



## HÖGSKOLAN I GÄVLE

### Thermal Comfort and Indoor Climate 7.5 cr

*Termisk komfort och inomhusmiljö 7,5 hp*

Set by Faculty of Engineering and Sustainable Development

**Version**

**Set at**

**Valid from**

12/12/12

**VT2013**

<b>Level</b>	A1F
<b>Education level</b>	Second cycle
<b>Course identifier</b>	ME545D
<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**

1. state the effects of heating and ventilation on indoor air quality and thermal comfort
2. state the effects of heating and ventilation on working expenses and indoor environment
3. construct HVAC-systems (Heating, Ventilation and Air Conditioning)
4. describe the use of energy in a building
5. describe the environmental building assessment and various assessment schemes and tools commercially available

**Course content**

The objective of this course is to provide a thorough understanding of how ventilation and heating/cooling affect thermal comfort, and air quality indoors, and how this, in turn reflects on energy management in the built environment. Thermal comfort and space-conditioning are analysed against the background of human physiological requirements. Different methods for evaluating thermal comfort and indoor climate are presented as applicable in different indoor environments (industries, offices, dwellings, etc.). Factors affecting air quality are analysed. Gaseous and particulate indoor air pollutants are discussed with regard to acceptable concentrations, health effects, existing regulations/standards and control measures. Ventilation demand and ventilation effectiveness are discussed as determined by requirements

of pollutant and heat removal in different indoor environments. Methods for estimating/calculating the energy flows required for achieving specific levels of thermal comfort and air quality are analysed as relevant to energy management in the built environment. The influence of architectural aspects is presented and analysed. The concept of environmental building assessment is presented together with assessment schemes and tools commercially available. Occupant behaviour is discussed as relevant to the possibilities of enhancing energy efficiency. A study visit to a relevant site/facility is arranged.

<b>Teaching</b>	All course activities consist of internet-based lectures and tutorials.		
<b>Prerequisites</b>	Basic thermodynamics 7.5 credits Basic Heat Transfer 7.5 credits Basic Fluid Mechanics 6.0 credits Energy Utilization 9.0 credits or equivalent courses		
<b>Examination</b>	All Exams are web-based. There are three basic exams: Midterm exam 1 (20%), Midterm exam 2 (20%) and Final exam (60%). Final exam includes all chapters of course literatures.		
<b>Grade</b>	A, B, C, D, E, Fx, F		
<b>Sustainable environment</b>	The majority of the course content deals with sustainable development..		
<b>Module</b>	0010 Written examination	7.5 cr	Grade: AF