Zurich University of Applied Sciences

School of Engineering

t.ENVT1 - Energie- und Verfahrenstechnik 1

Person responsible for the course:	Frank Tillenkamp, till
Credits:	4
Valid for:	2010/2011
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Learning objectives:

- Acquiring the fundamentals for the design of energy and process systems
- Broadening the scope of phenomena which make up the subject of standard energy con-version processes and alternative energy options and to mechanical and mass transfer processes.
- Deepening fluid mechanics, thermodynamics, and heat and mass transfer processes and transferring them to the design of energy equipment and process technology systems
- Introducing the dimensionless groups/analysis, developing the concept of unit operations and applying them to the design of apparatuses, machines and systems
- Developing skills to tackle new engineering problem in the broad field of energy and process technology

Course content:

Lectures:

- Exergy and anergy
- Clockwise running working cycles (steam-powered and gas-fired turbines, engines and combustion)
- Thermodynamic calculations of combustion of gaseous, liquid and solid fuels
- Thermodynamic table and charts of steam: changes of state and process design (steam generation, thermal Carnot and other cycles, thermal power plants, combined heat and power generation)
- Refrigerants and refrigeration processes and other heat pump applications
- MOLLIER diagram of humid air, air conditioning processes, drying processes
- Characterisation of particles and particle size distributions
- Particle separation by screening with sieving machines
- Particle separation in fluids: sedimentation, cyclone separation and centrifugation
- Solid-fluid separation: flows through fixed, fluidized beds and porous media, pressure drop and heat and mass transfer; filtration and membranes, devices
- Drop and spray formation, film and bubble flow; gas-liquid-contacting devices and gas cleaning
- Mixing mechanisms and segregation, measures of homogeneity; dynamic mixers for liquids and solids, motionless mixers

Practical:

- Heat transfer from heating wall, in air-water heat exchanger, condenser
- Transient temperature distribution in a stone bed
- Examination of the heat exchanger-cycle
- Examination of the water flow in a channel
- Screening and particle-size
- Fluid dynamics of fixed bed and batch cooling of products in a fluidised bed
- Dynamic and static mixing
- Individual topics from energy systems engineering, thermodynamics, fluid mechanics and process engineering

Previous knowledge:

The knowledge of Fluid- and Thermodynamics 1-3 is fundamental for this course.

Teaching method:

Type of lesson:	Number of lessons per week:
Lecture	14x4L
Tutorial/Practicum	
Group teaching	
Block instruction	
Seminar	

Assessment:

According to the table or as specified in writing by the lecture at the beginning of the semester!

Number	Type	Weighting
1	End of term exam	
	Exam during the semester	
	Further assessments	

Language of instruction:

Deutsch

Instruction material:

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Comments:

Additional project assignments with 3.0 ECTS-Credits with subjects from the course contents are realized and accounted separately.