ELECTRONICS_S5A Fall Semester Undergraduate/Junior	Electronics 1A	6 credits Lab: 33% Final exam: 66% (3h)

This course aims at providing the basic notions in understanding electronic systems. At the outcome, the student will be able to
- Identify functional blocks in a scheme or integrated component and define their characteristics and performances
- Design an electronic function from specifications, prototype it and verify that it meets the specifications using both CAD (Computer-aided design) and measurements.

The student has to acquire the following knowledge and skills.
- Know the basic components used in electronic functions
- Master the fundamental electricity laws
- Modelize (small- and large-signal) the components and how to use them
- Search information in datasheets and know the vocabulary
- Know the measurement methods and how to use the basic instrumentation devices
- Master a simulation tool to estimate the performances of an electronic circuit

Prerequisite: None

DEP_1301	Electronic systems	Language 🇫🇷
Lecture: 28	Tutorials: 22, BYOD: 6	Lab work: 24

Contextualization, from an example, of the main functions in electronics.

Circuits study frame: electricity
- Voltage and current, ground, electrical signal, DC & AC quantities, random quantities, power given to a dipole, decibels, dBm
- Receptor and generator conventions, active and passive dipoles, linear (Thevenin-Norton equivalency) and non-linear dipoles, linearization around a static point
- Putting linear circuits into matrix equations. Superposition, Thevenin, Millmann theorems

Measurement & component technology (lecture available online)

Linear quadripoles, amplifiers
- Linear quadripoles, descriptive matrix, input, output impedance, power gain

Non-linear dipoles: diodes
- Operation extern description, diode functions: rectifier, peak detection, alignment, clipping, non-linear transfer functions synthesis
- Zener diode, application to voltage regulators
- Internal operation, special diodes

Integrated linear amplifiers
- Operational amplifier circuits: linear operators, introduction to active filtering
- Operational amplifier imperfections effect on the functioning of the circuit
- Operational amplifier as comparators and applications

Bipolar transistor, amplification circuits
- Operation modes, polarization, linearisation and small-signal equivalent diagrams
- Amplifier stages, cascade, switching, LED driver

Field-Effect Transistors (FET)
- JFET, MOSFET constitution, operation modes, polarization, small-signal model
- Amplifier stages, use as variable resistor, gain control
- Switches, CMOS

Voltage regulator function
- Regulators, extern characteristics, LDO (Low-dropout)

Analog-Digital & Digital-Analog conversion
- Extern characteristics and realization of ADC and DAC