STI - Information Science and Engineering - S5-S6



AUTONOMIE STI

AUTONOMY

Lecturers: Ian O CONNOR, Alberto BOSIO, Julien HUILLERY
Lecturers : 0.0 | TC : 0.0 | PW : 0.0 | Autonomy : 12.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

The autonomous work of UE STI aims to facilitate the assimilation of concepts learned during the courses of Electronic Systems (AF STItc1) and Signal Processing (AF STItc2).

Through the theoretical study of methods to answer a given problem and their implementation in a simulation environment, the objective is to introduce students to a fundamental professional practice in engineering sciences.

Keywords : Theoretical analysis, Simulation, LTSpice, Matlab-Simulink

Programme	 Regarding Electronic Systems, the autonomous work consists of the study in simulation - with the help of the LTSPICE software - of systems treated on paper during the tutorial sessions. This work is done in the first part of the semester, as the tutorials progress. Regarding Signal Processing, the autonomous work consists of a mini-project where it is asked to fully study a method allowing to answer a given problem. The work goes from the theoretical study of this method to its validation in simulation under Matlab-Simulink and mobilizes all the knowledge and know-how acquired during the supervised sessions. It is carried out in the second part of the semester.
Learning outcomes	 Understand proposed methods for solving a problem. Know how to implement these methods with a simulation tool. Know how to analyse simulation results.
Independent study	Objectifs : This activity is not concerned with framed autonomy activities outside personal work.
	Méhodes : This activity is not concerned with framed autonomy activities outside personal work.
Core texts	
	Final mark - 100% know how

Final mark = 100% know-how Know-how = 100% final exam

Assessment



SYSTÈMES ÉLECTRONIQUES

ELECTRONIC SYSTEMS

Lecturers: Ian O CONNOR, Alberto BOSIO
| Lecturers : 14.0 | TC : 14.0 | PW : 6.0 | Autonomy : 2.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

The evolution of electronic systems is linked to Moore's Law according to which the complexity of integrated circuits doubles every eighteen months. In order to be able to grasp the complexity of current systems and understand their evolution, it is necessary to know the basics of electronic technology.

The objective of the "Electronic systems" course is therefore to provide the engineering student with the scientific and technological bases necessary for the understanding of the functioning of electronic systems and their evolution as well as for the design of complex systems composed of circuits for processing information represented as analog as well as digital signals.

Keywords : PN junction, CMOS transistor, analog circuits, digital circuits, processors.

Programme	 Introduction to electronics MOS transistor High frequency modelling, presentation of the CMOS amplifier Detailed study of the MOS inverter Digital circuits, combinatorial logic. Boolean algebra and Karnaugh tables. Digital circuits, sequential logic Microprocessor architecture
Learning outcomes	 Be able to understand the scope of the field of electronics: from device to processor. To be able to describe the evolution of microelectronic systems. Know how to identify circuit design methods and techniques.
Independent study	Objectifs : Learn more about the topics covered in tutorials (TD).
	Méhodes : Perform electrical simulations with a reference simulator (LTSPICE) to analyse the operation of devices and circuits.
Core texts	Rousseau Eric, <i>PSPICE : MÉTHODOLOGIE D'UTILISATION ET TECHNIQUES AVANCÉES</i> , DL, 2007 Dusausay Serge COMPRENDRE L'ÉLECTRONIQUE PAR LA SIMULATION : 43 CIRCUITS SIMULÉS & RAPPELS DE COURS, DL, 2000 Poitevin Jean-Marc <i>ÉLECTRONIQUE ANALOGIQUE ET NUMÉRIQUE : AIDE-MÉMOIRE</i> , DL, 2008
Assessment	Final mark = 90% Knowledge + 10% Know-how Knowledge mark = 100% final exam Know-how mark = 50% TP1 report + 50%TP2 report



TRAITEMENT DU SIGNAL

SIGNAL PROCESSING

Lecturers:Julien HUILLERY, Gérard SCORLETTI| Lecturers : 12.0 | TC : 14.0 | PW : 4.0 | Autonomy : 2.0 | Study : 2.0 | Project : 0.0 | Language : FR

Objectives

Signal processing consists of all the techniques used to describe the acquisition, storage, modification, coding and transmission of information. Faced with the mass of the signals that need to be processed, often in real time, technological systems of great complexity have invaded our society. In response to current challenges, powerful scientific methods have been developed to manage such complexity. The mastery of these methods becomes inescapable in the practice of the engineer whatever the field to which it is destined. The objective of this course is to present the preliminary bases for the acquisition and mastery of these methods and to illustrate them by their application.

Keywords : Deterministic and random signals, Analog and digital signals, Time domain and frequency domain analysis, Fourier and Laplace transforms, Analog and digital filtering, Sampling, Fast Fourier transform, Signal models

Programme	 Modelling and characterizing a signal: time domain and frequency domain analysis Modelling and characterizing a system: convolution and filtering Autocorrelation and intercorrelation for deterministic signals From analog signals to digital signals Digital Filtering From deterministic signals to random signals
Learning outcomes	 Be able to analyse a signal in the time and frequency domains. Be able to sample a signal. Be able to design analog and digital filters. Be able to model a signal.
Independent study	Objectifs : Follow an engineering approach by mobilizing knowledge and know-how acquired during the AF.
	Méhodes : Solve a practical and original signal processing problem by applying the numerical methods and tools acquired during the course.
Core texts	G. Scorletti, <i>TRAITEMENT DU SIGNAL</i> , Polycopié de cours, SDEC – École Centrale de Lyon, 2021 E. Tisserand, J.F. Pautex et P. Schweitzer <i>ANALYSE ET TRAITEMENT DES SIGNAUX</i> , Sciences sup. Dunod, 2004 E.W. Kamen et B.S. Heck <i>FUNDAMENTALS OF SIGNALS AND SYSTEMS WITH MATLAB</i> , Pearson Prentice Hall, 2007
Assessment	Final mark = 90% knowledge + 10% know-how Knowledge = 80% final exam + 20% continuous assessment Know-how = 100% continuous assessment



CONVERSION A/N POUR LES SYSTÈMES AUDIO

ANALOG TO DIGITAL CONVERSION

Lecturers: Cédric MARCHAND, Laurent BAKO | Lecturers : 0.0 | TC : 0.0 | PW : 4.0 | Autonomy : 0.0 | Study : 4.0 | Project : 0.0 | Language : FR

Objectives

Through the study of analog-digital conversion, this AF illustrates the complementarity of electronics and signal processing for the design of information management systems. The operation, simulation and then realization of an analog-digital converter "Sigma-Delta" will be studied. This converter has an excellent behaviour with respect to the quantization error inherent to the analog-to-digital conversion. These good performances justify its important use in the audio field for consumer applications such as CD recorders. In this AF, we focus on highlighting the link between the theoretical and technical aspects that accompany the design of an electronic system.

Keywords : Analog-to-digital conversion, electronic systems, Sigma-Delta modulator, digital signal, quantization, signal-to-noise ratio, filtering

Programme	 1st session (BE 2 h): uniform conversion (Presentation of analogue / digital conversion; Principle and properties of uniform analog / digital conversion; Practical Activity (1h): Simulation and study of a uniform converter with matlab) 2d session (BE 2 h): Conversion Sigma-Delta (Principle and properties of the Sigma-Delta converter; Practical Activity (1h): Simulation and study of a Sigma-Delta converter under matlab / simulink) 3d session (TP 4 h): Electronic realization of a Sigma-Delta modulator (Design of the electronic circuit carrying out a Sigma-Delta modulation; Observation and analysis of signals in the space of time and frequency)
Learning outcomes	 Know how to describe the theoretical principle of the Sigma-Delta converter. Be able to conduct a simulation of the system under Matlab-Simulink. Being able to design an electronic circuit making a Sigma-Delta modulator. Be able to analyse signals in time and frequency.
Independent study	Objectifs : This activity is not concerned with framed autonomy activities outside personal work.
	Méhodes : This activity is not concerned with framed autonomy activities outside personal work.
Core texts	Sangil Park., <i>PRINCIPLES OF SIGMA-DELTA MODULATION FOR ANALOG-TO-DIGITAL CONVERTERS.</i> , Rapport Technique Motorola APR8. Joshua Reiss <i>UNDERSTANDING SIGMA-DELTA MODULATION: THE SOLVED AND UNSOLVED ISSUES.</i> , Journal of the Audio Engineering Society, 2008
Assessment	Final mark = 100% Know-how Know-how mark = 100% continuous assessment