

## 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
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**Offered in the following programmes in 2024-2025**

	crdts	offering
<a href="#">Bridging Programme Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)</a>	3	A
<a href="#">Bridging Programme Master of Science in Electromechanical Engineering(main subject Mechanical Construction)</a>	3	A
<a href="#">Bridging Programme Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)</a>	3	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)</a>	3	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)</a>	3	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)</a>	3	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Maritime Engineering)</a>	3	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Construction)</a>	3	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Construction)</a>	3	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)</a>	3	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)</a>	3	A
<a href="#">Master of Science in Computer Science Engineering</a>	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.