Course Specifications

Valid as from the academic year 2016-2017

Sensors and Actuators (E008440)

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

Credits 4.0	**Study time 120 h**	**Contact hrs**	37.5 h

Course offerings and teaching methods in academic year 2016-2017

A (semester 2)	lecture	15.0 h
	project	12.5 h
	practicum	10.0 h

Lecturers in academic year 2016-2017

De Smet, Herbert	TW06	lecturer-in-charge

Offered in the following programmes in 2016-2017	crdts	offering
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	4	A
Master of Science in Biomedical Engineering	4	A
International Master of Science in Biomedical Engineering	4	A
Master of Science in Biomedical Engineering	4	A
Master of Science in Computer Science Engineering	4	A
Master of Science in Computer Science Engineering	4	A

Teaching languages

Dutch, English

Keywords

sensor operation principles, accuracy, calibration, linearisation, datasheet, bridge, noise, shielding, system analogies, instrumentation software, LabView, interfacing, data transport

Position of the course

This is a basic course about sensors and actuators, that assumes a basic knowledge of electronics.
It aims at teaching the students to take in to account the possibilities and limitations of the different sensor types and to gain some hands-on experience in interfacing them.

Contents

- Introduction
- Primary sensors
- Sensor electronics and signal conditioning
- Sensor types
- Actuators

Initial competences

Having successfully completed "Analogue Electronics" or "Electrical Networks" (+ a good external knowledge of operational amplifiers) or "Electronic Systems and Instrumentation"; or having acquired the equivalent competences in another way.

Final competences

1. Understand and discuss the operation of electromotive, resistive, capacitive, inductive and primary sensors and actuators
2. Explain linearity, calibration, noise, precision, sensitivity and other sensor characteristics; Explain and/or derive linearization, bridge circuits, differential ('push-pull') operation
3. Using sensors and actuators in practical applications, including the consulting of

datasheets, the use of instrumentation software, the implementation of hardware (PC-) interfacing and dealing with electromagnetic interferences and other limitations of data transmission in a mature way

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

Lecture, practicum, project

Learning materials and price

Syllabus: English. +/- 130 pages, sold by Student organisation VTK.
Viewfoils: English - free via Minerva website

References

- [1] J. Fraden, "Handbook of Modern Sensors" (AIP)
- [2] R. Pallàs-Areny / John Webster, ?Sensors and signal conditioning? (Wiley and Sons)
- [3] Ilene J. Busch-Vishniac, ?Electromechanical Sensors and Actuators?
- [4] Georges Asch, "Les Capteurs en Instrumentation Industrielle"
- [5] John P. Bentley, "Principles of Measurement Systems"
- [6] P. Rai-Choudhury, "Handbook of Microlithography, Micromachining and Microfabrication, Volume 2"
- [7] Aldert Van Der Ziel, "Noise", Prentice-Hall
- [8] James J. Allen, "Micro Electro Mechanical System Design", Taylor & Francis (Available via "EngNetBase")

Course content-related study coaching

Interactive via Minerva (forums, e-mail)

Evaluation methods

end-of-term evaluation and continuous assessment

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

Oral examination

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

Oral examination

Examination methods in case of permanent evaluation

Skills test, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

During examination period: oral closed-book exam, written preparation
During semester: graded project reports; graded lab sessions. Second chance: Possible in adapted form
Frequency: 2 lab exercises and 1 project

Calculation of the examination mark

Evaluation throughout semester as well as during examination period. Special conditions: Exam 2/3 and (lab exercises + project) 1/3