

# Building thermal analysis - Regulation and Simulation



## SCHOOL

Polytech Graduate School of Engineering



## CAMPUS

Belle-Beille



## LEVEL

Engineering 3rd year



## OPEN TO EXCHANGE STUDENTS

Yes



## SEMESTER

Spring (S2)

- > **Degree course:** Building and Safety
- > **Teaching unit:** Energy and Fluids
- > **Course language:** English
- > **Duration (hours):** 36
- > **ECTS:** 2
- > **Teacher(s):** Marie-Lise PANNIER

### > Assessment:

- Continuous assessment
- Final exam

### > Teaching methods:

- |   |    |       |                                     |
|---|----|-------|-------------------------------------|
| <input checked="" type="checkbox"/> Lecture course  | 8  | hours | <input type="checkbox"/> Case study |
| <input checked="" type="checkbox"/> Tutorial course | 8  | hours | <input type="checkbox"/> Project    |
| <input checked="" type="checkbox"/> Practical work  | 20 | hours |                                     |

## COURSE DESCRIPTION

- Heat transfer: conduction, convection and radiation (recall);
- Heat losses through opaque and glazed walls (thermal resistance R, thermal transmittance U), through thermal bridges and by air renewal and infiltrations;
- Solar and internal gains;
- Useful gains, avoiding overheating in summer, thermal inertia, bioclimatic architecture;
- Dynamic building energy simulation (DBES) using the STD module of Pléiades+COMFIE;
- Introduction to performance guarantee and uncertainty in building simulations;
- Calculation of consumption using the French method (RT 2012 and RE 2020) and case study on Perrenoud software (RT module) or on Pléiades+COMFIE (RT module);

## OBJECTIVES

- Knowing sources of heat losses and heat gains in a building;
- Being able to calculate heating loads and energy consumptions of buildings;
- Knowing and understanding the use of tools for prediction, optimization of the energy consumption of a building;
- Being able to assess thermal comfort in buildings and propose strategies to improve thermal comfort;
- Being able to run a regulatory calculation (French regulation) and understanding the underlying hypothesis of the calculation.

## PREREQUISITES

- Basic knowledge of physics and mathematics;
- Basic principles of thermodynamics and heat transfer;
- Knowledge of buildings and construction

## SELECTIVE BIBLIOGRAPHY

- Bruno Peuportier, Éco-conception des bâtiments et des quartiers ? Presses des Mines, 2008.
- Armand Dutreix, Bioclimatisme et performances énergétiques des bâtiments ? Ed. Eyrolles, 2010.
- Jean-François Sacadura : Transferts thermiques, Initiation et approfondissement, 2015.
- CSTB, « Tout savoir sur l'expérimentation E+C- », MOOC Bâtiment Durable, décembre 2018.