IL130V Biomedical Transducers, Development and Design 7.5 credits

Medicinska givare, utveckling och design

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for IL130V valid from Autumn 2007

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Electrical Engineering, Technology

Specific prerequisites

General admissions requirements incl documented proficiency in English and academic studies of 7,5 credits (previously 5 credits/points) within Electrical Engineering, Physics, Medical Technology or eqv.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The aim of the course is to:

- develop deeper understanding about the common medical transducers
- present different methods for measuring temperature, pressure, force, flow and other important parameters in determining the circulation-, breathing- and excretory functions.
- study how different measurement techniques are used to determine the vital parameters of diagnostic importance.
- provide an engineering approach to develop a physiological measurement system

Course contents

Contents and planning:

Lectures: Introduction to the course, Basic principles, terminology and characteristics, Classification of sensing devices, Active and passive transducers, Signal conditioning and interfacing; Passive circuit and active circuits. Application of R, C and L as sensors, Bridge circuits, Theoretical considerations, Examples, Transducers for the measurement of temperature, Basic considerations and definitions, Application considerations, Classification of thermal sensors, Thermocouples, Noise thermometry, Thermoresistors, Thermodiodes, Thermo transistors, Other electrical microsensors, Non-electrical thermal microsensors, performance considerations and commercial devices. Applications in medicine, Transducers for the measurement of pressure, Basic considerations, Force microsensors, Stress-sensitive electronic devices, Pressure microsensors and strain microsensors, Applications in medicine, Transducers for the measurement of flow, basic considerations, thermal flow microsensors, capacitive flow microsensors, Resonant bridge microsensors, Applications in medicine, Application of some magnetic microsensors and biochemical microsensors in medicine. Transducers for the measurement of concentration, Applications in medicine, Design of a measurement system using optical transducers to measure concentration

Design of a measurement system using thermocouple and thermodiodes to measure temperature

Design of a measurement system using piezoelectric transducer for measurement of pulse rate and blood pressure.

Study the application of accelerometers in a Pacemaker.

Design of a measurement system using optical transducers to measure concentration

Seminar 1 Students present a selected scientific article, and critically analyse the work.

Seminar 2 Students present a selected transducer and describes its advantages and disadvantages.

Final seminar: To summarize the course, examination and course evaluation

Disposition

Course is conducted during two periods at day time, and is in the form of lectures and exercises, laboratory work and project work.. The medium of instruction can be English.

Course literature

Course literatureSelected materials, edited by Mannan Mridha Reference literature:Biomedical Transducers and Instrumentation by Togawa, Tamura and Öberg 1998Microsensors by Julian W. Gardner 1996

Examination

- PRO1 - Project, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 3.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Obligatory activities: Labs (2 p), Seminar and project presentation.

Other requirements for final grade

To pass the obligatory activities

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.