COURSE DESCRIPTION CARD - SYLLABUS

Course name

Modelling of threats

Course

Field of study

Safety Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/6

Profile of study

general academic

Course offered in

Polisch

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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ul. Jacka Rychlewskiego 2, 60

Responsible for the course/lecturer:

Prerequisites

The student should know the basic types of threats in the natural environment and in the working

environment, learned during the classes on Monitoring of threats to safety and Organization and functioning of safety systems. Moreover, the student should be able to apply the knowledge gained in practical situations during laboratory classes.

Course objective

To acquire the ability to apply in practice risk modelling methods in the working and living environment in order to carry out preventive actions. To get acquainted with computer programs supporting the process of modeling natural hazards and in the work environment.

Course-related learning outcomes

Knowledge

1. the student has a structured, theoretically based knowledge of threats, their effects, risks and monitoring, identification and evaluation of criticality of events occurring in the work environment. - [P6S_WG_03]

2. knows the detailed relationships between the basic parameters characteristic of the tested hazards - [P6S_WG_03]

3. knows how to apply the methods learned to support decision-making - [P6S_WK_03]

4. is familiar with basic mathematical models describing the hazards caused by fire, explosion and flooding. - [P6S_WK_03]

5. is familiar with the basic simulation models for mapping the working environment, as well as allowing to deduce the phases of development of fires, floods and describing evacuation conditions - [P6S_WK_03]

Skills

1. can assess the magnitude of the hazard caused by fire, explosion and flood - [P6S_UW_04].

2. is able to select and apply appropriate mathematical models for risk assessment - [P6S_UW_04].

3. can determine the size of danger zones - [P6S_UO_01]

4. can determine the permissible duration of exposure - [P6S_UO_01]

5. is able to operate applications that allow modelling of evacuation conditions and determine the characteristics of evacuation - [P6S_UO_01]

Social competences

1. is able to use risk models to make decisions and solve design problems - [P6S_KK_01]

2. is aware of the importance of and understands the non-technical aspects and impacts of engineering activities, including their impact on the environment and the associated responsibility for decisions taken - [P6S_KK_03]

3. sees risks in the living and working environment in an interdisciplinary way - [P6S_KK_01]

4. is able to make wrong decisions, and is able to make a lack of competence within a known range - [P6S_KR_02].

5. can indicate the directions of development of competence in the field of simulation techniques and tools to support the design process - [P6S_KR_02].

6. is able to identify the risks associated with the organisation of mass events - [P6S_KK_02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
Formal evaluation:

a) for laboratory classes: on the basis of two written colloquia and reports;

b) for lectures: on the basis of a colloquium in the last lecture class.

Summary evaluation:

a) in laboratory classes: on the basis of the arithmetic mean of grades from two written colloquia, where 5 tasks have to be solved in each of them; these tasks are scored on a scale from 0 to 1; a positive grade is given to the Student after solving 50% of the tasks; the condition of passing is a positive grade in the reports from all laboratory classes.

b) in the scope of lectures: assessment of the credit colloquium on a scale from 2 to 5.

Programme content

Mathematical-physical threat models. Modelling of hazards in the working environment (AutoCAD-APOLINEX, CATIA-DELMIA, TECNOMATIX-JACK). Forecasting of hazards caused by climatic anomalies - droughts, hurricanes, heavy snowfalls. Flood hazard zones. Hydrological protection. Flood hazard modelling. Elements of fire theory. Balance equations describing a fire. Mass balance and energy balance in internal fires. Gas exchange in an internal fire. Stationary and non-stationary internal fire conditions. Non-linear phenomena in an internal fire. Fire models. Modelling of internal fires using Pyrosim application. Explosion theories. Technical failures. Modelling of mass and/or energy release. Prediction of biological, chemical and radiological hazards. Modelling of the spread of contamination and flammable or toxic clouds. Modelling of hazards in land, water and air transport. Modelling of evacuation conditions in buildings. Basic evacuation models and applications for their simulation (Pathfinder).

Teaching methods

Lecture supported by a multimedia presentation. During laboratory classes, students solve individually prepared problem tasks requiring work with a computer and specialized computer software. During part of the classes they carry out tasks using Pathfinder and Pyrosim applications.

Bibliography

Basic

1. M. Borysiewicz, S. Potempski, Ryzyko poważnych awarii rurociągów przesyłowych substancji niebezpiecznych. Metody oceny, CIOP-PIB, Warszawa 2005

2. PN-IEC 1025: 1994 Analiza drzewa niezdatności (FTA)

3. Modelowanie wypadków przy pracy, Pietrzak L., Bezpieczeństwo Pracy, nr 4 i 5, 2002

4. Badanie wypadków przy pracy. Modele i metody, Pietrzak L., Wyd. CIOP, Warszawa

5. Maszyny. Metody analizy bezpieczeństwa na stanowisku pracy, Wyd. CIOP, Warszawa, 1996

6. Model badania wypadków, Kowalewski S., Atest, nr 5, 2000

Additional

1. Dennis P. Nolan, Handbook of fire and explosion protection engineering principles for oil, gas, chemical, and related facilities, Noyes Publications, Westwood, New Jersey, U.S.A.

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	45	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	45	1,5

[1] delete or add other activities as appropriate