

# Process Control

**Teaching by:**

**Ljubisa Miskovic** ([ljubisa.miskovic@epfl.ch](mailto:ljubisa.miskovic@epfl.ch)),

**Assistants:**

**Ilias Toumpe** ([ilias.toumpe@epfl.ch](mailto:ilias.toumpe@epfl.ch))

**Valentine Jaussi** ([valentine.jaussi@epfl.ch](mailto:valentine.jaussi@epfl.ch))

**Office hours:**

To be communicated / agreed with students

@ CH H4 595 (teacher)

@ CH H4 575 (assistants)

**Textbook:**

Commande de Procédés, polycopié by D. Bonvin

# Course Material

- Moodle  
<https://moodle.epfl.ch/course/view.php?id=13903>
- Zoom (only if needed)  
<https://epfl.zoom.us/j/92961176334>
- Recordings (old material, some parts may be obsolete)  
check the link in the Moodle

# Communication

- Moodle forum

# Evaluation

**Final exam (during the examination period)**

**- typically 4-5 problems in 3h**

**Homework?**

# Recap

**The negative feedback is:**

- A.** An irrelevant opinion of a boring-to-death person.
- B.** A mechanism that counteracts the changes in the system and brings the system back to its original state.

# Recap

**The negative feedback is:**

- A. An irrelevant opinion of a boring-to-death person.
- B. A mechanism that counteracts the changes in the system and brings the system back to its original state.

**Which of the following represents negative feedback?**

- A. Blood platelets release chemicals that attract more blood platelets which then fill a wound
- B. One bird fleeing a predator spurs three birds, which in turn scares the whole flock
- C. In producing an amino acid, the enzyme a cell uses is inhibited after the amino acid reaches a specific concentration

# Recap

**Bees control the temperature of their hive in an interesting way. When the temperature gets too hot, certain bees signal the rest of the colony to evaporate water from their mouths and fan their wings to decrease the temperature significantly. As it cools, the colony resumes its normal activities. Which of the following terms describes this scenario?**

- A. Positive Feedback
- B. Negative Feedback
- C. Enzyme Inhibition

# Recap

## **The feedforward concept:**

consists in providing future-oriented options or solutions.

Example: Next time you perceive a curve in the road ahead, I suggest you slow down before the curve and accelerate when you are in the curve. Try that and see how it feels.

## **The feedforward control concept:**

is to measure important disturbance variables and take corrective action before they upset the process.

# Course Syllabus

## 1. Mathematical modeling

- Notion of systems, modeling process
- State space representation of systems

## 2. Linear systems

- Linearization
- Laplace transform
- Transfer functions

## 3. Basic notions of control

- On-off control
- PID control
- Stability and performance

## 4. Advanced control

- Compensation of disturbances
- Cascade control
- Discrete control

# Tentative Course Schedule

	Course	Exercises
17 Sep	Introduction to control and modeling	
24 Sep	Modeling	Set 1
01 Oct	Modeling, part II	Set 2
08 Oct	Linearization	Set 3
15 Oct	Laplace Transform	
29 Oct	Transfer Functions	Set 4
05 Nov	Linear systems	Set 5
12 Nov	On-off control, PID control	Set 6
19 Nov	PID control, part II	Sets 7 & 8
26 Nov	PID control, part III	Set 9
03 Dec	Stability and Performance	Set 10
10 Dec	Advanced control	Set 11
17 Dec	Advanced control, part II	Set 12
?	Missed class	