

Course Specifications

Valid in the academic year 2024-2025

Sensors and Interfacing (E735040)

Course size	(nominal values; actual values may depend on programme)				
Credits 6.0	Study time 180 h				
Course offerings in acad	demic year 2024-2025				
A (semester 1)	Dutch	Gent			
Lecturers in academic y	ear 2024-2025				
Willems, Brecht			TW06	staff membe	er
Missinne, Jeroen			TW06	lecturer-in-c	harge
Offered in the following programmes in 2024-2025				crdts	0
Master of Science Engineering)	in Electronics and ICT Engineering	Technology(main s	subject Electronic	s 6	

Master of Science in Electronics and ICT Engineering Technology(main subject Embedded6ASystems)Master of Science in Electronics and ICT Engineering Technology(main subject ICT)6A

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.

offering A

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.

Study material

Type: Syllabus

Name: Course notes Sensors and Interfacing Indicative price: Free or paid by faculty Optional: no Language : English Number of Pages : 110 Available on Ufora : No Online Available : No Available in the Library : No Available through Student Association : No Additional information: students will receive the printed course notes free of charge

Type: Slides

Name: Slides sensors and interfacing Indicative price: Free or paid by faculty Optional: no Language : English Number of Slides : 400 Available on Ufora : Yes Online Available : Yes Available in the Library : No Available through Student Association : No

Type: Lab Material

Name: Arduino Uno Indicative price: € 24 Optional: yes Available through Student Association : No Usability and Lifetime within the Course Unit : intensive Usability and Lifetime within the Study Programme : regularly Usability and Lifetime after the Study Programme : occasionally

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

Assessment moments

end-of-term and continuous assessment

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

Written assessment

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

Written assessment

Examination methods in case of permanent assessment

Oral assessment, Assignment

Possibilities of retake in case of permanent assessment

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.