# Spring Semester 2009 Lecture „Risk Analysis of Highly-integrated Systems“

**Time / place lecture:** Tuesday: 8-10 / CAB H53
**Time / place tutorial:** Monday: 10-11 / ML H34.3
**Lecturer:** I. Eusgeld/ W. Kröger

**Goal:** Developing a basic understanding of risk and vulnerability of complex systems including their interdependencies, taking energy systems and digital systems for industrial control as a reference. Introduction to concepts of risk and vulnerability analysis as well as respective analytical instruments. Profound understanding of required traditional and advanced modelling techniques and software tools and their limitations. Applying methods to case studies including risk analysis, assessment and management and systems' optimisation.

**February 2009**

17. G I: Key terms, analytical goals and focal points, notion of system and its boundaries, possible disturbance factors and threats, management tasks
24. G II: Energy systems (production sites and distribution networks) as complex infrastructure; system modelling and functional analysis, probabilistic risk analysis (PRA) as methodological framework

**March 2009**

03. RA I: Tabular methods of hazards disturbances and effects analysis (FMEA, HAZOP), Master Logic Diagram, introduction into graph theory
10. RA II: Graph methods (fault and event tree analysis), quantification (Boolean algebra, minimal cut sets), data need, sources and uncertainties
17. RA III: Methodological uncertainties, Binary Decision Diagram
24. RA IV: Systematic failures (categorisation, modelling approaches), inclusion of areal events
31. RA V: Human factors, human reliability analysis (THERP, SLIM, et al.)

**April 2009**

07. RA VI: Complexity and interdependencies, advanced simulation techniques, (network theory, agent based modelling)
21. RA VII: Scenario development, characterisation of accident caused releases; dispersion into air, models for accident consequences
28. RB I: Result representation, (expected value, frequency-consequence-diagram, uncertainties), visualisation (GIS), regional aspects

**May 2009**

05. RB II: Principles and methods of risk evaluation (target lines, cost-benefit-analysis) and criticality of infrastructures, decision making and tools
12. VA: Vulnerability and resilience (basic assumptions, models for quantitative analyses); engineering of robust systems
19. RM: Steps of risk management; emergency protection (concepts, authoritative requirements, analytical models „real time“-information)
26. F: Reflecting on experiences; comprehensive case study

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