

Signal processing



SCHOOL

Polytech Graduate School of Engineering



CAMPUS

Belle-Beille



LEVEL

3rd year Bachelor's degree



OPEN TO EXCHANGE STUDENTS

Yes



SEMESTER

Spring (S2)

> **Degree course:** Graduate School of Engineering - Automation and Computer Engineering

> **Teaching unit:** UE 6.2 Sciences de l'ingénieur

> **Course language:** English

> **Duration (hours):** 20

> **ECTS:** 1

> **Teacher(s):** Etienne Belin

> Assessment:

Continuous assessment

Final exam

> Teaching methods:

Lecture course 6 hours

Tutorial course 8 hours

Practical work 6 hours

Case study

Project

COURSE DESCRIPTION

1) General concepts of signal processing.

2) Frequency representation of signals :

- Fourier series, Fourier transform (FT).
- Dirac delta function : definition, properties, relation to FT.

3) Interaction of signals with linear systems :

- Definition of a linear system, Impulse response, Convolution,
- Transfer function in frequency, Filtering, identification, deconvolution.

4) Sampled signals :

- Shannon sampling condition, z transform, truncation window,
- discrete Fourier transform, fast Fourier transform.

5) Linear digital filters :

- Analysis :
Recurrence equation in time, Impulse response, z transfer function,
Frequency transfer function, Example of the integrator filter.
- Synthesis : Transformation method. -

OBJECTIVES

The bases of signal processing are reviewed, with corresponding applications, as useful for a curriculum in industrial engineering, automation and computer engineering. Special emphasis is placed on deterministic signals, and frequency-domain processing of signals and their interactions with linear systems. These notions are presented both in the realm of continuous-time signals (physical level of the measured signals) and in the realm of discrete-time signals (digital processing). - For each important notion, typical applications are addressed, such as harmonics in electric power systems, modul

PREREQUISITES

Mathematical bases : Differentiation and integration of elementary functions, complex numbers, trigonometric functions.

SELECTIVE BIBLIOGRAPHY

- V. Oppenheim, "Signals and Systems", Prentice Hall. - V. Oppenheim, "Discrete-Time Signal Processing", Prentice Hall. - M. H. Hayes, "Schaum's Outline of Theory and Problems of Digital Signal Processing", McGraw Hill. -