GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2026-2027

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 2026-2027

A (semester 1)	Dutch	Gent

Lecturers in academic year 2026-2027

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

Offered in the following programmes in 2026-2027	**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, readout electronics, sensor characteristics, accuracy.

Position of the course

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

Contents

Part Theory:

- Introduction and positioning of sensors in the context of embedded systems
- In the part regarding sensor characteristics, the main properties of sensors are discussed such as sensitivity, transfer function, resolution, accuracy, DC and AC properties
- Interfacing: in this part, the most commonly used electronics for reading out sensors are discussed: opamp circuits, instrumentation amplifier, bridge circuits, etc.
- Overview of sensors, such as:
  - Temperature sensors
  - Mechanical sensors (force, pressure)
  - Light sensors, image sensors
  - Sensor technology:
  - Biosensors
  - Strain gages + optical version (fiber Bragg grating sensor)
  - Position sensors, displacement sensors
- Sensor technologies
  - Overview of the main technological processes needed to realize (integrated) sensors
  - Discussion on the fabrication of some important sensors
- Case study or guest lecture

Part Lab:

In the lab sessions, several aspects from the theoretical course are elaborated and

developed into prototypes and tested. Depending on the size of the assignments, this is done individually or in groups.

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 explaining terms such as linearity, calibration, noise, precision, sensitivity and other sensor characteristics; Performing and commenting on linearisation, 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 to solve complex engineering problems, particularly choosing the most suitable sensor for a specific application.
3 ATTITUDES: taking inaccuracies and measurement errors into account when designing, optimizing and executing measurements for a sensor application. Critically evaluate obtained measurement results.
4 SKILLS: Communicate and present results in a scientifically accurate manner, and be able to defend the decisions made.

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 conditions, modifications can be appended such as switching to a more suitable teaching method.

Study material

Type: Syllabus

Name: Course notes Sensors and Interfacing
Indicative price: € 5
Optional: no
Language : English
Number of Pages : 110
Available on Ufora : No
Online Available : No
Available in the Library : No
Available through Student Association : Yes

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 lab sessions
- 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 lab results + 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 to 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 examiner and gets a score of 9/20.
- If there is clearly a different input from the various group members, then the final grading per student belonging to the same group may differ.
- 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 transferred.
- The final score for the practical exercises is obtained by multiplying the assessment for the practical exercises (lab-examination) by (12-X)/12, where X is the number of illegitimate absences. A legitimate absence should not be overtaken.