

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 2023-2024

A (semester 2) English Gent lecture

B (semester 2) Dutch Gent

Lecturers in academic year 2023-2024

De Smet, Herbert TW06 lecturer-in-charge

Offered in the following programmes in 2023-2024

	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

Dutch, English

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).

Learning materials and price

Complete syllabus and slide set in English, available through the electronic learning environment

References

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

Course content-related study coaching

4-5 researchers

Evaluation methods

end-of-term and continuous assessment

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

Oral assessment

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

Oral assessment

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

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