HN2022 System Safety and Risk Management

Course memo 2023

Welcome to the course System Safety and Risk Management!

During this course, we review central terms and concepts related to system safety and risk management, and discuss how various risks in socio-technical systems can cause safety failure and workplace accidents. Furthermore, we study different risk management methods and tools for analysis, assessment, and evaluation of risks. The course also includes a group project where you are expected to identify and describe system safety risks and suggest actions for improved safety.

Malin Håkansson, PhD, is responsible for the course in close collaboration with the safety specialist Josué Maia Franca and professor Mats Ericson. You are welcome to make contact via email, but you are encouraged to use a discussion forum in Canvas for general questions regarding the course, literature, or assignments where the answer may be of interest for all students.

The course is given during one study period and you are expected to allocate about *20-25 hours weekly* for the course for lectures, workshops, seminars, and self-study activities. You find time, place and content for lectures and seminars in the detailed schedule in Canvas, but make it a habit to check in to Canvas regularly to stay informed of any changes. Notifications about important updates will also be sent through 'Announcements' in Canvas. Make sure to have set up your notifications to suit your needs. Here is a step-by-step guide how to do that.

Course Literature

A list of the mandatory course literature is attached as an appendix in this course memo. All material is available online either as links or as files on the learnings platform Canvas. Some of the course material is connected to the MOOC (Massive Open Online Course) Work and Technology on Human Terms, by Prevent. Be sure to have created an account on Prevent (with your KTH email address) to get access to the book chapters there. Detailed advice and requirements about how to prepare for each learning activity are provided in the detailed schedule.

Venue

The schedule is divided into Campus weeks (weeks 35, 38, and 41) and Online/hybrid weeks. The lectures and seminars on campus weeks will mostly be "live" at Campus Flemingsberg, Hälsovägen 11C, in Huddinge. Learning activities in the non-campus week will be offered online or as hybrid teaching, see the detailed schedule in Canvas for more information. The Zoom link for the course is published in Canvas. For the seminars you need to log in using your KTH account, by signing in here: https://kth-se.zoom.us/ Tips about Zoom is published in the first module in Canvas.

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Teachers & Guest Teachers

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Course Learning Outcomes and Content

The course is assessed with the grades A, B, C, D, E, FX, F and is based on written and oral presentation of a the project work (A-F, 2.5 credits), active participation in exercises (P/F 2.0 credits), written assignments (P/F, 1.5 credits) and written examination (A-F, 1.5 credits), see the Course Syllabus.

The overall course aim is that the student will reach an advanced understanding of system safety and risk management based upon system theory applied to safety and socio-technical systems. After the course, each student shall be able to:

1. Describe, exemplify and reflect about the system perspective and on human, technological and organizational aspects of the concept MTO.
2. Argue for and identify risks in socio-technical systems (MTO), both risk that contribute to the system safety failure as well as workplace accidents and events.
3. Describe, exemplify and reflect about risk management from an organizational perspective like safety management systems.
4. Analyse identified weaknesses in risk management processes and suggest improvements.
5. Analyse identified weaknesses in safety in a workplace, and suggest actions for mitigating risk and improvements.
6. Read, understand, and discuss international scientific publications in the area of system safety and risk management.

Project Work Purpose and Procedures (2.5 credits)

The course includes a project work (*PRO1- 2.5 credits*) in which a domain of your own choice is investigated and reported upon. Your investigation should include a brief review of how key trends and developments within the field of system safety and risk management have evolved in the domain over time. Further, it should include common themes of accidents and current methods or interventions to make the domain safer.

The purpose of the project work is to provide a deeper understanding of system safety and risk management and how risks in complex socio-technical systems can be identified, analyzed, eliminated, and mitigated. The project work also aims at practicing your skills in analyzing and synthesizing scientific literature, disseminate your knowledge in a convincing manner and argue for relevant measures to improve system safety in an occupational setting.

The project work is done in groups of four students. The work is presented in a written report, maximum of 12 A4 pages including cover sheet, table of contents and references. The work is also presented as an *online lecture* presented to the other groups via Canvas with an accompanying quiz. Detailed instructions for the project work, report design and presentation are available on the Canvas course page.

After completing the project, you are required to do individual evaluation of your project work, your collaboration, and what you have learned during the project.

Disposition of your Course Project Work

Choose a domain you are interested in. This can be for instance aviation, health care, road traffic, rail, nuclear power plants, maritime, construction, or process industry. We want to have a good distribution of domains, so it will be first come, first served, if more than one group is interested in the same domain.

Literature review. Search for relevant scientific literature related to the field of safety and risk management in the domain.

Introduce the domain. Describe the current key trends and developments and how they have evolved over time. Naturally, aviation is a significantly younger domain than for example the maritime, so you must balance your information and decide what to describe and to which level of detail. Give examples of typical risks from an HTO perspective within the domain.

CAST accident analysis. Perform a CAST analysis (Leveson, 2011, 2019) on a high-profile accident.

Moving forward. What are the current methods, tools or interventions that are applied to make the domain safer? Are these generic or specifically tailor-made to fit the domain? Examples of leading safety indicators. What can we learn that may be useful also for other sectors?

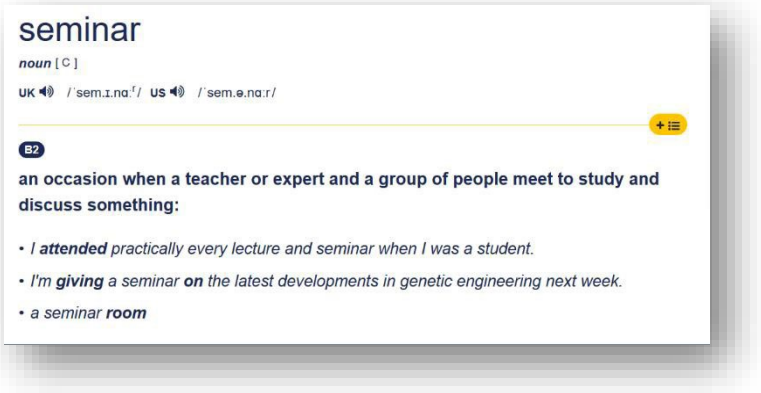
Prepare an online lecture. The lecture should summarize your key findings and be supplemented with three 'test questions'. If you find a YouTube film that in a few minutes describes the accident you are analysing, you are welcome to include it in your lecture.

The PRO1 (project work) module is intended to measure the progression of the student with regard to all six learning objectives and is judged based on how the student has completed the project assignment they have been assigned. The grading scale is A, B, C, D, E, Fx, F. All project works will be checked for plagiarism, see more under the heading *Referencing & Academic Integrity*.

Resources: Zoom is available for registered students, so you are welcome to use it for your project group meetings. See more on www.kth-se.zoom.us Visit the TTAHM Programme Room in Canvas to learn more about how to book group rooms and for more tips about writing and collaborating.

Literature Seminars (2 credits)

Full attendance is required in the seminars, and active participation throughout each seminar is expected. The seminars (*ÖVN2 - 2 credits*) are graded Pass/Fail. Due to the purpose and nature of a seminar – to study and discuss a certain topic – a missed seminar cannot be substituted with a written assignment. If you for any reason should miss a seminar, you will be offered an opportunity to take a "re-seminar" at the end of the course.



Definition of seminar, according to Cambridge Dictionary 2020

It is important that you come prepared. You are expected to read the literature and do any preparatory work before the seminar, so that our discussions are based on a solid understanding of concepts and theory. You can make the preparation in groups, but the hand-ins are individual.

Here is some advice to help you approach seminars:

- Check the course guide and on Canvas to see if you are expected to do any preparatory work before the seminar, such as completing a specific task, reading a text or noting down questions on a topic. Also check the hand-in dates for the coursework.
- In the room, pick a seat that enables you to contribute to the discussion. We want to sit together. Unfortunately, the room are not always very suitable for round-table discussion but together we can make the most of it.
- Be prepared to talk. Seminars are places where questions are explored, topics are debated and analysed. You are expected to actively contribute to the discussion.
- Be prepared to listen. Pay attention to and respect the views of other students. You do not have to agree with your teacher and fellow students but listen first, then you are encouraged to clarify any points that need clarification and articulate your view.
- I addition to what is stated above: To be able to actively participate in online seminars it is your responsibility to secure a quiet space with a good internet connection. We expect that you have your camera on, that you are audible, that you monitor the chat, and that you take part in polls in Zoom. See tips about how to use Zoom in Canvas.

Online Seminars

Many of the seminars in the course are held on the conferencing platform Zoom. For those you need to log in using your KTH account. You can access Zoom from a web browser or download the app. See more tips about Zoom on how to use Zoom on Canvas.

Written Exam (1.5 credits)

The written exam in the course is an open-book exam (*TEN2 – 1.5 credits*) performed on a computer at campus where you have access to the mandatory course literature. The exam consists of about 4 to 5 open-ended essay questions. The exam is to be written individually. In your answers, justify your arguments by referring to literature, e.g. the articles you have read.

For the articles included in the mandatory course literature, you only have to mention the author(s) and publishing year, for instance (Aven, 2016). You are free to use all course literature when answering the exam questions. When you write direct quotes, use " " around the quotation and state the reference including page number.

Hand-ins (Assignments - 1.5 credits)

The Hand-ins (*INL1 - 1.5 credits*) consists of written assignments with reflections related to the literature and learning activities. The grading scale is Pass/Fail. The assignments are published and submitted in Canvas.

Referencing & Academic Integrity

The hand-ins, the project report and the exam in the course should be written in the student's own words with support from the mandatory course literature and relevant sources. To pass the students must, where required, relate to concepts/models/theories described in the mandatory course literature, supported by references in the text and in a reference list at the end according to an accepted reference system. You can advantageously use APA 7th as a reference system, see this comprehensive and user-friendly guide from Lund University.

All hand-ins and the exam will be checked for plagiarism. Failure to cite references in a correct manner can be interpreted as plagiarism and lead to negative consequences for you as a student. To learn more about how to steer away from plagiarism we recommend that you watch the film *Avoid plagiarism and cheating* [<4 min] about how to make a reference to your sources and avoid plagiarism from the KTH Centre for Academic Writing.

You can find more tips in the KTH handbook *Guiding students away from plagiarism* on how to avoid plagiarism. [Note that the English version of the book starts at Adobe page 86]. In the TTAHM Program Canvas you will find more tips about writing and referencing.

Generative AI: Students must honestly disclose the use of any assistance, tools, resources, and references. For this course, the use of generative AI of any form (such as ChatGPT) is not allowed. Note that while current methods for detecting AI-generated text are incomplete, they are improving all the time. As better methods become available, we may apply such detection methods to your text retroactively, so please be vigilant in your use of AI.

Support for Students with Disabilities

If you have a disability, you can apply for compensatory support through Funka. To learn more about how to apply visit the FUNKA website.

We hope that you will enjoy the course and learn a lot!

Best regards,
Malin Håkansson on behalf of the Teaching Team

Appendix 1 – Mandatory Course Literature

Akselsson, R (2015). Safety and risk. In M. Bohgard et al. (Eds.), *Work and Technology on Human Terms*. Prevent. [Available online.]

Aven, T. (2016). Risk assessment and risk management: Review of recent advances on their foundation. *European Journal of Operational Research*, 253(1), 1-13. https://doi.org/10.1016/j.ejor.2015.12.023

Berglund, M., Karltun, A., Karltun, J. & Eklund, J. (2015). In M. Bohgard et al. (Eds.), *Work and technology on human terms*. Prevent.

Cook, R., & Rasmussen, J. (2005). "Going solid": A model of system dynamics and consequences for patient safety. *Quality & Safety in Health Care, 14(2),* 130-134. http://dx.doi.org/10.1136/qshc.2003.009530

Grote, G. (2015). Promoting safety by increasing uncertainty–Implications for risk management. *Safety science*, 71, 71-79. https://doi.org/10.1016/j.ssci.2014.02.010

Harms-Ringdahl, L. (2013). *Guide to safety analysis for accident prevention*. IRS Riskhantering.

Hollnagel, E. (2014). Is safety a subject for science? *Safety Science*, 67, 21-24. https://doi.org/10.1016/j.ssci.2013.07.025

Hollnagel, E., Wears, R. L., & Braithwaite, J. (2015). *From Safety-I to Safety-II: a white paper*. The Resilient Health Care Net.

ISO (2018). *Health and safety at work - Are you ready for ISO 45001?* ISO focus March-April 2018. ISSN 2226-1095.

Leveson, N. (2011). *Engineering a safer world: Systems thinking applied to safety*. MIT Press.

Leveson, N. (2019). *CAST Handbook - How to Learn More from Incidents and Accidents*.

Pęciłło, M. (2016). The concept of resilience in OSH management: a review of approaches. *International journal of occupational safety and ergonomics*, 22(2), 291-300. https://doi.org/10.1080/10803548.2015.1126142

Swedish Institute for Standards. (2018). Occupational health and safety management systems – Requirements with guidance for use. (SS-EN ISO 45001:2018). https://www.sis.se/en/produkter/management-system/occupational-health-and-safety-management-systems/ss-iso-450012018/

WHO (2002). *Establishing a dialogue on risks from electromagnetic fields. World Health Organization.* https://www.who.int/publications/i/item/9241545712

Suggested further reading can be found in the course Library in Canvas. You are further expected to search for and read additional scientific articles related to your project work. Suggested databases to search in are *Web of Science, Pubmed, Ergonomics Abstracts, and Scopus.*

Link to databases at KTH Library.