COURSE DESCRIPTION CARD - SYLLABUS

Course name
Risk analysis in engineering tasks [S2Bioinf2>ARZI]

Course

Field of study
Bioinformatics

Year/Semester
1/1

Area of study (specialization)
–

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
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr inż. Piotr Mitkowski
piotr.mitkowski@put.poznan.pl

Lecturers

dr inż. Piotr Mitkowski
piotr.mitkowski@put.poznan.pl

Prerequisites

The student knows the basics of algebra and probability theory.

Course objective

The aim of the course is to familiarize students with risk management techniques that are crucial in research and development, engineering tasks and experimental data analysis, and are universal in nature. Students will learn to identify and define problems, analyze and assess risks, and develop risk management strategies in these areas. The course is based on ISO 31000 and EN IEC 31010 standards.

Course-related learning outcomes

Knowledge:
1. Student knows definitions and basic concepts related to risk management, including the processes of hazard identification, risk analysis, and risk assessment.
2. Student has knowledge enabling the selection of risk analysis techniques for defined engineering problems.
3. Student knows the general issues affecting risk management and safety in engineering activities and their possible impact on business operations.

Skills:
1. Student can identify the essential areas and steps of risk management in engineering and business tasks.
2. Student can select techniques aimed at: (a) obtaining opinions from stakeholders and experts, (b) identifying hazards, (c) determining sources, causes, and risk factors, (d) analyzing controls, (e) understanding consequences and likelihood, or (f) recording and reporting risks.

Social competences:
1. Student knows the limitations of their own knowledge and understands the need for continuous education and improvement of professional competencies, which may impact the engineering tasks undertaken.
2. Student is aware of and understands the social aspects of the practical application of acquired knowledge and skills in risk management and the associated responsibilities.
3. Student is aware of the advantages and limitations of individual and group work in solving interdisciplinary problems in technical and technological areas. Student is aware of the responsibility for jointly undertaken tasks within team work.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge and skills acquired during the lecture classes are verified in the colloquium in the form of a test with both closed and open questions. The test scoring range is 0-100 points, with the following grading scale: 3 (50%; 60%>; 3.5 (60%; 70%>; 4 (70%; 80%>; 4.5 (80%; 90%>; 5 (90%; 100%>.
The knowledge and skills acquired during the practical classes are verified through the completion of a project task in a group of at least 3 people. The task involves selecting risk analysis techniques for a given engineering problem and performing a risk analysis. The results of the group work are presented. The project task scoring range is 0-100 points, with the following grading scale: 3 (50%; 60%>; 3.5 (60%; 70%>; 4 (70%; 80%>; 4.5 (80%; 90%>; 5 (90%; 100%>.

Programme content

The course content focuses on hazard identification and risk analysis for risk management in technical areas. The techniques presented are derived from various fields of technical knowledge, and the content and possible applications are universal in nature.

Course topics

The course covers the following topics:
1. Issues related to planning and implementing risk assessment for individual engineering activities and enterprises/organizations;
2. Information management and model development;
3. Application of risk assessment techniques:
3.1. Techniques for obtaining opinions from stakeholders and experts (e.g., brainstorming, Delphi technique, structured or semi-structured interviews, surveys);
3.2. Techniques for identifying risks (e.g., checklists, Failure Modes and Effects Analysis (FMEA), Hazard and Operability Studies (HAZOP), Structured What-If Technique (SWIFT));
3.3. Techniques for determining sources, causes, and risk factors (e.g., Ishikawa analysis);
3.4. Techniques for analyzing controls (e.g., bow tie analysis, Layers of Protection Analysis (LOPA));
3.5. Techniques for understanding consequences and likelihood (e.g., Cause-Consequence Analysis (CCA), Event Tree Analysis (ETA), Fault Tree Analysis (FTA));
3.6. Techniques for analyzing dependencies and interactions (e.g., causal mapping);
3.7. Techniques for evaluating the significance of risk (e.g., As Low As Reasonably Practicable (ALARP), Pareto charts, risk indices);
3.8. Techniques for recording and reporting (e.g., consequence/likelihood matrix, risk matrix);
4. Decision-making based on risk analysis.

Teaching methods

Multimedia presentation, materials made available in the university's e-Learning system.

Bibliography

Basic:
1. Materials provided by the lecturer.
2. PN-ISO 31000. Zarządzanie ryzykiem. Wytyczne.
3. PN-EN IEC 31010. Zarządzanie ryzykiem. Techniki oceny ryzyka.

Additional:
1. Taleb Nassim N. Czarny łabędź. Jak nieprzewidywalne zdarzenia rządzą naszym życiem. Wydawnictwo Zysk i S-ka, 2020.
2. Markowski Adam S., Bezpieczeństwo procesów przemysłowych, 2017, Wydawnictwo Politechniki Łódzkiej, ISBN: 978-83-7283-805-6
3.Crowl D. A., Louvar J. F., Chemical Process Safety. Fundamentals with Applications, Pearson Education INC, 2011.
4. PN-EN 61882. Badania zagrożeń i zdolności do działania (badania HAZOP). Przewodnik Zastosowań.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
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)	20	1,00