LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Riskanalys inom säkerhetsområdet
Risk Assessment in the Safety Area

VRSN25, 7,5 credits, A (Second Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED BI/RH
Date of Decision: 2023-04-12

General Information

Compulsory for: BI3, RH4-rh
Elective for: Pi4
Language of instruction: The course will be given in Swedish

Aim

The aim of the course is that the students gain the capability of utilizing methods and tools for risk analysis and evaluation as a basis for making decisions concerning risk management within the safety area. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to describe common accident models within the area of safety and be able to present the assumptions on which they are based.
- be able to decribe the basic principles for risk assessment within the safety area and process safety.
- be able to descrbe both qualitative and quantitative methods for riskanalysis of systems related to safety.
- have basic knowledge about methods that are based on barrier perspective and adapted to complex systems.
- have basic knowledge about research and development within risk analysis and evaluation in the safety area.

Competences and skills
For a passing grade the student must

- be able to identify risks in systems related to safety.
- be able to analyse such systems and calculate relevant risk metrics.
- be able use qualitative and quantiative methods and tools for risk assessment, also in situations that are new for the student.
- be able to evaluate the contents of existing risk analyses.
- be able to, both orally and in writing, present the results and discuss the implications of an risk assessment in a way understandable to persons with different knowledge backgrounds.
- be able to utilise material in scientific publications that is relevant for risk analysis within the area of safety.
- demonstrate the capacity to plan and undertake project assignments and in doing so focused on risk assessments demonstrate a capacity for teamwork.

Judgement and approach
For a passing grade the student must

- be able to assess the applicability of various risk analysis methods depending on the nature of the problem and within the framework of safety.
- be able to carry out analyses in a way that takes into consideration both scientific, societal and ethical aspects.
- be able to realise and judge the limitations of a conducted risk assessment.

Contents

The course covers an overview of risk assessment in safety, accident theories, barrier perspectives, complex systems and quality of risk assessments. And in-depth consideration and applications of qualitative and quantitative methods for risk analysis, likelihood estimations, consequence analysis, uncertainty analysis, risk presentation, risk evaluation and the risk assessment process.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: The examination represents a combination of results individual assignments, group assignments and a written examination. The examination consists of both questions on theory and questions of a problem-solving nature. Participation in obligatory seminars is required.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts
Code: 0117. **Name:** Written Examination.
Credits: 4. **Grading scale:** TH. **Assessment:** Written examination. **Contents:** This element constitutes the whole course including an overview of risk assessment in safety, accident theories, barrier perspectives, complex systems, and quality of risk assessments. And in-depth consideration and applications of qualitative and quantitative methods for risk analysis, likelihood estimations, consequence analysis, uncertainty analysis, risk presentation, risk evaluation and the risk assessment process.
Code: 0217. **Name:** Indivudal Assignments and Group Assignments.

Credits: 3,5. **Grading scale:** UG. **Assessment:** Successfully completed individual assignments and project assignments completed in groups. **Contents:** During the course a number of individual assignments as well as a major group project assignments are to be completed. For the project assignments, supervisors are available for consultation.

Admission

Admission requirements:

- EXTA60 Statistics or FMS012 Mathematical Statistics, Basic Course or FMS032 Mathematical Statistics, Basic Course or FMS035 Mathematical Statistics, Basic Course or FMS086 Mathematical Statistics or FMS140 Mathematical Statistics, Basic Course or FMSF20 Mathematical Statistics, Basic Course or FMSF45 Mathematical Statistics, Basic Course or FMSF50 Mathematical Statistics, Basic Course or FMSF55 Mathematical Statistics, Basic Course or FMSF70 Mathematical Statistics or FMSF75 Mathematical Statistics, Basic Course or FMSF80 Mathematical Statistics, Basic Course

Assumed prior knowledge: FMA430 Calculus in Several Variables or FMAB30 Calculus in Several Variables Basic course in risk assessment, at least 7,5 hp.
The number of participants is limited to: No
Selection: Completed university credits within the program. Within programs where the course is given as a compulsory course students are guaranteed admission. Thereafter priority is given to students enrolled in programs that include the course in the curriculum.
The course overlaps following course/s: VBRN01, VBR180

Reading list

- CCPS: Guidelines for Chemical Process Quantitative Risk Analysis. New York, Center for Chemical Process Safety, American Institute of Chemical Engineers, 2000.
- Fischer, S.: Vådautsläpp av brandfarliga och giftiga gaser och vätskor. Försvarets forskningsanstalt, FOA Umeå , 1997. Pp. 1-10, 113-139, 161-196, 243-277.
- Apostolakis, G.: How useful is Quantitative risk assessment?. 2004. Risk Analysis, 24(3): 515-520.
- CCPS: Guidelines for Developing Quantitative Safety Risk Criteria. New York, Center for Chemical Process Safety, American Institute of Chemical Engineers, 2009. Chapter 4: Considerations in Developing Risk Criteria.
- CCPS: Evaluating Process Safety in the Chemical Industry: A user's guide to quantitative risk analysis. New York, Center for Chemical Process Safety, American Institute of Chemical Engineers. , 2000.
- CCPS: Guidelines for Hazard Evaluation Procedures. New York, Center for Chemical Process Safety, American Institute of Chemical Engineers. , 1992.
- DNV Värdering av risk. Rapport skriven för Statens räddningsverk, Karlstad, 1997.
- Duijm, N. J. : Recommendations on the Use and Design of Risk Matrices. 2015. Safety Science 76, pp. 21-31.
- FOA: Vådautsläpp av brandfarliga och giftiga gaser och vätskor. Försvarets forskningsanstalt, Umeå, 1997. Page 1-10, 113-139, 161-196, 243-277.
- Hollnagel: Barriers and Accident Prevention. Ashgate, 2004. Page. 44-67.
- Hollnagel: Risk + barriers = safety?. 2008. Safety Science 46: 221–229.
- Hollnagel E., Wears R.L. and Braithwaite J. : From Safety-I to Safety-II: A White Paper. The Resilient Health Care Net: Published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia, 2015.

- IPS: Introduktion till Processäkerhet. Intresseföreningen för processäkerhet, 2010.
- Johansen, I. L. & Rausand, M. : Foundations and choice of risk metrics. 2014. Safety Science 62: 386–399.
- Johansson, H. : Bayesiansk uppdatering. Kompendium, Avdelningen för brandteknik och riskhantering, Lunds universitet, Lund , 2007.
- MSB: Vägledning: Riskutredning för mindre och medelstora verksamheter. Myndigheten för Samhällsskydd och Beredskap, 2017.
- Möller, N & Hansson, S.O. : Principles of engineering safety: Risk and uncertainty reduction. Reliability Engineering and System Safety, 2008. 93: 776–783.
- O'Hagan, A., C. E. Buck, A. Daneshkhah, J. R. Eiser, P. H. Garthwaite, D. J. Jenkinson, J. E. Oakley and T. Rakow : Uncertain Judgements: Eliciting Experts' Probabilities. John Wiley & Sons, 2006.
- Otway and von Winterfeldt : Expert Judgment in Risk Analysis and Management: Process, Context, and Pitfalls. 1992. Risk Analysis, 12(1): 83-93.
- Pasman, H. J., Jung, S., Prem, K., Rogers, W. J., Yang, X. : Is risk analysis a useful tool for improving process safety?. Journal of Loss Prevention in the Process Industries, 2009. 22: 769–777.
- Rae, A., Alexander. R. & McDermid, J. : Fixing the cracks in the crystal ball: A maturity model for Quantitative risk assessment. 2014. Reliability Engineering and SystemSafety:125: 67–81.
- Rausand, M. : Risk Assessment: Theory, Methods, and Applications. Hobroken: Wiley, 2011.
- WSP: Detaljerad riskbedömning avseende farligt gods på Drottningholmsvägen i höjd med Tranebergsängen. WSP Brand & Risk, Stockholm, 2011.
- DNV: Värdering av risk, Rapport skriven för Statens räddningsverk, Karlstad. 1997.
- Goerlandt, F., Khakzad, N., & Reniers, G. : Validity and validation of safety-related quantitative risk analysis: A review. 2017. Safety Science, 99, 127-139.
- Hopkins, A. : Thinking about process safety indicators. 2009. Safety Science 47: 460–465.
- Modarres, M. : Risk analysis in engineering: techniques, tools, and trends. CRC press, 2006.
- Noekland, T. E., & Aven, T. : On Selection of Importance Measures in Risk and Reliability Analysis. 2013. International Journal of Performability Engineering, 9(2).

Contact and other information

Course coordinator: Henrik Hassel, henrik.hassel@risk.lth.se
Course administrator: Linnéa Ekman, linnea.ekman@ebd.lth.se

Further information: Active participation in group work is mandatory. Each group member must be able to present and answer for the contents of the joint report. A student who does not meet the demands of active participation, or disregard their obligations, can be replaced to another group or failed by the examiner.