EMC for integrated circuits

Component
École Nationale Supérieure d'Électrotechnique d'Électronique d'Informatique d'Hydraulique et des Télécommunications

In brief

- **Ametys Code:** M34HPOT5
- **Open to exchange students:** Yes

Presentation

Objectives

By the end of this course, students will be able to:
- Understand the fundamental principles of electromagnetic compatibility (EMC) as applied to integrated circuits.
- Identify and analyze electromagnetic coupling mechanisms in integrated circuits.
- Master the basic units and concepts associated with EMC measurements.
- Interpret the use of frequency bands according to applications and regulations.
- Analyze signals in the time domain (square wave theory) and in the frequency domain (power measurement).
- Classify integrated circuit pins according to EMC requirements and compliance standards.
- Understand the main EMC standards for the automotive industry (IEC, ISO) and their specifications.
- Understand the certification process and compliance testing associated with integrated circuits.

Description

1. Introduction to EMC
Definition and challenges of electromagnetic compatibility.
Context of application to integrated circuits.
2. Electromagnetic coupling mechanisms

Capacitive, inductive, radiated, and conduction coupling.
Impact of coupling mechanisms on the behavior of integrated circuits.
3. Fundamental concepts and units in EMC
Quantities and units used in EMC.
Electromagnetic compatibility measurements.
4. Use of frequency bands
Regulations and frequency band allocations.
Applications and constraints related to frequency bands in EMC.
5. Analysis of signals in EMC
Time domain: square wave theory and impact on EMC.
Frequency domain: power measurement theory and implications in EMC.
6. Pin classification and integrated circuit compliance
Pin typology and impact on EMC.
Compliance classes and specific requirements.
7. EMC standards and regulations for the automotive industry
Introduction to EMC standards applied to automotive integrated circuits.
Main IEC and ISO standards.
Generic test specifications for integrated circuits (Generic IC EMC Test Specification v1.2).
8. Certification process and compliance testing
Classification of tests and compliance levels.
Acceptable EMC limits and thresholds for the automotive industry.
Proliferation of standards and their evolution.