Course guides
230363 - FSP - Fundamentals of Discrete-Time Signal Processing

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications.
Degree: MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2013). (Optional subject).
Academic year: 2020  ECTS Credits: 2.5  Languages: English

LECTURER

Coordinating lecturer: Lamarca Orozco, M. Meritxell
Others:

TEACHING METHODOLOGY

Lectures
Individual work
Matlab simulations

LEARNING OBJECTIVES OF THE SUBJECT

To characterize the application of LTI systems for discrete time signal processing in the time domain. To be able to use the Fourier transform, DFT and z-transform for the characterization of signals and systems. To understand the relationship between an analog signal and its discrete-time representation in A/D and D/A conversion. To learn the characterization of random variables (both scalar and multivariate).

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>4,0</td>
<td>6.40</td>
</tr>
<tr>
<td>Hours large group</td>
<td>16,0</td>
<td>25.60</td>
</tr>
<tr>
<td>Self study</td>
<td>42,5</td>
<td>68.00</td>
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</tbody>
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Total learning time: 62.5 h
## CONTENTS

### Random variables

**Description:**
Random variable concept. Exemples: Bernouilli, uniform, Gaussian, exponential.
Distribution function. Probability density function.
Mean and variance.

**Full-or-part-time:** 14h 30m  
Theory classes: 5h  
Laboratory classes: 1h  
Self study : 8h 30m

### Linear time-invariant systems

**Description:**
Impulse response. Convolution.
Discrete-time systems characterized by difference equations. FIR and IIR systems.

**Full-or-part-time:** 6h  
Theory classes: 2h  
Self study : 4h

### Signals and systems in the frequency domain

**Description:**
Discrete-time Fourier transform. Definition, properties, examples and applications.
Discrete Fourier Transform (DFT). Definition, properties, examples and applications.

**Full-or-part-time:** 24h 30m  
Theory classes: 6h  
Laboratory classes: 2h  
Self study : 16h 30m

### Z-transform

**Description:**
Z-transform. Definition, properties, examples.
Transfer function of a LTI system. Relationship with its frequency response.

**Full-or-part-time:** 12h  
Theory classes: 3h  
Laboratory classes: 1h  
Self study : 8h

### GRADING SYSTEM

Assignments (100%)
BIBLIOGRAPHY

Basic: