



Course Plan Autumn 2020

Medical Information and Communication Systems (HI2010)

Welcome to Medical Informatics and Communications (MI&C) Course!

Here you find all information you need for the course.

Course information

Number of credits: 6 credits (HP)

Grading scale: A, B, C, D, E, FX, F

Contact information

- Martin Jacobsson (MJ), martin.jacobsson@sth.kth.se, room 6306, examiner
- Seyedfarhad Abtahi (SA), sabbt@kth.se (holds Lab 2)

Course Content

The course is broad introduction to the field of biomedical and health informatics as well as standards and regulations in medical technology. The application areas include healthcare, preventive care, elderly care, well-being, sports, mHealth, home care, etc. The focus is on the use of modern information and communications technology (ICT) solutions in these areas. The course also contains an in-depth part, where a narrower topic within the field is studied.

The practical parts of the course consist of labs covering the processing of physiological signals and the construction of software systems for wireless sensors and mobile applications in health and sports.

It is mandatory to attend the lab presentations and the seminars. In addition, it is strongly recommended to attend the lectures and exercises during the entire course. The written exam is based on the course material on the course web page as well as the lectures and exercises.

Learning Outcomes

By the end of the course the students should be able to:

- describe and discuss health informatics and biomedical technology
- find, analyse, synthesise and present scientific articles in the subject area
- use common ICT requirements methods to identify, reason, and analyse the medical and care needs of ICT solutions
- implement simple ICT systems with applications in the subject area
- apply basic signal processing algorithms to biomedical signals

Course literature

The reference book for the course is

- *Handbook of Medical Informatics*, Editors: J.van Bommel, M.A. Musen, Springer Berlin Heidelberg, 2002

Complementary Source

- *Biomedical Informatics. Computer Applications in Health Care and Biomedicine*, Editors: Shortliffe, Edward H., Cimino, James J. Springer Berlin Heidelberg

edX course eHealth – opportunities and challenges - from Karolinska Institute

- You can find several short video lectures from the edX course eHealth – opportunities and challenges - from Karolinska Institute in a folder in Canvas.
- It gives a broad and inspiring introduction to health informatics. We recommend that you listen to the online lectures during the course, especially for the fulfilment of the student independent work.

Extra material

- Laurel Riek, "Healthcare Robotics", Communications of the ACM, Volume 60 Issue 11, November 2017, Pages 68-78. <https://doi.org/10.1145/3127874> (Available through KTH Library)
- Chapter 3 and 4 from "Systems Engineering Fundamentals", Defense Acquisition University Press, 2001. Available at: <https://web.archive.org/web/20110722184431/http://www.dau.mil/pubscats/PubsCats/SEFGuide%2001-01.pdf>
- Alexander Cowan, "Your Best Agile User Story", <https://www.alexandercowan.com/best-agile-user-story/>
- and more material ...

Course Content

Lectures (tentative)

- L1 (Tue 25 Aug), T3, **Introduction**, Martin Jacobsson
- L2 (Thu 27 Aug), Zoom, **Designing Medical Info.Sys**, Martin Jacobsson
- L3 (Fri 28 Aug), Zoom, **Medical ICT and Lab 1**, Martin Jacobsson
- L4 (Thu 10 Sep), Zoom, **Health comm. and Poster intro**, Jonas Willén & Martin Jacobsson
- L6 (Tue 15 Sep), Zoom, **Physiological Signals & Data Processing**, Martin Jacobsson
- L7 (Thu 17 Sep), Zoom, **Medical data processing & Lab 2**, Farhad Abtahi
- L5 (Tue 22 Sep), Zoom, **Standards in Medical ICT**, Björn-Erik Erlandsson
- L8 (Tue 29 Sep), Zoom, **Medical Imaging, DICOM, and PACS**, Chunliang Wang
- L9 (Thu 1 Oct), Zoom, **Guest lecture: ??**
- L10 (Fri 2 Oct), Zoom, **Hospital Information Systems / Sjunet**, Björn-Erik Erlandsson
- L11 (Fri 6 Oct), Zoom, **Extra lecture**

After each lecture, you need to create two questions and upload to the KTH online teaching platform Canvas. One question must have been covered and answered by the lecture. The other question can either be a question that you still have after the lecture or be a question related to the lecture, but not covered by the lecture. These questions will be shared among all students.

Seminar

- There is a mandatory seminar scheduled in the beginning of the course. Active participation is required. You will be divided into 2-3 groups, and have the seminar either on 8:15-10:00, 10:15-12:00, or 13:15-15:00. All on Tuesday Sept. 1.
- In the seminar, you will work in a group with requirement analysis and stakeholder analysis for a fictive IT system for healthcare.

Labs

- Lab 1 is about **programming a wireless sensor**. The task is to make a complete system consisting of an analog medical sensor, data acquisition, communications, and rudimentary data processing and presentation. The lab is examined by handing in the solution and demo it to the teacher during a special session (Thu 10 Sep 13:00-17:00 in T64). The work is done in pairs and you need to book a time slot of 15 minutes during the session.
- Lab 2 is about **medical signal processing using Matlab**. Here, you will learn Matlab and how more sophisticated signal processing can be done on simple medical signals. More details to be communicated later.

Examination and final grade

To pass the course you have to comply with:

- RED2 (grade A-F)
 - One seminar
 - Poster production and presentation
 - Lecture Questions
- TEN1 (grade A-F)
 - Written home exam with strict time limitation
 - Oral Exam (this is a Covid-19 adaptation)
- LAB1 (grade P/F)
 - Two labs

Grade criteria

Final grade is based on the lower grade of RED2 and TEN1, given the grade P on LAB1.

To obtain grade E, the student must fulfil all learning outcomes.

To obtain grade C, the student must also be able to:

- describe and discuss **some topics in** health informatics and biomedical technology
- find, analyse, synthesise, and present **several** scientific articles in the subject area

To obtain grade A, the student must fulfil the criteria for grade C, and also be able to:

- describe and discuss **several topics in** health informatics and biomedical technology
- find, analyse, synthesise, **compare** and present **several** scientific articles in the subject area

The grades D and B can be obtained if the student does not quite fulfil the objectives for grade C or A respectively, but fulfil with distinction the objectives for grade E or C respectively.

The exam

Due to the Covid-19 pandemic, we cannot do the exam in an exam hall as usual. Instead, the course includes a written home exam complemented with an oral exam.

The written home exam will take place online using our online teaching platform Canvas. Both the questions and the answers will be handled through Canvas. The exam questions will be divided into two parts. Both parts are taken at the same time. The first part is about health informatics and the second is about biomedical technology. The questions will be of a more open and reasoning type.

However, many questions are not suitable for a home exam. Therefore, we need to complement the written home exam with an oral part. For the oral part, you will be asked about 4 questions. The questions will be randomly selected from two lists of questions. The first list is based on your questions from the lectures (see above), which will be compiled and shared ahead of the oral exam with everyone. Two questions will be selected from this list. The second list is constructed by the teachers and kept secret. The remaining two question will be randomly selected from this teacher list.

You need to answer at least 50% of the oral questions to satisfaction for a pass on the oral part. To pass the written home exam, you will need to score at least 40% of the points of the first part and at least 40% of the points of the second part.

The score of both the oral and the written home exam will be added together into one single score and used for grading. The total score is a weighted sum between the oral and written parts (33% oral and 67% written). The weighted score will give you the grade of TEN1 as follows (as long you pass both the oral and written parts):

Grade	Minimum Total Exam Score
E	
D	60%
C	70%
B	80%
A	90%

Poster Presentation

You will be divided into pairs (in exceptions: groups of three) and together pick a topic in the area of medical ICT.

Your task is to find literature (including scientific literature) that discuss the chosen topic and then compile the work into an abstract and a poster.

The poster will be presented during a special session (on Wednesday 8 Oct. or Thursday 9 Oct. 13:15-17:00), where your fellow students and others may interact and ask you questions about your poster. You will also get the chance to see the other posters and interact with them as well.

Grading of the poster presentation is based on the following criteria:

- For the production of a satisfactory poster and presentation, you will be awarded a E. You also need to pass the seminar and the lecture questions assignment.
- Grade D and C can be given for posters that are clearly better than level E, but do not fulfil the requirements for a B or A.
- If your poster mentions and discuss several research and other types of articles, you will be awarded a B. Both the number of articles and the quality and diversity of articles will be considered.
- If your poster also is able to compare some of the articles to each other in an interesting way, you will be awarded an A.