GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Sensors and Interfacing (E735040)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0 **Study time 180 h**

Course offerings in academic year 2023-2024

A (semester 1)	Dutch	Gent

Lecturers in academic year 2023-2024

Willems, Brecht	TW06	staff member
Missinne, Jeroen	TW06	lecturer-in-charge

Offered in the following programmes in 2023-2024	crdts	offering
Master of Science in Electronics and ICT Engineering Technology (main subject Electronics Engineering)	6	A
Master of Science in Electronics and ICT Engineering Technology (main subject Embedded Systems)	6	A
Master of Science in Electronics and ICT Engineering Technology (main subject ICT)	6	A

Teaching languages

Dutch

Keywords

Sensors, calibration, signal conditioning, linearisation, microcontroller, interfacing, sensor characteristics, accuracy.

Position of the course

The course gives the student an overview of the main sensors and sensor characteristics. Beside the operation, fabrication and applications, also the interfacing, linearity, calibration and accuracy are covered.

Contents

Part Theory:

- In the part regarding sensor characteristics, the main properties of sensors are discussed suchs as sensitivity, transfer function, resolution, accuracy, DC and AC properties
- Interfacing: in this part, the most commonly used electronics for reading out sensors is discussed: opamp circuits, instrumentation amplifier, bride circuits, etc.
- Overview of sensors and sensor technologies, such as:
  - Temperature sensors
  - Mechanical sensors (force, pressure)
  - Light sensors, image sensors
  - Sensor technology: discussion of the fabrication of some important sensors
  - Biosensors
  - Straing gages + optical version (fiber Bragg grating sensor)
  - Position sensors, displacement sensors
  - Case study or guest lecture

Part Lab:

During the lab sessions students build an application with one or more sensors seen during the theoretical sessions. More complex projects are worked out in group.

Initial competences

This course unit builds on certain course competencies/learning outcomes of course units Embedded Systems: Microcontrollers, Electronics II, Electronics.

Final competences

1 KNOWLEDGE and UNDERSTANDING: Understanding and describing the operation of various sensor principles and knowledge of their application domain; Defining and declaring terms suchs as linearity, calibration, noise, precision, sensitivty and other sensor characteristics; Performing and commenting on linearization, bridge operation and push-pull action; Recognizing and explaining basic circuits for reading out sensors, such as opamp circuits, instrumentation amplifiers and bridge operation.
2 SKILLS: use of datasheets; understanding and critically reading of scientific papers; Practical experience with a few sensors and corresponding readout electronics. Being able to apply scientific knowledge for solving complex engineering problems, particularly choosing the most suitable sensor for a specific application.
3 ATTITUDES: taking unaccuracies and measurement errors into account when designing, optimizing and executing measurements for a sensor application.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Group work, lecture, practical

Extra information on the teaching methods

Theory: Lectures
Lab: practical course/project (in group). Presence during the labs on campus is compulsory.
For practical reasons, students should be enrolled for the course before the start of week 3.
In the case of exceptional hygienic conditions, modifications can be appended such as switching to a better matching teaching method.

Learning materials and price

Course notes written by lecturer (~6EUR) (in English)
Extra papers and documentation via the electronic learning platform

References

Book: Sensor Technology Handbook
Jon S. Wilson
Elsevier
ISBN: 0-7506-7729-5

Course content-related study coaching

Students can receive additional explanation:
- during or after the lectures and labsessions
- individually, after making an appointment

Evaluation methods

end-of-term and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Written assessment

Examination methods in case of periodic evaluation during the second examination period

Written assessment

Examination methods in case of permanent evaluation

Oral assessment, assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Extra information on the examination methods

First examination period:
PE1 - Theory: written examination, closed book.
NPE - Lab : Report labresults + oral exam about the practical knowledge and practical skills acquired during the labs, e.g. in the form of a presentation

Second examination period:
PE2 - Theory: written examination, closed book.

Calculation of the examination mark

50% theory + 50% lab

- In order to pass, one has tot attain a score of at least 8/20 for both periodic and permanent evaluation. If this condition is not fulfilled, and when the calculated score is 10/20 or more, the student will be failed by the examinator and gets a score of 9/20.
- If a student has a theory exam in the second examination period, then the score obtained for the lab in the first examination period will be transfered.