

Modeling and simulation



SCHOOL

Polytech Graduate School of Engineering



CAMPUS

Belle-Beille



LEVEL

3rd year Bachelor's degree



OPEN TO EXCHANGE STUDENTS

Yes



SEMESTER

Fall (S1)

- > **Degree course:** Graduate School of Engineering - Automation and Computer Engineering
- > **Teaching unit:** UE 5.2 Automatique and Automatisation
- > **Course language:** English
- > **Duration (hours):** 36
- > **ECTS:** 3
- > **Teacher(s):** Laurent Hardouin

> Assessment:

- Continuous assessment
- Final exam

> Teaching methods:

- | | | | |
|---|----|-------|-------------------------------------|
| <input checked="" type="checkbox"/> Lecture course | 6 | hours | <input type="checkbox"/> Case study |
| <input checked="" type="checkbox"/> Tutorial course | 30 | hours | <input type="checkbox"/> Project |
| <input type="checkbox"/> Practical work | | hours | |

COURSE DESCRIPTION

Introduction on differential equations and the state representation

Modelization:

- Modeling of compartmentalized systems, biological models (Lotka-Volterra, prey-predator, SIR epidemiological model, etc.).

- Modelling of hydraulic systems (multi-tank systems, dairy supervision application, etc.).

- Modelling of mechanical systems (inverted pendulums, mobile robots, autonomous boats, submarines, etc.)

Simulation:

- Euler method

- Runge-Kutta method

- Simulation based on Python, 2D graphical representation -

OBJECTIVES

This course introduces some modelling technics for mechanical systems, hydraulic systems and biological systems. -

Numerical methods (such as Euler method or Runge-Kutta method) for the simulation of these systems are also presented and illustrated using the Python language. -

PREREQUISITES

Mathematics and basics of Physics. - Programming: Algorithmics, C Language -