

Assessing heating and cooling energy needs in dynamic building simulation with TRNSYS

Held by

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Venue: Aula Didattica 1, ground floor, Polo "Idraulica", Via Carlo Francesco Gabba 22, Pisa

Date: 15 hours

Wednesday, October 22nd, 2025, 14:30-17:30 (Tentative, to be confirmed)

Thursday, October 23rd, 2025, 14:30-17:30 (Tentative, to be confirmed)

Wednesday, October 29th, 2025, 14:30-17:30 (Tentative, to be confirmed)

Thursday, October 30th, 2025, 14:30-17:30 (Tentative, to be confirmed)

Abstract

The building sector is responsible for about 40% of the final energy use. So, the assessment of actual energy demand for heating and cooling services, the identification of the most inefficient subsystems and the choice of actions for upgrading have become topical research issues.

Full dynamic simulations of envelope-HVAC systems are the most complete and accurate methods to calculate the energy needs of buildings and seek for the most cost-effective solutions to reduce the consumption.

In this course, TRNSYS 18 software will be presented as a tool to carry out the energy audit procedure, simulating the envelope-HVAC systems. The software calculates thermal losses due to transmission and ventilation, internal and solar gains, and the effects of thermal inertia. The efficiency of the heating/cooling system is assessed through a comprehensive model of all the HVAC subsystems.

Finally, we will discuss some methods for the post-processing of the obtained data. The discussions are going to be aimed at presenting and highlighting the main results through typical plots and indexes.

The course is addressed to PhD students, post-doc researchers and anyone interested in exploring energy audit for buildings through dynamic simulations. The course will include class exercises and live simulations.

Agenda

Day #1

Basic features of TRNSYS – TRNBuild and case studies

- TRNSYS 18 setup
- Definition of envelope elements in TRNBuild
- Examples and case studies

Day #2

Basic features of TRNSYS – TRNBuild and case studies

- Definition of windows elements in TRNBuild
- Definition of schedules, heating and cooling setpoints
- Examples and case studies

Day #3

Basic features of TRNSYS – Simulation Studio and case studies

- Definition of external climate and other boundary conditions
- Definition of HVAC system characteristics
- Examples and case studies

Day #4

Integration of TRNBuild and Simulation Studio - Post-processing of the data

- Importance of input data and sensibility analysis
- Definition and evaluation of typical indexes for energy efficiency
- Creation of typical graphs and plots to represent the most relevant outcomes of the dynamic building simulation
- Examples and case studies