



## HÖGSKOLAN I GÄVLE

### Sensors and Measurement Technology 7.5 cr

*Sensorer och mätteknik 7,5 hp*

Set by Faculty of Engineering and Sustainable Development

#### Version

Set at	Valid from
10/11/13	VT2015
6/7/16	HT2016

<b>Level</b>	A1N
<b>Education level</b>	Second cycle
<b>Course identifier</b>	EEA002
<b>Credits</b>	7.5 cr
<b>Main field of study</b>	Electronics
<b>Subject group</b>	Electronics
<b>Disciplinary domain</b>	Technology 100.0 %

**Learning outcomes** The aim of the course is to give theoretical and practical knowledge and understanding of different types of sensors and the error analysis that is needed in real world scenarios. In a mandatory assignment a sensing system should be designed for a realistic application.

After completion of the course the student shall be able to

1. describe the physical principles of operation of common types of sensors
2. describe the technical and physical limits in the use of common types of sensors
3. state how to select the correct type of sensor for a given requirement
4. make an error analysis using real sensory data
5. explain accuracy, precision, and error propagation
6. describe how to compensate for a sensor's transfer function
7. explain the basics of sensor fusion and how to use it to enhance the quality of sensory data.

**Course content** Various types of sensors  
- electrical sensors  
- optical sensors  
- microwave sensors

- thermal sensors
- accelerometers
- Error analysis
- error propagation
- accuracy and precision
- quantization error
- Compensation
- linearization
- equalization
- Sensor fusion
- sensor fusion for obtaining quantities that cannot be directly measured
- sensor fusion for improved accuracy
- sensor fusion for redundancy

**Teaching** The education is performed as lectures, exercises, and laboratory work/assignments. The laboratory work/assignments is normally performed in groups of two students. Emphasis is put on the student's capability of accomplishing and reporting the work. The lectures and exercises are not mandatory for the student. However, participation in laboratory work and assignment tasks is mandatory.

**Prerequisites** English language proficiency equivalent to (the Swedish upper secondary school) English course 6/B.  
B.Sc. degree in Electronics, Electrical Engineering or equivalent.

**Examination** Written examination, Laboratory Exercise and Assignments

**Grade** A, B, C, D, E, Fx, F

**Other regulations** Criteria for final grade will be given at the beginning of the course.

**Sustainable environment** A minor part of the course content deals with sustainable development.

<b>Module</b>			
	0030	Written examination	3.5 cr      Grade: AF
	0040	Laboratory exercise	2.5 cr      Grade: UG
	0050	Assignments	1.5 cr      Grade: AF