USEEJ2 - Digital Signal Processing

Mis à jour le 09-04-2020

Code : USEEJ2

Unité spécifique de type cours

4 crédits

Responsabilité nationale :
EPN03 - Electroniques, électrotechnique, automatique et mesure (EEAM) / Hmaïed SHAIEK

Contact national :

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Présentation

Prérequis

- Have, at least, bac + 2 level in electronics (BTS, DUT, DPCT).

Objectifs pédagogiques

In this course we address:

- Analog to digital signal conversion concept,
- Sampling and analog to digital conversion
- Discrete signal Fourier and FFT analysis,
- FIR and IIR filtering,
- Introduction to random signal processing,
- Adaptive filters.

Compétences

- Provide the basics of digital signal processing, making the connection between theoretical analysis and applications.
- Be able to design and implement a processing device or software.
- Design and build a digital signal processing device.

Programme

Contenu

Learning Outcomes

By the end of this course, the students will be able to:

- characterize the main elements of a digital signal processing scheme, including ADC, DAC, anti-aliasing filter and reconstruction filter,
- compute the discrete Fourier transform, the z-transform of discrete signal,
- implement digital filters of the FIR or IIR type, and study the stability and the phase behavior of digital filters,
- compute the auto-correlation, cross correlation and PSD of discrete random signals,
- understand the need for designing an adaptive digital filter with coefficients computed based on LMS or RLS algorithm.
- use Matlab for simulations of digital signal processing.

Items

- Introduction
- Sampling, ADC and DAC,
- Discrete Fourier transform, FFT and z-transform,
- FIR filtering
- Design of FIR filters and applications
- IIR filtering
- Design of IIR filters and applications
- Introduction to discrete random signal processing,
- Adaptive filters
- Project: students will be asked to put in practice assimilated notions to carry out a project describing a practical application. This project will be developed using MATLAB and dedicated digital signal processing platforms.

Modalités de validation

- Projet(s)

- Examen final

Description des modalités de validation

- Project mark plus final exam.

Project (40%) and Exam (60%).

Bibliographie

Titre	Auteur(s)
Discrete Time Signal Processing, Pearson New International Edition, 3rd edition, 2014.	A.V Oppenheim and R.W. Schafer
Digital Signal Processing: Principles, Algorithms, and Applications, Prentice Hall International, 3rd edition 1996.	J. G. Proakis and D. G. Manolakis