COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modelling of threats [N1IBiJ1>MZ]

Course

Field of study
Safety and Quality Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
9

Laboratory classes
18

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

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 advanced knowledge of issues related to risk identification, analysis and estimation in the context of threat modeling [K1_W03].
2. The student knows the fundamental dilemmas of modern civilization and development trends as well as best practices in threat modeling. [K1_W10].

Skills:
1. The student is able to assess the size of the threat caused by fire, explosion and flood; Is able to select and apply appropriate mathematical models to assess threats [K1_U04].
2. The student is able to present a problem within the framework of threat modeling using appropriately selected means [K1_U09].
3. The student is able to plan, organize and manage individual and team work in a way that ensures high quality results of experiments, measurements and simulations [K1_U11].

Social competences:
1. The student is able to use threat models to make decisions and solve design problems [K1_K01].
2. The student is aware of the importance and understands non-technical aspects and effects of engineering activities, including its impact on the environment and the related responsibility for decisions made [K1_K03].
3. The student is aware of the responsibility for his or her own work and is ready to obey the principles of teamwork and be responsible for jointly performed tasks [K1_K07].

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

The programme content includes the acquisition of skills in the practical application of methods of modelling hazards in the work and living environment in order to carry out preventive actions. Familiarisation with computer programmes supporting the process of modelling natural hazards and in the work environment.

Course topics

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	75	3,00
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)	70	2,00