and Environmental Engineering Reports 28(4), p. 149-162, 2018.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate