

Spring Semester 2010

Lecture „Risk Analysis of Highly-integrated Systems“

Time / place lecture: Tuesday: 8 - 10 / CLA E4
Time / place tutorial: Monday: 10 - 11 / ML H34.3
Lecturer: 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 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 as well as systems' optimisation.

February

23 F I: Key terms, analytical goals and focal points, notion of system and complexity, set of failures, hazards and threats, management tasks

March

02 F II: Energy systems (generating plants and distribution networks) as complex infrastructure; system modelling and functional analysis, methodological frameworks

09 RA I: Tabular methods of hazards disturbances and effects analysis (FMEA, HA-ZOP), Master Logic Diagram, introduction into graph theory

16 RA II: Fault and event tree analysis, quantification (Boolean algebra, minimal cut sets), data needs and sources

23 RA III: Methodological uncertainties, Binary Decision Diagram

30 RA IV: Systematic failures (categorisation, modelling approaches), inclusion of common cause initiating events (earthquakes etc.)

RA V: Human factors, human reliability analysis (THERP, SLIM, etc.)

April

13 AM II: Complexity and interdependencies, advanced modelling and simulation techniques(network theory)

AM II: Advanced techniques (object-oriented modelling, MC simulation)

20 RA VI: Scenario development, characterisation of accidental releases, atmospheric transport, models for impact analysis

27 RB I: Result representation (expected value, frequency-consequence-diagram, uncertainties), visualisation (GIS), regional aspects

May

04 RB II: Principles and methods of risk evaluation (target lines, cost-benefit-analysis). criticality of infrastructures, decision making and tools

11 VA I: Vulnerability and resilience (basic assumptions, models for quantitative analyses).

18 VA II: Vulnerability and resilience (models for quantitative analysis, engineering of robust systems

25 RM: Steps of risk management, emergency protection (concepts, legal requirements, analytical tools on based „real time“-information)

June

01 F: Comprehensive case study

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