

SE2650 Risk Assessment and Management

Professor: Enrico Zio

Language of instruction: English – **Number of hours:** 36 – **ECTS:** 3

Prerequisites: MA1200 and MA1300 or equivalent.

Period: S8 Elective 11 March to June IN28IE4, SEP8IE4

Course Objectives

Nowadays, many areas of engineering require a systematic approach to system design and management, within given safety and reliability limits.

Furthermore, the safety issues are relevant not only from the viewpoint of the technical-scientific profile of the future professional: their evaluation and control are included in specific regulations and laws with respect to standards of emissions, environmental impact, and the filing of safety reports by industries at risk, as regulated by the Seveso rules. Companies and organization then need to be able to understand and explain their risks, and the ways they handle them, to their investors, employees, and customers. Risk assessment and management have become everyone's business.

The course addresses the safety and reliability issues related to modern industrial activities and illustrates the methodologies available for the evaluation, the management, and the control of the associated risks. The objective is to provide the most common tools adequate for tackling the problem with the required scientific rigor and practical efficacy.

The expertise acquired by the students is that expected from a safety and reliability analyst and manager. This course also provides a good background preparation for the Master's level courses of the top of the Industrial Engineering (GI) option.

On completion of the course, students should be able to

- ✧ Have a general knowledge of all aspects of risk management
- ✧ Use effectively some of the methods of risk assessment (e.g. hazard identification, fault tree and event tree analyses)
- ✧ Identify the risk-critical points of a system and optimally decide on their elimination or protection of the system's environment

Course Contents

- ✧ Dimensions of risk: frequency and consequences. History of risk management
- ✧ Hazard identification: functional analysis, Hazard and Operability analysis (HAZOP), Failure Modes Effects and Criticality Analysis (FMECA)
- ✧ Definitions and fundamental formulas: reliability, availability, failure rate, MTTF, MTTR...
- ✧ Probabilistic Risk Assessment (PRA)
- ✧ Fault tree and event tree analysis; other methods

Course Organization

Lectures: 21 hr, Tutorials: 6 hr, Labwork: 3 hr, Exams: 6 hr

Teaching Material and Textbooks

- ✧ Copy of slides and selection of downloadable papers
- ✧ Enrico Zio, An Introduction to the Basics of Reliability and Risk Analysis. World Scientific Publishing Company, 2007
- ✧ Terje Aven, Foundations of Risk Analysis: a Knowledge and Decision-Oriented Perspective. Wiley, 2003

Resources

Lecturers: Nicola Pedroni, Enrico Zio and others

Evaluation

- ✧ Midterm exam: 3 hours
- ✧ Final exam: 3 hours