

Signal processing

1. **Course number and name:** 020TRSCI3 Signal processing
2. **Credits and contact hours:** 2 ECTS credits, 1x1:15 contact hours
3. **Name(s) of instructor(s) or course coordinator(s):** Alain Ajami
4. **Instructional materials:** PowerPoint slides; course handouts; in-class problems

5. **Specific course information**

a. **Catalog description:**

This course aims to provide students with a thorough understanding of key concepts related to filtering of periodic signals and sampling. Students will have the opportunity to deepen their knowledge of linear filters, understanding their operation and exploring the effects of first and second-order filters on a periodic signal. Special attention will be given to the sampling process, with a detailed study of the Nyquist-Shannon theorem, which establishes the necessary conditions to avoid spectrum folding. Additionally, students will have the opportunity to become familiar with digital filtering.

b. **Prerequisites:** 020SPHCI1 Physical signals

c. **Required/Selected Elective/Open Elective:** Required

6. **Educational objectives for the course**

a. **Specific outcomes of instruction:**

- Understand periodic signals and their nature.
- Study the use of linear filters in processing non-sinusoidal periodic signals.
- Analyze the effects of first and second-order filters on a periodic signal.
- Apply the concept of sampling and implement the Nyquist-Shannon theorem.
- Recognize and explain the phenomenon of spectrum folding.
- Apply digital filtering techniques to periodic signals.

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

PI	1.2	1.3
Covered	x	x
Assessed	x	x

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

- Chapter 1: Introduction to Signal Processing: Functions of signal processing, Classification of signals, Singular functions, Decomposition of a periodic signal into Fourier series (2 lectures)
- Chapter 2: Periodic Signals, Filtering, Non-sinusoidal periodic signals, Action of a

- filter on a non-sinusoidal periodic signal + Tutorial 1 (8 lectures)
- Chapter 3: Sampling, Spectrum of a sampled signal, Weighting window, Digital filtering + Tutorial 2 (2 lectures)