Direzione Ricerca,
Innovazione e
Internazionalizzazione

UNIVERSITÀ
DI TORINO

ID

VP_105_INF

Visiting Professor Program
Academic Year 2025/2026

TEACHING COMMITMENT: **24 hours**

COURSE TITLE

Analysis and Processing of Digital Signals

TEACHING PERIOD

I semester

SCIENTIFIC AREA

Computer Science

LANGUAGE USED TO TEACH

English

COURSE SUMMARY

The course is devoted to learning the fundamentals of digital signal analysis and processing. The class cover both theoretical and formal aspects, and the related practical computer tools. The course covers the following topics.
Definition, classification and characterization of digital signals: sampling of analogic signals (voice, audio), multidimensional signals (images and volumes), biomedical signals, time series.
Introduction to classical digital signal processing:
- Discrete –time signals in time domain
- Discrete-time signals in the frequency domain (continuous Fourier transform, discrete-time Fourier transform)
- Linear systems (classification, impulse response, transfer function)
- z-Transform representation of signal and systems
- Signal processing based on FIR and IRR filter structures

Hints of discrete-time random signals (wide sense stationary signals, ergodic signal, transform-domain representation)
Advanced processing tools (Short Time Fourier Transform, Discrete Cosine Transform, Spectral estimate).
The class also includes computer exercises on real signal samples.

LEARNING OBJECTIVES

The educational goals are to provide both theoretical and practical skills in the field of analysis and processing of digital signals. The course contributes to the specific educational goals of CdS in Computer Science, in particular the ones relative to the Image, Vision and Virtual Reality curriculum. The course provides methodological foundations in analyzing and processing digital data, such as audio, images, and biomedical signals. These methodologies allow for the development of systems capable of organizing, processing, and transmitting various aspects of information in an optimal manner, independent of the medium used for fruition.

OTHER ACTIVITIES BESIDE THE COURSE

VISITING PROFESSOR PROFILE

The candidate is expected to have previous teaching and research experience in the signal processing field.

CONTACT REFERENT

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