GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Sensor Based Measurement Systems (E032322)

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

Credits 3.0 **Study time 90 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 2)	English	Gent	lecture
B (semester 2)	Dutch	Gent	

Lecturers in academic year 2024-2025

De Smet, Herbert	TW06	lecturer-in-charge

Offered in the following programmes in 2024-2025	crdts	offering
Bridging Programme Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	3	A
Bridging Programme Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	3	A
Bridging Programme Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	3	A
Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)	3	B
Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	3	B
Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	3	A
Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	3	B
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	3	B
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	3	A
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	3	B
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	3	A
Master of Science in Computer Science Engineering	3	A

Teaching languages

English, Dutch

Keywords

Sensors, measurements, data-acquisition, microcontrollers

Position of the course

This course covers the electronic measurement of several physical quantities, using sensors, data acquisition and signal processing. This course is divided into two parts. Part 1 describes the general characteristics of a measurement system: principles of signal conditioning (sensor principles, data transmission, data acquisition and signal processing) and characterisation (static and dynamic). Part 2 describes examples for measuring strain, pressure, gasses, temperature, humidity, displacement, power consumption, acceleration,... Attention is paid to sensors made by MEMS technology.

Contents

- Part 1: signal conditioning, characterisation
- Part 2: analogue sensors, digital sensors

- Extra document: introduction of the group work

Initial competences

Electronic systems and instrumentation (or equivalent)

Final competences

1 Understand and describe the operation of sensors and signal conditioners
2 Dealing with inaccurate measurement data in a judicious way; eliminate or take into account interferences and digitizing artifacts.
3 Programming of microcontrollers for data acquisition and programming in Python to process measurement data.
4 Collaborate in a small group on a project to design and realize a practical sensor based measurement system.

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

Extra information on the teaching methods

Lectures on campus if can be organised in a safe manner, online as a fall-back solution.
Group work: in small groups, spread over several sessions during the whole semester, a working sensor based measurement system is designed and built, comprising both the hardware (signal conditioning) and software (microcontroller software and processing software on the PC).

Study material

Type: Syllabus

Name: Sensor Based Measurement Systems
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Pages : 159
Available on Ufora : Yes
Online Available : Yes
Available in the Library : No
Available through Student Association : No

Type: Slides

Name: Sensor Based Measurement Systems
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Slides : 228
Available on Ufora : Yes
Online Available : Yes

Type: Other

Name: Completely equipped practicals room including a supply of electronic components
Indicative price: Free or paid by faculty
Optional: no
Usability and Lifetime within the Course Unit : intensive
Usability and Lifetime within the Study Programme : intensive
Usability and Lifetime after the Study Programme : not

References

- E.U. Doebelin "Measurement Systems", Mc Graw-Hill, 4th. Ed., New York (1990)

Course content-related study coaching

4-5 researchers

Assessment moments

end-of-term and continuous assessment

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

Oral assessment

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

Oral assessment

Examination methods in case of permanent 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

During examination period: oral closed-book exam (with written preparation if organised on campus, without written preparation if organised online); followed by brief interview about group work. If the number of students is more than 65, the option of a written exam with closed book will be considered. This decision will be announced well in advance of the exam.
Year work (= continuous assessment): assessment of group work (possibly including peer assessment), deliverables (including hard and software), final report.

Calculation of the examination mark

50% exam + 50% year work

Facilities for Working Students

Work students cannot be exempted from the compulsory participation in the group work.