HN2013 Ergonomics, Human Factors and Patient Safety 6.0 credits *(In Swedish: Ergonomi, MTO och patientsäkerhet)*

**Educational level:** Second cycle  
**Subject area:** Technology and Health  
**Grade scale:** A, B, C, D, E, FX, F

**Course offered by**  
School of Technology and Health, Unit of Ergonomics and Unit of Patient Safety.

**About the course**

After the course students should be able to analyze how the health care system interacts with human physiology cognition and technology. The aim is that the students should be able to apply a "Human-Technology-Organization” perspective in the design, development and evaluation of medical devices.

Moreover, they should be able to explain the principles of system safety and analyze factors contributing to mishaps and injuries in health care. The students should also be able to analyze the impact of medical technology on the work environment and patient safety and give examples of how this can be applied by medical engineers in the work for a positive progress on safety. As well as being able to reflect on how the organisation and the work environment affect patient safety.

**Learning outcomes**

By the end of the course each student will be able to:

- describe, exemplify and reflect on methods for applying knowledge about humans in the design, development and evaluation of medical technology.
- describe and discuss different approaches in analyses of incidents in complex systems.
- describe, exemplify and reflect on the main principles of system safety and how factors on different levels in the system can contribute to patient safety and the safety of the healthcare personnel.
- describe, exemplify and explain how organizational issues and the work environment affects patient safety.
- describe, exemplify and reflect on how medical technology affects the work environment and patient safety.
- describe, exemplify and reflect on how medical technology engineers actively can contribute to improve the work environment and patient safety in healthcare.
Course main content

- Background, development and relationship between ergonomics, human factors and patient safety.
- Humans cognitive and physical capacities, as individuals and in work.
- The systems view and sociotechnical systems.
- Risks in healthcare.
- Methods and tools for analysis, design and evaluation of work, work environment and products.
- Human factors and ergonomics concepts and terminology.
- Methods for risk analysis from a systems perspective.
- Patient safety concepts and terminology.
- Measures for increased safety in healthcare systems.
- Read and discuss scientific papers within the area of patient safety and worker safety.

Eligibility

120 university credits (hp) in engineering or natural sciences and documented proficiency in English corresponding to English B.

Requirements for final grade

- INL1 – Assignments – written report, 2.0 credits, grade scale: P, F
- SEM1 – Seminars - active participation, 2.0 credits, grade scale: P, F
- TEN1 – Written home exam, 2.0 credits, grade scale: A, B, C, D, E, FX, F

Literature

The course literature is mainly based on scientific papers freely provided to students in PDF-format available on the course pages on KTH-Social.

- See reference list in Appendix 1.
- Papers in conjunction with seminars.

Assignment (INL1)

The aim with the assignment (INL1) is for the students to start reading and reflect on the literature, lectures and seminar exercises. Each student should, individually or in pair of two, write a short report (no more than 15 pages) about patient and worker safety in the health care system. The report can be written in English or Swedish. The assignment report should be e-mailed to the examiner (mats.ericson@sth.kth.se) no later than 11 pm on 2015-10-04.
In the assignment you should choose one of the common risks that affect patient and/or worker safety (e.g. alarms, infections, infusion pumps, hand overs etc). The aim is for you to describe the risk and discuss the complexity with regards to patient and worker safety. In order to pass you need to include the following aspects:

a) Discuss how they may be affected by the system in which they appear.
b) Discuss how these risks are and can be identified.
c) Discuss what can be done to reduce risks.
d) Discuss what can an engineer in medical technology working in the industry or at a hospital do to contribute to the safety.

To be able to fulfill the assignment you will have to read and use the course literature, the seminar papers and find and read relevant scientific literature or governmental statistics from the library or from internet search. You need to refer to a minimum of 10 of the papers that are on the course literature list in order to pass.

Seminars (SEM1)

It is mandatory to participate in all seminars (SEM1) apart from the last one. Note that the seminars will cover the topics from the lectures, thus everyone is strongly recommended to attend the lectures in order to facilitate participation in the seminars. Before each seminar students are expected to read the listed papers (see below) and it is essential that all students do so in order to manage an active participation in the seminar exercises. After the seminar everyone is asked to send the examiner a short summary of what one has learned from the seminar literature and exercise (maximum 1 page). The seminars will be examined by an active participation at the seminars and the submission of a summary. A minimum of at least four out of five mandatory seminars must be attended to pass. For the occasion that might be missing a written reflection on the literature or processed cases must be written (2-3 pages) and submitted to the examiner.

Seminar Papers

Everyone is expected to prepare for each seminar by reading the listed paper/papers.

Seminar I – Technology and patient safety

The aim with seminar I is to do a group exercise based on the Terac-25 case (see listed paper) from the perspective of the different actors involved in the case.

*Paper Seminar I:*


Seminar II – Different cases and system dynamics

At seminar II different cases will be discussed from different perspectives and in relation to Rasmussens model of conflicting objectives.

*Papers Seminar II:*

Reading instructions for the SINTEF report

The report describes two accidents and then present different perspectives of safety and also discusses how the different accidents can be viewed from the different perspectives of safety. Read the following chapters:
Chapter 3 page 23-34 (you can skim through the Snorre A blow out example)
Chapter 8 page 79-94 (you can skim through the Snorre A blow out example)


Seminar III – Psychosocial work related factors and its implications for patient and worker safety

The aim with seminar III is to discuss how factors in the psychosocial work environment and management affects patient safety and worker safety.

Papers Seminar III:

Seminar IV – Different perspectives on safety and accident investigations

The aim with seminar IV is to review the Terac-25 case from different safety perspectives (see literature). Moreover, different accident investigation methods are discussed.

Papers Seminar IV:


Reading instructions for the SINTEF report
The report describes two accidents and then present different perspectives of safety and also discusses how the different accidents can be viewed from the different perspectives of safety. Read the following chapters:
- Chapter 3 page 23-34 (you can skim through the Snorre A blow out example)
- Chapter 4 page 35-46 (you can skim through the Snorre A blow out example)
- Chapter 5 page 47-56 (you can skim through the Snorre A blow out example)
- Chapter 6 page 57-68 (you can skim through the Snorre A blow out example)

Seminar V – Open seminar for Q&A
This is not a mandatory seminar. During this seminar the course leaders will be available for questions and supervision for those who wants input to their work with the home exam.

Examination (TEN1)
Examination (TEN1) is made in the form of a home examination. You will randomly be given four in depth questions that you should consider in a written essay / report of 20-25 pages (not counting the reference list).

The assignment of the in depth questions will be distributed through mail in the evening of 2015-10-07. If you have not received it, immediately contact the examiner.

The completed paper (TEN1) must be submitted to the examiner for assessment no later than Sunday evening (11 pm) 25:th of October (2015-10-25). The papers received after this date can only be considered for grades F, Fx, or E. In order to obtain higher marks than E must timeout (2015-10-25) have been held. Among the submitted papers, some will be randomly selected where the student also must undergo an oral examination to reasonably ensure that it is the student who wrote the essay. The essays will be checked for plagiarism in accordance with KTH guidelines.

The grading will be made from the criteria listed bellow. In general a higher grade is associated with demonstrated ability to argue, reflect and critically analyze and summarise the issues based on the literature and your own reflections. For grades E-A you must answer the questions from both a worker- and patient safety perspective in all questions. Note that for grades D-A the exam must be submitted before 2015-10-25.
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<th>Grade</th>
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| F     | Very limited knowledge and understanding of the literature and key issues.  
       | A number of irrelevant and inaccurate claims.  
       | Brief or unfinished essay which prevents assessment.  
       | Deficiencies which may no longer be correct within a reasonable time frame. |
| Fx    | Insufficient description of the issues related to the question.  
       | Not supporting statements with references to literature or sources.  
       | No clear structure of the essay and/or the text being hard to follow for the reader.  
       | Brief and unstructured text.  
       | Insufficient or inadequate resources. |
| E     | Covering the basic areas related to the issues that the question is related to.  
       | Uses literature and references to support description of the issues.  
       | Has a structure that makes it easy to follow and has a summary and conclusion. |
| D     | Has a structure that makes it easy to follow and has a summary and conclusion.  
       | A careful review of the used literature has been carried out.  
       | The home exam is well structured and well written.  
       | The student demonstrates a good understanding of the literature and important empirical and theoretical issues. |
| C     | Has a structure that makes it easy to follow and has a summary and conclusion.  
       | A solid understanding of the literature that has been used.  
       | An ability to apply this understanding in well-structured arguments and presentations.  
       | An ability to contextualize and compare the key parts of the literature that has been used. |
| B     | Has a structure that makes it easy to follow and has a summary and conclusion.  
       | A high degree of independence and originality in the discussion and analysis of the literature used.  
       | A high level of comparative ability and critical analysis.  
       | Well-written reflections and interpretations that are based on the literature that has been used.  
       | A high level of understanding of the relationship between theory and empirical material  
       | Being able to relate the issues to examples or discuss how issues related to the question can be applied. |
| A     | Has an excellent structure that makes it easy to follow and has a summary and conclusion.  
       | A high level of originality and critical synthesis  
       | A high level of comparative ability.  
       | Well-written and self-reflections and interpretations that are based on the literature that has been used.  
       | A deep understanding of the empirical evidence and theoretical issues.  
       | Gives examples and discuss application of relevant theories or empirical issues.  
       | Addresses major questions and counter-arguments that readers are likely to raise. |
**Course web and communication**

Course material for the seminars will be distributed and available through the KTH-Social. Here will also other course related information and lecture power points be distributed.

**Examiner**

Mats Ericson, professor, mats.ericson@sth.kth.se

**Course administration**

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**Schedule and Teachers**

To be announced on KTH-Social at the start of the course.

**Appendix 1, HN2013**

A. Course literature, reference list (to be published on KTH-Social latest at the start of the course).

B. Schedule (to be published on KTH-Social latest at the start of the course).