Fire University of Warsaw, Poland
Faculty of Security Engineering and Civil Protection
Syllabus 2018 -

Risk Analysis

profile	general academics
degree	first degree
programme	ERASMUS
semester	1
part time / full time	full time
ECTS	3
coordinator	dr hab. Marcin Smolarkiewicz, prof. uczelni

form of the activity: exercise

hours	15
prerequisites	Knowledge of ordinary, linear, linear first-order differential equation. Knowledge of elementary integrals, knowledge of exponential function, knowledge of simple statistical distributions. Knowledge of using computer spreadsheets.
objectives	Obtaining knowledge and skills in the area of: understanding selected methods of identification, evaluation and prioritization of risk based on probability equation and mathematical statistics, additionally acquiring skills in designing and solving simple models of hazard spread resulting from unfavorable events.
methods	Exercises - unassisted work on given topics, making calculations, solving a given problem. Discussion on received results. Case study, discussion.
own work	Self-studying of required reading. Learning of knowledge acquired during lectures and exercises. Unassisted work on assignments and tasks within contact classes and outside them. Studying for exams.
basic literature	1. Jerzy Wolanin „Zarys Teorii Bezpieczeństwa Obywateli. Warszawa 2005 2. Agnieszka Plucińska, Edmund Pluciński „ Rachunek Prawdopodobieństwa Statystyka Maematyczna Procesy Stochastyczne" WNT 2008 3. W. Krysicki, J. Bartos i inni „Rachunek Prawdopodobieństwa i statystyka matematyczna w zadaniach" PWN 2002 4. J. Koronacki, J. Mielniczuk „Statystyka dla studentów kierunków technicznych i przyrodniczych" WNT 2001. 5. Jerzy Wolanin „Podstawy Rozwoju Pożaru". SGSP 1986 6. Kazimierz Rup „Procesy Przenoszenia Zanieczyszczeń w Środowisku Naturalnym. 7. Włodzimierz Pihowicz „Inżynieria Bezpieczeństwa Technicznego" WNT 2008

supplementary literature	1. C. Domański, K. Pruska „Nieklasyczne Metody Statystyczne 2. W. Krysicki, L. Włodarski „Analiza Matematyczna w Zadaniach" t. 1 i t. II PWN 1999 3. Ron Dembo, John Willey „Seeing tomorrow - Rewriting the Rules of Risk. NY 1998 4. A. M. Hasofer "Risk Analysis in Building Fire Safety Engineering" Elsvier 2007 5. Dan Borge "The Book of Risk" John Wiley & Sons, Inc. 2001 6. Marcus Abrahamsson " Uncertainty in Quantitative Risk Analysis - Characterization and Methods of Treatment" Lund 2002 7. ARAMIS “ Accidental Risk Assessment Methodology for Industries in the Context of the Sveso II Directive Project under the 5th Framework Programme 2004 8. "Risk Assessment - Recommended Practices for Municipalities and Industry" Canadian Society for Chemical Engineering URL:http://www.chemeng.ca

contents	hours
Unfavorable event. Event space. Events set. Boolean algebra. Set operations. Empty set. Opposite set. Common part of sets. Defining a probability function on sets. De Morgan's laws. Probability axioms. Probability properties. Empty set probability. Probability of independent events and opposite events.	2
Introduction into combinatorics: permutation, combinations, n-tuples and k-permutations.	1
Selected probability distributions. Properties of density probability function. Properties of two-point distribution, properties of Poisson distribution, gamma beta distribution and normal distribution. Expected value, standard bias, ordinary and central moment, median, and quintile. Properties of distribution function. Designing risk profiles. Entropy properties. Stochastic processes.	4
Combustion processes. Fire parameters. Hazards occurring during an internal fire. The principle of retaining mass and energy. Equations describing both principles. Equations of mass flow. Gas exchange in a fire. Mass balance in water flows. Differential equations of flood surface change. Atmospheric properties and phenomena creating hazards. Dispersal of toxic clouds in the atmosphere. Three ways of heat transport. Defining critical parameters. Models of PF, FF, BLEVE, FB creations.	4
Risk definition. Risk - blurred term. Individual risk. Group risk. Qualitative definition of risk. Half-quantitative definition of risk. Quantitative definition of risk. Links of uncertainty, probability and frequency in risk calculation. Methods of risk determination: risk matrix (probability - consequence). APELL method. Basics of ARAMIS method. Initiating event. Critical event. Triplet of Kaplan - Gavrick. Logical gates (and; or). Constructing event scenarios. Fault tree, event tree. The method of bow-tie. Expert methods in defining risk. Risk zones and profiles. Risk transfers. Accidents at a workplace. Elements of reliability theory of technical safety.	4

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