REHVA
Federation of European Heating, Ventilation and Air Conditioning Associations

REHVA COURSE at CLIMA 2019

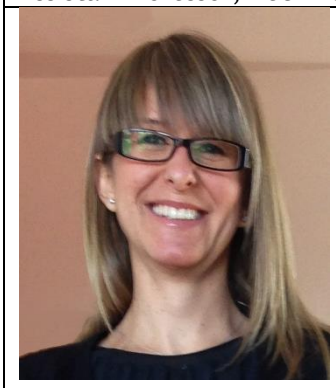
NZEB design: approach, principles and best practices

Teachers

Stefano Paolo CORGNATI	
Full Professor, Politecnico di Torino	
	Stefano Paolo Corgnati, graduated with honors in Mechanical Engineering and Ph.D in Energetics, is Full Professor at the Energy Department and Vice Rector for Research at the Politecnico di Torino. He teaches building physics, building energy systems and sustainable building design at the Faculty of Architecture. He works in the TEBE Research Group focusing on energy and buildings and indoor environmental control. He is the author of more than 250 scientific, technical and didactic publications, mainly concerning: radiant panels technologies, objective and subjective assessment of indoor environmental comfort, building energy certification, influence of occupant behaviour on building energy consumption and cost-optimal design of zero energy buildings. For the quality of his research activity, he won in 2009 the Rehva "Young Scientist Award". Moreover, in 2011 he was nominated "Rehva Fellow". He is involved in a number of National, European and International Research Projects on building energy consumptions. He is also chair of the REHVA Task Force on "NZEB design strategies for Mediterranean region".

Cătălin LUNGU	
Associate Professor, Technical University for Civil Engineering	
	Associate Professor at The Technical University for Civil Engineering since 1996 where he teaches heating systems and computational methods for energy performance of buildings , he graduated PhD in Civil Engineering (2004) at the Technical University for Civil Engineering from Bucharest with specialised training at the University Paris XII Val de Marne, France; he is invited professor at the Technical Military Academy in Bucharest and at the Ecole Nationale Superieure de l'Energie, l'Eau et l'Environment ENSE 3 in Grenoble, France. Since 2016 he is vice-dean of the Building Services Engineering Faculty and since 2012 Senate member of The Technical University for Civil Engineering. He is also vicepresident of AIIR-The Romanian Association for Building Services Engineers since 2012, since May 2017 vice-president of REHVA (and REHVA fellow since 2016), and chair of the organising committee of the HVAC world congress CLIMA 2019 (2016-2019). His main research areas are the Dynamic Modelling of HVAC systems and buildings,

	nZEB Buildings (BREEAM Assessor and energy auditor); he was director of 2 research projects and member in other 4; member in 4 technical committees of ASRO (Romanian Standardisation Agency). Publications-5 books (co-author), more than 40 articles.

Cristina BECCHIO	
Assistan Professor, Technical University for Civil Engineering Bucharest	
	Cristina Becchio, graduated with honors in Architecture and Ph.D. in Technological Innovation for Built Environment, is currently Assistant Professor at the Energy Department of the Politecnico di Torino. She teaches Building Physics in the courses of Architecture of PoliTO. She works in the TEBE Research Group focusing on energy and buildings. In particular, her activity deals with energy performance assessment of buildings using dynamic simulation software, financial valuations with the application of cost-optimal methodology, economic estimations using methods as cost-benefit and multicriteria analysis, and evaluations of indoor environmental quality and its effects on users' health, well-being, comfort, productivity and satisfaction. She is also the operative coordinator of the REHVA Task Force on "NZEB design strategies for Mediterranean region".

Introduction to the training

A clear design approach to follow, starting from the very first conceptual phase, is fundamental to get the target of developing a zero-energy building up to a positive energy building. Nowadays, the problem is not to find suitable technologies but to apply innovative technologies in a systemic way, considering at the same time their energy, environmental and economic effect. The selection of the proper mix of energy technologies is the crucial issue in the design phase, and the cost optimal approach can be a powerful tool to compare solutions and select the best one. Indeed, in NZEB designing it is fundamental taking into account both the energy and the financial perspective right from the preliminary phases of the project. Success in realizing NZEBs lies in finding the right balance between energy performances, architectural quality and costs, which include investment, maintenance and running costs, incurred by the project owner during a defined period.
In this course, the design principles for an NZEB are not only introduced and discussed, but also their application is examined by analysing successful case studies.

Target audience of the training

The target group of the training are professionals interested in getting the full vision about the design methodologies considering practical implication too. The course in also addressed to Master and PhD students that want to deepen their knowledge about the design approach for NZEB.

After this training you will:

- clarify the design approach for a NZEB
- illustrate the difference in NZEB principles moving from cold to hot climate
- analyse the suitable technologies according to the different energy targets
- use cost-optimality as a tool to compare solutions.

Contents

- Designing and building a NZEB represents, since the first concept, a challenge between strictly costs controlling and reaching high energy efficiency targets, taking into account also architectural quality and elevated level of indoor comfort.
- The challenge of planning and building high performance buildings is of increasing interest in

South Europe and in Mediterranean countries. The specifics of Mediterranean climate, in which winter heating loads and summer cooling loads have to be balanced, require a detailed re-visitation of the approaches aimed at reducing energy consumptions of buildings.

- The designers face with a multitude of opportunities, which have to be taken up by mixing traditional constructive measures and approaches and new technologies available on the market. An increasing awareness of the need of specifics in designing zero-energy buildings and the ability in reinterpreting the existing design experiences have to be consolidated; different climatic conditions require ad hoc design, specific for each building.
- Cost-optimal analysis bands together energy and financial performances of different design configurations and identifies the so-called cost-optimal level that represents the energy performance solution which leads to the lowest cost during the economic building lifecycle. Specifically, the methodology represents a decision-making tool to guide design team and owners' choices. Nowadays, maybe the simple cost-approach is not sufficient, but it is necessary to take into account also benefits and co-benefits in order to evaluate in a complete way different NZEB solutions.
- Case studies analysis.