COURSE DESCRIPTION CARD - SYLLABUS

Course name
Structural fire engineering [S2Bud1-KB>IPKB]

Course

Field of study
Civil Engineering

Year/Semester
1/2

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
15

Other
0

Tutorials
30

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Student should have a knowledge of mathematics and physics, particurally he/she should be able to use calculus to solve engineering problems and have a knowledge of stuctural engineering, strength of materials and basics of the theory of elasticity and plasticity. Student should also be able to analize engineering problems using critical thinking, and he/she shuld be able to elaborate his/her analyses in the form of enginnering report. Student should be able to critical research information from given and new sources.

Course objective

The course objective is to deliver the knowledge of material and structural behaviour in fire and modelling of recognized in fire phiscal processes taking into accout reciprocal dependences between them.

Course-related learning outcomes

none

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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The knowledge recievied during the course is verified at the end of the semester based on two tests: theoretical test and calculation test. The theoretical test consists of 10-20 questions, which can differ between each other in scope and scoring. The calculation test consists of 5-10 questions, which also can differ between each other in scope and scoring.
The lectures grade is an averaged grade from theoretical and calculation tests.
The turtorials grade is the grade from calculation test.
The skills recievied during laboratories are verified based on evaluation of reports elaborated by individual students. The reports describe effects of students" work on the problems given to them during the classes.
To pass the course, each student have to recieve minimum 50% points from each type of class.

Programme content

All following topics constitute programme content of each individual type of classes: lectures, tutorials and laboratories.
1. Physical processes observed in civil engineering structures during fire. Qualitative and quantitative measures.
2. Material behaviour at elevated temperature. Physical and mechanical properties.
3. Structure behaviour in fire.
4. Fire models, heat transfer models, material models, structural models.
5. Classical and advanced design approaches for structures in fire.

Course topics

The lecture program includes:
1. Discussion of fire characteristics and fire modeling methods.
2. Discussion of the properties of construction materials at high temperatures.
3. Discussion of the behavior of building structures in fire.
4. Introduction to classical and advanced methods of structural design in fire.

The exercise program includes:
2. Theoretical tasks aimed at familiarizing the student with the nonlinearities that occur in structures during a fire.
3. Practical tasks aimed at familiarizing the student with practical methods of designing and analyzing structures in a fire.

The laboratory program includes numerical modeling of materials and structural elements, in particular: steel and steel beams, concrete and concrete columns.

Teaching methods

1. Lectures: informative lectures, problem-oriented lectures, conversations; use of presentations and blackboards.
2. Turtorials: direct instructions - teacher convey knowledge to students primarily through scripted lesson plans; use of presentations and blackboards.
3. Laboratories: teacher first guides students showing the task, then offers support and guidance as students work on projects. Classes require computers with specialized software installed.

Bibliography

Basic
1. Eurocodes: EN 1990, EN 1991-1-1, EN 1991-1-2, EN 1992-1-1, EN 1992-1-2, EN 1993-1-1, EN 1993-1-2, EN 1994-1-1, EN 1994-1-2.
2. Franssen, J-M, Vila Real, P. (2013) Fire Design of Steel Structures.
3. Hertz, K. (2019) Design of Fire-resistant Concrete Structures.
4. Maślak, M. (2008) Trwałość pożarowa stalowych konstrukcji prętowych.
5. Kowalski, R. (2019) Konstrukcje żelbetowe w warunkach pożarowych.
6. Anderberg et al. (2004) Background documents to EN 1992-1-2.
Additional
7. Purkiss, J. A., Li, L-y (2017) Fire Safety Engineering Design of Structures.
8. FIB 38 (2007) Fire design of concrete structures - materials, structures and modelling.

9. Wang, Y., Burgess, I., Wald, F., Gillie, M. (2012) Performance-Based Fire Engineering of Structures.

Breakdown of average student's workload

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