LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Konsekvensberäkningar
Consequence Analysis

VBRA10, 7,5 credits, G1 (First Cycle)

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

General Information

Main field: Technology.
Elective for: BI4, RH4
Language of instruction: The course will be given in Swedish

Aim

The course will provide an introduction to the field of Consequence Estimations, within the fire-engineering operational field including sustainability. It will also form a valuable complement to the course, "Risk Analysis Methods", insofar as the consequences of undesirable leakages of gases and liquids are concerned.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to estimate the magnitude of undesirable leakages of gases and liquids, vaporisation of liquids, and fire occurrences in liquids and gases.
- be able to describe the evolution of leakages of gases and liquids; spreading of gases.
- Be familiar with environmental and safety legislation including EU-directives that are relevant for the area.
- understand fundamental sustainability terminology, including UN global sustainable development goals
- understand holistic life cycle thinking.

Competences and skills
For a passing grade the student must

- be able to estimate the consequences of undesirable escapes of gases and liquids.
- be able to utilise applicable computation methods (manual and computer-based models) for consequence assessments of undesirable emissions of gases and liquids.
- be able to apply computation models for undesirable emissions of gases and liquids in disasters and risk events.
- be able to report and discuss the consequences of undesirable emissions of gases and liquids with persons of similar background.
- be able to select and utilise existing computer programs to solve problem components, and be familiar with the range of application and limitations of these programs, and how the results are interpreted and reporte.
- be abele to discuss sustainability terminology and application of life cycle thinking.

Judgement and approach
For a passing grade the student must

- be able to demonstrate capability for making assessments with regard to the relevant scientific, community-related, and ethical aspects.
- be able to demonstrate insight into the possibilities and limitations of the subject field.
- be able to demonstrate capability for identifying his/her needs for further knowledge and for ongoing improvement of his/her competence.

Contents

The course consists of lectures, computational sessions, computer exercises, and assignments. During the lecture periods, extracts of the course literature is discussed, with the aid of theory review, examples of calculations, and presentations on disasters that have occurred.

Computational sessions are computation exercises in which the student performs independently a set of given assignments that must be solved using manual computation models. The exercises are solved individually with the help of tutors.

In addition to the manual computation models, computer-based computation models are also used. The students get to familiarise themselves with these during the computer exercises in which given assignments are solved. The assignments are solved individually with the help of tutors.

Handed-in assignments constitute one of the elements in the course. The first one comprises a task where the student shall show understanding of the UN global sustainability goals and the relevance of fire in relation to these goals. The second assignment comprises a computation assignment in which the student solves a given problem with the help of knowledge gained from the course, and also manual computations and computer models. The following sub-fields are covered in the course:

- Knowledge of chemical preparations. Dangerous properties of chemicals. Condensed toxic gases.
- UN stustainable development goals.
- Holistic thinking, life-cykle-analysis, life-cykle-cost, cost-benefit and social life-cykle-analysis.
- Consequence analyses. Estimation of the consequences of undesirable leakages of gases and liquids. Computation methods for leakage rate (source intensity), flashing, vaporisation, fires in liquid pools, heating-up of containers, flame jets, gas spreading

(neutral and heavier-than-air gases), vapour cloud explosions, and tank rupture, as well as effect models. Computation methods cover, in part, manual computation methods and, in part, use of computer programs.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: The examination is given individually and consists of approved solutions to assignments, as well as written examinations consisting of both theory-related issues and problem solving. Final certification is based on the results of written examinations.

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: 0123. **Name:** Consequence Analysis - Written Exam.
Credits: 4,5. **Grading scale:** TH. **Assessment:** The examination is given individually and consists of written exam consisting of both theory and problem solving questions. The final grade is based on the results of written examinations. **Contents:** The course consists of lectures, computational tutorials, a computer laboratory and an assignment.
Code: 0223. **Name:** Assignment Submission/s, Computer Lab and Seminars.
Credits: 3. **Grading scale:** UG. **Assessment:** The examination of the assignment submission/s is given groupwise. Examination of the computer lab and seminars is given individually. All parts of this course must be passed for the course points to be awarded. **Contents:** The course consists of lectures, computational tutorials, a computer laboratory and an assignment submission/s.

Admission

Assumed prior knowledge: VBR022 Fire Chemistry and Explosions, VBRF20 Fire Chemistry and Heat Transfer, VBRF10 Fire Dynamics.
The number of participants is limited to: 60
Selection: Completed university credits within the program. Priority is given to students enrolled on programmes that include the course in their curriculum.
The course might be cancelled: If the number of applicants is less than 12.
The course overlaps following course/s: VBR100, VBR230

Reading list

- Fischer, S. m fl: Vådautsläpp av brandfarliga och giftiga gaser och vätskor. FOA, 1998, ISBN: ISSN: 1104-9154.
- Lag om skydd mot olyckor, SFS 2003:778. Can be downloaded from: www.lagrummet.se.
- Förordning om skydd mot olyckor, SFS 2003:789. Can be downloaded from: www.lagrummet.se.
- Lag om åtgärder för att förebygga och begränsa följderna av allvarliga kemikalieolyckor, SFS 1999:381. Can be downloaded from: www.lagrummet.se.
- Förordning om åtgärder för att förebygga och begränsa följderna av allvarliga kemikalieolyckor, SFS 2015:236. Can be downloaded from: www.lagrummet.se.
- Lag om brandfarliga och explosiva varor, SFS 2010:1011. Can be downloaded from: www.lagrummet.se.
- Förordning om brandfarliga och explosiva varor, SFS 2010:1075. Can be downlaoded from: www.lagrummet.se.
- Allmänna råd om skyldigheter vid farlig verksamhet, MSBFS 2014:2. Can be

downloaded from: www.lagrummet.se.
- Föreskrifter om åtgärder för att förebygga och begränsa följderna av allvarliga kemikalieolyckor, inklusive Konsekvensutredningen, MSBFS 2015:8. Can be downloaded from: www.lagrummet.se.
- Andersson, B.: Karakteristiska egenskaper hos kemikalier, stencil. Brandteknik, 2005.
- Farligt ämne, klor, ammoniak, svaveldioxid och propan, utdrag ur RIB.
- Andersson, B.: Utdrag ur: Introduktion till konsekvensberäkningar, några förenklade typfall. Brandteknik, LTH, 1992.
- Pasquill´s stabilitetsklasser och andra tabeller, stencil. Brandteknik.

Contact and other information

Course coordinator: Margaret McNamee, margaret.mcnamee@brand.lth.se
Further information: Some parts may be given in English. 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.