Course Plan Autumn 2019

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), sabt@kth.se

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.

The course is organized in four different modules:
- introduction to biomedical signal processing,
- introduction to medical communications
- introduction to health informatics, and
- independent work at a poster seminar.

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

Examination and final grade

To pass the course you have to comply with:
- RED1 (grade A-F)
  - One seminar
  - Poster production and presentation
  - Final written Exam
- LAB1 (grade P/F)
  - Two labs

Grade criteria

The final grade of the course is the same as the grade on RED1, given the grade P on LAB1.

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

The course includes a written exam. No aid besides pen and eraser is allowed.

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. To pass the written 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 total score of the exam together with level of the poster will give you the grade of RED1 as follows (you need to fulfil both requirements):

Grade	Minimum Total Exam Score	Poster Level
E		
D	60%	
C	70%	Several articles
B	80%	Several articles
A	90%	Several articles + compare

Course literature

The reference book for the course is
- *Handbook of Medical Informatics*, Editors: J.van Bemmel, 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
- L1 (Tue 27 Aug), T61, **Introduction**, Martin Jacobsson
- L2 (Thu 29 Aug), T67, **Designing Medical Info.Sys**, Martin Jacobsson
- L3 (Tue 3 Sep), T67, **Medical ICT and Lab 1**, Martin Jacobsson
- L4 (Fri 9 Sep), T61, **Health comm. and Poster intro**, Jonas Willén & Martin Jacobsson
- L5 (Thu 12 Sep), T67, **Standards in Medical ICT**, Björn-Erik Erlandsson
- L6 (Tue 17 Sep), T67, **Physiological Signals & Data Processing**, TBD
- L7 (Thu 19 Sep), T67, **Medical data processing & Lab 2**, Farhad Abtahi
- L8 (Tue 24 Sep), T67, **Medical Imaging, DICOM, and PACS**, Chunliang Wang
- L9 (Thu 3 Oct), T67, **Guest lecture: Navin Govind**, Aventyn.com
- L10 (Fri 4 Oct), T67, **Hospital Information Systems / Sjunet**, Björn-Erik Erlandsson
- L11 (Fri 8 Oct), T67, **Guest Lecture:** TBD
- L12 (Thu 10 Oct), T67, **Extra lecture**

Seminar
- There is a mandatory seminar scheduled in the beginning of the course. Active participation is required. You will be divided into two groups, where one group will have the seminar on Monday 2 Sep. 8:15-10:00 and the other group 10:15-12:00.
- 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 (Fri 13 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.

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 9 Oct 8:00-17:00, but we will not use the entire time), 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.