COURSE DESCRIPTION CARD - SYLLABUS

Course name
Structural Fire Engineering

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 studies

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

4

Lecturers

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

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

Knowledge

have extended and detailed knowledge of material strength, modelling and constructing; have knowledge of theoretical principles of the finite element method as well as general rules of non-linear calculations of engineering structures.

know in detail the principles of analysing, constructing and dimensioning elements and connections in selected building structures.

have extended and detailed knowledge of mathematics, physics and chemistry, forming theoretical principles appropriate to formulate and solve tasks related to building engineering.

Skills

can prepare an evaluation and statement of strengths influencing both simple and complex building units.

an design elements and connections in complex building units, working both individually and in a team.

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.

utilizing the obtained knowledge, they can select appropriate (analytical, numerical, simulation, experimental) methods and tools to solve technical problems.

are able to obtain information from literature, databases and other properly selected information sources; can integrate the obtained information, interpret and evaluate it as well as draw conclusions, formulate, justify, discuss and present opinions.

Social competences

: take responsibility for the reliability of working results and their interpretation.

are ready to autonomously complete and broaden (extend) knowledge in the field of modern processes and technologies of building engineering.

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:

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.

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	120	4,0
Classes requiring direct contact with the teacher	60	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	60	2,0

[1] delete or add other activities as appropriate