

## Digital Systems and Control

1. **Course number and name:** 020SCNES3 Digital Systems and Control
2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours
3. **Instructor's or course coordinator's name:** Jean Sawma
4. **Instructional materials:** Professor textbook and course material

5. **Specific course information**

a. **Catalog description:**

This course is divided into three main parts. The first part discusses discrete system modeling, Z-transform, discrete transfer function and discrete systems stability. The second part develops the design of digital controllers (discretized classic controllers, dead-beat control). The final part presents the implantation of digital controllers using embedded system and real time simulations of a system in closed loop.

b. **Prerequisites:** Linear Control (020AULES2), Signals and Systems (020SYSES2)

c. **Required** for EE students.

6. **Educational objectives for the course**

a. **Specific outcomes of instruction:**

- Analyze the structure and operation of a discrete system.
- Design a system discrete controller.
- Compute a system discrete model.
- Emulate the model of a system in real-time.
- Measure the performance of a system in closed loop.

b. **PIs addressed by the course:**

PI	1.1	1.2	1.3	6.1	6.2	6.3	6.4
<b>Covered</b>	x	x	x	x	x	x	x
<b>Assessed</b>				x	x	x	x

**7. Brief list of topics to be covered:**

- Introduction to numerical control and application examples (2 Lectures)
- Z-transform: definition, properties of Z-transform, Calculation of the Z-transform using the Laplace transform, inverse Z-transform: partial fraction decomposition, division by increasing power, Residues method, (5 Lectures)
- Continues to discrete transformation, systems simulation (4 Lectures)
- Design of a discrete controller, discretization of classic control laws (PI, PID), Dead-beat control, (6 Lectures)
- Simulation of a discrete system in closed-loop using Matlab-simulink, (3 Lectures)
- Introduction to embedded computing (2 Lecture)
- Emulation an electrical system (3 Lectures)
- Labs (3 Lectures)