

# SYST003 - LINEAR CONTROL SYSTEMS

## HOMEWORK III – Controller in time domain

### Instructions

- ✓ Deadline: Sunday 10<sup>th</sup> November 2019 at 23:59
- ✓ Submission online: <https://submit.montefiore.ulg.ac.be>
- ✓ One report per group in English
- ✓ Respect the number of pages as indicated per section (in total: 6 pages)

**Statement:** Realisation of the controller in time domain

1. Summary of project (max.  $\frac{1}{2}$  page)
  - Inputs (domain and image)
  - Outputs (domain and image)
  - State variables (domain and image)
  - ABCD matrices
2. State feedback controller: *Computation* of K and  $k_r$  (max. 1 page)

You don't need to give the definition or theoretical information– just explain how you compute the gain for your project.
3. Observer: *Computation* of L (max. 1 page)

You don't need to give the definition or theoretical information – just explain how you compute the gain for your project.
4. Constraints and simulations specifications (max  $\frac{1}{2}$  page)

on your reference (how this reference can vary, how far my output signal can be from its reference value, ...), on your input signal (controllable input: give a physical range, uncontrollable input: be realistic for your scenario, ...), on your output signal, ...

At this stage of the project, you should be able to quantify all your signals present in your system (physical acceptable range of values) and have numerical values for all your parameters.
5. Simulations and discussion (max 3 pages)

In order to choose the right parameters of your controller, discuss how did you choose the state-feedback and observer gains (why these values for K and L).

  - Response to a reference variation
  - Response to a perturbation(disturbance). Do not hesitate to do several scenarii.
  - Check what happens when you have noise in your system. Explain where noise is affecting your system. ( max  $\frac{1}{2}$  page)

Interpret your results. Do not forget that you are modeling “something” that could be implemented and tested in a lab. Each simulation tells a story of your system.

**Remarks**

- ✓ Readable figures ! (special care to label, axis, unit, caption, legend, font size)
- ✓ Explain your results !
- ✓ Take into account feedbacks given in the two previous reports.