COURSE PROGRAMME

ICT in building design

prof. G.Chiesa & prof. L.Bottaccioli

CEAR-08/C – IINF-05/A
Progettazione tecnologica e ambientale dell'architettura – Sistemi di elaborazione delle informazioni .

Lecture time

- Tuesday (presence)

Room 11S

14:30 – 17:30

- Wednesday (presence)

Room 4M

08:30-10:00

Note:

20/11 lecture moved in the afternoon at the Valentino POLITO site

Topics

- L-BD 1 Course programme and exam rules
- L-BD 2 - Introduction to sustainable design & cityfutures
- L-BD 3 - Building as a system - part A, B, C
- L-BD 4 - Introduction to smart buildings
- L-BD 5 - Building modelling
- L-BD 6 - EPBD and Building envelope and modelling
- L-BD 7 - Schedule and standard reference values
- L-BD 8 IDF EnergyPlus input file
- L-BD 9 - Thermal comfort
- L-BD 10 - ventilation and shading systems + control logic IDF
- L-BD 11a - Daylighting in buildings: requirements and performance calculation and control
- L-BD 11b - Artificial lighting
- L-BD 11c - LENI

IP students on shading and lighting

- L-BD 12 - IAQ
- LBD 13 - Building model calibration

 # PRELUDE EVENT. ICT Didactic Activities Exhibition

IP students' comfort monitoring kits

- L-BD 14 - climate data elaborations and usage in simulation
- L-BD 15 - Introduction to digital architecture

- L-ICT 1 - Course programme and exam rules
- L-ICT 2 - Principles of Thermodynamics
- L-ICT 3 - BMS
- L-ICT 4 - IoTL-ICT surrogate design / white-grey-black

- Lab-01 Exercise introduction & basic KPIs
- Lab-02 Group definition
- Lots of group ex. Checks

PRELUDE EVENT. ICT Didactic Activities Exhibition

- 20 November 2024

The 1.5h morning lecture is moved to the afternoon at

POLITO, Valentino Castle, Salone d'onore | Viale Pier Andrea Mattioli 39 - Torino

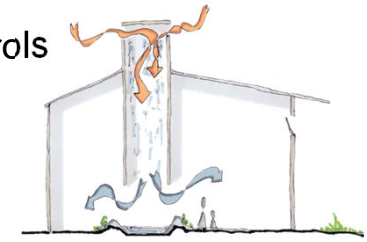
Registration will be required in any case being followed by a catering event

TOPIC: conclusion education activities of the PRELUDE H2020 Project

- involving Polito (arch & ICT) students in project development,
- international lecture/conference series,
- large citizenscience involving 6 schools in the Piedmont Region (IEQ/IAQ measurements and activation).

Building treated topics

- Introductive aspects supporting a direct dialogue with building-correlated professions
- Building energy/sustainable open topics connected to intelligent buildings and basic directives (EPBD, SRI, EN 16798-1...)
- Building modelling and dynamic simulation aspects and tools, building monitoring samples
- ENVIRONMENTAL COMFORT issues & controls
  - Thermal comfort
  - Visual comfort
  - IAQ (air quality comfort)
  - (acoustic comfort)



ICT treated topics

- Basics of building physics
- ICT role in building design and operation
- Design parameter optimization
- Surrogate model
- Operational phase modelling
- Platforms for smart buildings

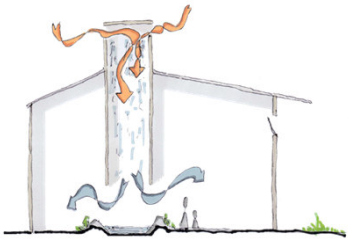
ICT and BD treated topics

Parametric Optimisation of smart/intelligent

Building operation and building design choices

By using white, black and grey **modelling** techniques

Including building and built environment variables and constraints



College of Electronics and Telecommunication Engineering, and Physics – Master Degree in ICT for Smart Societies
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Exercise topics

NOTE: Exercises simulate tangible professional aspects connected to ICT/IT usage in the building domain. → building management optimisation (operational) & building design choice opt.

Part 1 synthesises three main aspects (Building Design/Rating):

- Support optimising design choices (specific Nexus series follow that)
- Support retrofitting analyses
- Describe building-weather & building-energy correlations till the passage from white to black box models

Part 2 synthesises ... Main aspects (Building Operation):

- Smart building systems (simulation acts like sensors feeding database)
- Energy/temperature(comfort) forecasting
- BMS data flows (simulation used as sensor/actuator managed via external platforms)

Disclaimer: this material cannot be used or diffused outside this classroom

Exercise topics

DesignBuilder

EnergyPlus

Grafana

influxdb

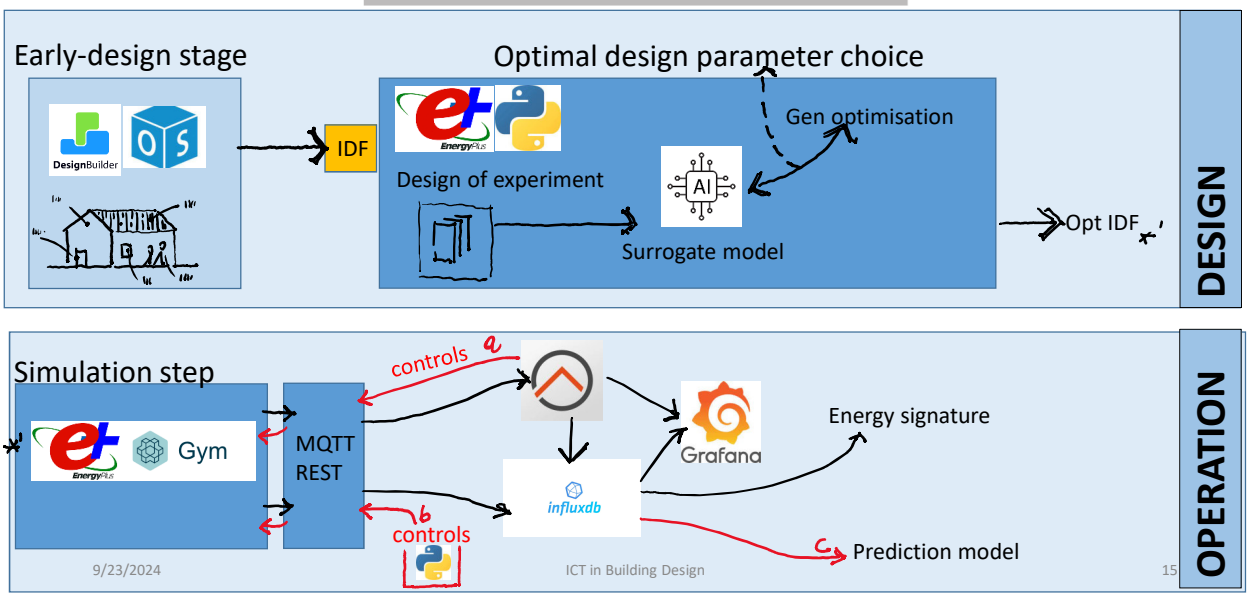
AI

Gym

Basic exercise (compulsory)

Adv. exercise (suggested)

Exercise topics



تخصیص نمرات نهایی

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EXAM PROCEDURE (from course page)

The final exam with relevant scoring will include:

- a test to assess theoretical knowledge acquired during the course (weight: 40% of the final score; duration: 1 h) – consultation of supporting tools and material is not allowed;
- an evaluation by the teachers of the final results of the exercises carried out during the course (data, analyses, code and VM) and presented in a book/report one week before the final exam (weight: 40%);
- a slide presentation of the results of the exercises carried out during the course and discussion about them to check students' comprehension of the learning process (weight: 20%; duration: 20 minutes per student team).

٪40 تمرینات

٪20 ارائه 20 دقیقه‌ای گروهی از تمرینات

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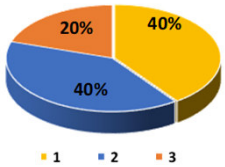
EXAM PROCEDURE

The Exam will be based on the following steps:



1. **Written test**
   (individual - theoretical aspects and lectures)
2. **Exercises (ex. development + VM + final report)**
   (group work – delivery one week before the exam date)
3. **Oral presentation**

Professors

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• Lorenzo Bottaccioli
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Useful materials

Past years, work results (the exercise has changed!!)

- 2019 Parametric Optimization of Window-to-Wall Ratio for Passive Buildings Adopting A Scripting Methodology to Dynamic-Energy Simulation, https://doi.org/10.3390/su11113078
- 2020 Assessing Optimal U-value in Residential Buildings in Temperate Climate Conditions Considering Massive Dynamic Simulation and Statistical Uncertainty, https://dx.doi.org/10.1007/978-3-030-30841-4_25 https://hdl.handle.net/11583/2781354
- 2019 Ventilative cooling effectiveness in office buildings: a parametrical simulation, https://hdl.handle.net/11583/2732606
- 2018 Insulation, building mass and airflows provisional multivariable analysis, https://hdl.handle.net/11583/2723216