



## HÖGSKOLAN I GÄVLE

### Measurement Techniques for Building Energy and Indoor Climate 7.5 cr

*Mätteknik för energi och inneklimat i byggnader 7,5 hp*

Set by Faculty of Engineering and Sustainable Development

**Version**

**Set at**

**Valid from**

9/14/11

**HT2011**

<b>Level</b>	A1F
<b>Education level</b>	Second cycle
<b>Course identifier</b>	ME556D
<b>Credits</b>	7.5 cr
<b>Main field of study</b>	Energy Technology
<b>Subject group</b>	Energy Technology
<b>Disciplinary domain</b>	Technology 100.0 %

**Learning outcomes**

After completed course the students are expected to be able to

1. give an account of the measurement techniques dealt with in the course regarding:
  - underlying physics
  - essential technical functioning of measurement instruments
  - applicability and limitations
2. show practical ability regarding the measurement methods and instruments dealt with in the laboratory work of the course
3. calculate and present the uncertainty of measurement results in accordance with international standards
4. suggest appropriate measuring strategies for practical cases
5. present results of laboratory experiments orally and in written reports according to international scientific practice
6. evaluate and critically discuss measurement reports in view of method and uncertainty aspects.

**Course content**

The course deals with practical measurement techniques that concern

building energy consumption and factors in the indoor environment that affect health, comfort and working performance of people. Also building preservation is addressed.

The main measurement items are:  
Temperature (incl. IR-thermography)  
Pressure  
Fluid flow rate  
Air velocity and flow visualization  
Thermal comfort  
Building tightness and air leakage  
Air change rate (tracer gas techniques)  
Wind effects on buildings and power stations  
Humidity and moisture in buildings  
Power and energy consumption of electrical appliances  
Instrument calibration and uncertainty

**Teaching** Lectures of the course include measurement theory as well as demonstration and practical handling of a diversity of measurement equipment. At the end of the course, five laboratory works will be performed. Results of the laboratory works will be evaluated in groups and discussed at a concluding seminar.

**Prerequisites** The master courses “Indoor environment” and “Building energy systems” or equivalent.

**Examination** Examination includes fulfilled assignments and active participation on the following items:

**Grade** Pass and Fail

**Sustainable environment** The majority of the course content deals with sustainable development..

**Module**

0010	Laboratory work 1	1.5 cr	Grade: UG
0020	Laboratory work 2	1.5 cr	Grade: UG
0030	Laboratory work 3	1.5 cr	Grade: UG
0040	Laboratory work 4	1.5 cr	Grade: UG
0050	Laboratory work 5	1.5 cr	Grade: UG