

## Syllabus Course description

Course title	"Tools for empirical and numerical assessment of energy systems"
Course code	
Scientific sector	ING-IND/11
Degree	PhD in Sustainable Energy and Technologies
Semester	1
Year	1
Academic year	2016/2017
Credits	3
Modular	No
Total lecturing hours	24
Total lab hours	0
Total exercise hours	0
Attendance	At least 75 % of each lecturer's hours
Prerequisites	-
Course page	-

measurements for Validating the models
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## Freie Universität Bozen

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Libera Università di Bolzano Università Liedia de Bulsan

Lecturer	Giovanni Pernigotto, PhD K0.07, giovanni.pernigotto@unibz.it, T: +39 0471 017632
Scientific sector of the lecturer	ING-IND/11
Teaching language	English
Office hours	According to individual arrangement by email
Teaching assistant (if any )	-
Office hours	-
List of topics covered	<ul> <li>Introduction to the air heat balance for the characterization of the energy performance of buildings</li> <li>Modelling of the building system with EnergyPlus</li> </ul>
Teaching format	Frontal Lecture, exercises with notebooks

Lecturer	Alessandro Prada, PhD alessandro.prada@unitn.it
Scientific sector of the lecturer	ING-IND/11
Teaching language	English
Office hours	According to individual arrangement by email
Teaching assistant <i>(if any )</i>	-
Office hours	-
List of topics covered	<ul> <li>Modelling of air-conditioning systems and hot water systems with EnergyPlus</li> <li>Monitoring air-conditioning systems in the existing building stock</li> </ul>
Teaching format	Frontal Lecture, exercises with notebooks

Lecturer	Francesca Cappelletti, PhD francesca.cappelletti@iuav.it
Scientific sector of the lecturer	ING-IND/11
Teaching language	English
Office hours	According to individual arrangement by email
Teaching assistant (if any )	-
Office hours	-
List of topics covered	<ul> <li>Modelling of the building system with TRNSYS</li> <li>Simulation of the existing building stock: input data collection through in situ and laboratory measurements</li> </ul>
Teaching format	Frontal Lecture, exercises with notebooks

Lecturer	Francesco Patuzzi, PhD K0.07, francesco.patuzzi@unibz.it, T: +39 0471 017609
Scientific sector of the lecturer	ING-IND/10
Teaching language	English
Office hours	According to individual arrangement by email
Teaching assistant (if any )	-
Office hours	-
List of topics covered	Mass and energy balance of energy generation systems,



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	<ul> <li>with a particular focus on biomass boilers and CHP</li> <li>Implementation of thermodynamic calculations by means of Cantera toolbox</li> <li>System modelling through the integration of the single components' codes in a Matlab-Simulink environment</li> </ul>
Teaching format	Frontal Lecture

Learning outcomes	Knowledge and understanding:
_	Understanding and modelling the main heat transfer
	mechanisms and the air heat balance of the indoor
	environment. Understanding and modelling the main
	terms involved in the mass and energy balances of an
	energy generation system.
	Applying Knowledge and understanding:
	Use of building energy simulation codes to analyse the
	energy performance of buildings under unsteady
	conditions, with EnergyPlus and TRNSYS.
	Use of Cantera codes for thermodynamic calculations and
	integration in Matlab-Simulink environment for system
	modelling.
	Making judgments:
	Understanding main possibilities and limitations of
	building energy simulations, focusing in the context of the
	built environment. Analyzing of the role of uncertain
	inputs in simulation.
	Understanding when thermodynamic equilibrium
	approaches are worth to be applied and which strategies
	can be implemented for the modelling of real energy
	systems.
	Communication skills:
	Discussing the thermal behavior of simple thermal zones.
	identifying main contributions of the building energy
	halance.
	Discussing the main issues in modelling and monitoring a
	real system for obtaining experimental measurements for
	validating the models.
	Learning skills
	Ability of collecting data, developing models and run
	simple simulation to characterize built environments and
	energy generation systems.
Assessment	No formal test scheduled
Assessment language	Fnalish
Fvaluation criteria and	
criteria for awarding marks	
Required readings	
Supplementary readings	"Building Performance Simulation for Design and
. r <i>i </i>	Operation" by Jan L.M. Hensen, Roberto Lamberts
	(Editore)

(Editors)"Energy Simulation in Building Design" by JA Clarke