COURSE DESCRIPTION CARD - SYLLABUS

Course name
Risk management in UAV flights [S1Lot2-BSP>ZRwLBSP]

Course

Field of study
Aviation

Year/Semester
3/6

Area of study (specialization)
Unmanned Aerial Vehicles

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Understanding of system concepts and ability to identify social, industrial, and transport systems. Basic knowledge of probability calculus and reliability of technical objects. Ability to calculate probabilities of elementary and complex events. Proficiency in office software packages. Awareness of the necessity to introduce restrictions in social, industrial, and transport systems to improve safety. Time management skills to accomplish assigned tasks.

Course objective

Understanding risk management methods and acquiring practical skills in managing threats in selected areas of transport, particularly aviation.

Course-related learning outcomes

Knowledge:
Advanced knowledge of mathematics (algebra, analysis, differential equations, probability, analytical geometry) and physics (classical mechanics, optics, electricity and magnetism, solid-state physics, thermodynamics) applicable to aviation engineering and modeling.
Detailed knowledge of manned and unmanned aircraft construction, onboard equipment, control

systems, communication and recording systems, automation, and flight simulation methods.
Understanding of probability distributions, statistical inference, and mathematical modeling for data analysis.
Basic knowledge of environmental protection in transport, including the impact of aviation on the environment and legal, social, and economic aspects of engineering activities.

Skills:
Ability to gather, interpret, and critically evaluate information from various sources (including literature and databases in Polish and English).
Proficiency in using information and communication technologies in aviation projects.
Capability to solve complex and unpredictable aviation-related problems using analytical, simulation, and experimental methods.
Social Competencies:
Awareness of the rapid evolution of technical knowledge and skills.
Entrepreneurial mindset, considering both business and social aspects of aviation activities.
Ethical decision-making and professional integrity in aviation engineering.

Social competences:
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Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: Assessed through a written test.
Exercises: Evaluated through a written assignment.
Laboratories: Assessed based on prepared reports.

Programme content

Demand for safety analyses. The concept of the Safety Management System (SMS).
Risk management as a component of SMS in aviation. Levels of risk management in aviation and types of risk.
Sources of hazards, threats, undesirable events, risk of threats, identification of hazard sources and threats, characteristics of hazards, hazard activation, probability levels, and consequence levels of hazard activation.
Risk models, generalized risk model, risk models in known risk assessment methods, risk estimation.
Risk valuation/assessment - risk categories.
Approaches to risk - general overview of safety system models.
Risk monitoring and risk communication.
Exercises in applying risk management procedures and methods in areas related to transport, particularly aviation.

Course topics

1. Need for Safety Analyses - Importance of risk minimization in aviation.
2. Risk Management in SMS - Identification, assessment, and mitigation of risk.
3. Levels of Risk Management & Types of Risk - Strategic and operational risk analysis.
4. Sources and Characteristics of Hazards - Identification, activation, and consequences of hazards.
5. Risk Models & Assessment Methods - Risk estimation and classification.
6. Risk Monitoring & Communication - Ongoing control and dissemination of risk-related information.
7. Practical Application of Risk Management Methods - Exercises in aviation risk analysis.

Teaching methods

Lecture: Systematic information presentation, either introductory or specialized.
Exercise-BasedLearning:Practical application of knowledge, including problem-solving and skill training.
Project Work: Applying knowledge from lectures and exercises to develop a risk management procedure for a selected analysis area.

Bibliography

Basic:
Chruzik K., Safety Engineering in Transport, Silesian University of Technology Press, Gliwice, 2016.
Gill A., Layered Safety System Models for Railway Transport Applications, Poznan University of Technology Press, Poznań, 2018.
Klich E., Flight Safety, Scientific Publishing of the Institute of Exploitation Technology - PIB, Radom, 2011.
Konieczny J., Crisis Management in Accidents and Disasters, GARMOND Publishing, Poznań - Warsaw, 2001.
Szymanek A., Safety and Risk in Engineering, Radom University of Technology Press, Radom, 2006.
Szymanek A., Theory and Methodology of Risk Management in Road Traffic, Radom University of Technology Press, Radom, 2012.
Enterprise Risk Management - Integrated Framework, Vol. I, COSO II - The Committee of Sponsoring Organizations of the Treadway Commission, Polish edition, Polish Institute of Internal Control, Warsaw, 2004.
Integrated Transport Safety System, Vol. 2: Conditions for the Development of Transport Safety System Integration, Editor: Krystek R., Gdańsk University of Technology, Warsaw, 2009.

Additional:
Chruzik K., Safety Management in Railway Transport, Institute of Exploitation Technology PIB, Radom, 2014.
Gucma L., Guidelines for Maritime Risk Management, Maritime Academy Publishing, Szczecin, 2009.
Jamroz K., Risk Management Methodology in Road Engineering, Gdańsk University of Technology Press, Gdańsk, 2011.
Kadziński A., Selected Aspects of Reliability in Railway Vehicle Systems and Objects, Poznan University of Technology Press, Poznań, 2013.
Krasodomska J., Operational Risk Management in Banks, Polish Economic Publishing, Warsaw, 2008.
Markowski A.S. (ed.), Preventing Industrial Losses, Part III: Process Safety Management, Łódź University of Technology Press, Łódź, 2000.
Radkowski S., Fundamentals of Safe Engineering, Warsaw University of Technology Press, Warsaw, 2003.
Rak J.R., Tchórzewska-Cieślak B., Methods of Risk Analysis and Assessment in Water Supply Systems, Rzeszów University of Technology Press, Rzeszów, 2005.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	0,50