

## Content

| Course Code             | Course Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Semester | Theory | Practice | Lab | Credit | ECTS |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|----------|-----|--------|------|
| INF345                  | Digital Signal Processing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5        | 3      | 0        | 0   | 3      | 5    |
| Prerequisites           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |        |          |     |        |      |
| Admission Requirements  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |        |          |     |        |      |
| Language of Instruction | French                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |        |          |     |        |      |
| Course Type             | Compulsory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |        |          |     |        |      |
| Course Level            | Bachelor Degree                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |        |          |     |        |      |
| Objective               | The objective of this course is to give basic information of signal processing. The aim is to present theoretical results on this subject and practical applications.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |        |          |     |        |      |
| Content                 | <p>w1 Digital processing, motivation and needs. The digital signal processing systems, characteristics and advantages</p> <p>w2 Signals and Systems I: discrete time and continuous-time signals. Transformation of the argument. Exponential and sinusoidal signals. The unit impulse and unit step functions.</p> <p>w3 Signals and Systems II: continuous time and properties of discrete-time system. Memory Systems, causality, stability, linearity and time invariance</p> <p>w4 The linear time invariant (LTI) systems: convolution sum and integral. Unit impulse response and convolution sum expression LTI systems. LTI system properties.</p> <p>w5 Term (periodic) signals to the expression in Fourier series. discrete time and continuous-time convergence of Fourier series and the properties of expressions</p> <p>w6 sign with non-periodic expression of Fourier series. discrete time and continuous-time convergence of Fourier series with properties and expressions</p> <p>w7 Fourier transform amplitude-phase expression. filter design, ideal and non-ideal at the time and frequency characteristics of filters</p> <p>w8 The mid-term</p> <p>w9 Sampling: The sampling of analog signals. sampling theorem, the sampling pulse train</p> <p>w10 The Laplace transform: convergence zone, transformation properties. systems using the Laplace transform analysis LTI</p> <p>w11 convergence zone: Z-transform. transformation properties. LTI systems using the Z transform analysis</p> <p>w12 Digital signal processing, software and applications, programming languages, development environments and the introduction of software</p> <p>w13 practical applications of the concepts I: Examples of digital signal processing and its applications</p> <p>w14 practical concepts applications II: Examples of digital signal processing and its applications</p> |          |        |          |     |        |      |
| References              | Francis Cottet, "TRAITEMENT DES SIGNAUX ET ACQUISITION DE DONNÉES" Dunod. Paris 2009<br>Vinay K. Ingle and John G. Proakis, "Digital Signal Processing Using MATLAB", Cengage Learning, 2007                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |        |          |     |        |      |

## Theory Topics

| Week | Weekly Contents                                                                                                                                                                 |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Digital processing, motivation and needs. The digital signal processing systems, characteristics and advantages                                                                 |
| 2    | Signals and Systems I: discrete time and continuous-time signals. Transformation of the argument. Exponential and sinusoidal signals. The unit impulse and unit step functions. |
| 3    | Signals and Systems II: continuous time and properties of discrete-time system. Memory Systems, causality, stability, linearity and time invariance                             |
| 4    | The linear time invariant (LTI) systems: convolution sum and integral. Unit impulse response and convolution sum expression LTI systems. LTI system properties.                 |
| 5    | Term (periodic) signals to the expression in Fourier series. discrete time and continuous-time convergence of Fourier series and the properties of expressions                  |
| 6    | sign with non-periodic expression of Fourier series. discrete time and continuous-time convergence of Fourier series with properties and expressions                            |
| 7    | Fourier transform amplitude-phase expression. filter design, ideal and non-ideal at the time and frequency characteristics of filters                                           |
| 8    | The mid-term                                                                                                                                                                    |

| Week | Weekly Contents                                                                                                                        |
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| 9    | Sampling: The sampling of analog signals. sampling theorem, the sampling pulse train                                                   |
| 10   | The Laplace transform: convergence zone, transformation properties. systems using the Laplace transform analysis LTI                   |
| 11   | convergence zone: Z-transform. transformation properties. LTI systems using the Z transform analysis                                   |
| 12   | Digital signal processing, software and applications, programming languages, development environments and the introduction of software |
| 13   | practical applications of the concepts I: Examples of digital signal processing and its applications                                   |
| 14   | practical concepts applications II: Examples of digital signal processing and its applications                                         |