Last update: 06-05-2019

230085 - MATEL - Mathematics for Telecommunications

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering

Teaching unit: 749 - MAT - Department of Mathematics

Academic year: 2019

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Compulsory)

ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Villar Santos, Jorge Luis

Others: Morillo Bosch, Maria Paz
Sáez, Germán
Gràcia, Xavier

Prior skills

Basic Calculus, Linear Algebra

Degree competences to which the subject contributes

Transversal:

07 AAT N1. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

Teaching methodology

Expository instruction/Master class

Learning objectives of the subject

The main goal of the subject is the study of the main transforms, the Fourier Series and their applications to solving ordinary differential equations and systems, and some partial differential equations (like the one-dimensional wave equation). The contents of this subject is well connected to the other subjects about linear circuits and signal processing, including as well the basic concepts about differential equations needed in other subjects related to electronics and electromagnetism.

Study load

Total learning time: 150h	Hours large group:	65h	43.33%
	Self study:	85h	56.67%

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Content

Laplace Transform

Learning time: 12h
Theory classes: 12h

Description:
Definition, convergence. Properties. Transforms od the basic functions. Inversion by partial fractions decomposition. Piecewise defined functions. Convolution. Dirac's delta.

Introduction to ordinary differential equations

Learning time: 12h
Theory classes: 12h

Description:
First order ordinary differential equations. Initial value problems. Resolution examples. Homogeneous and non-homogeneous linear equations. Higher order ordinary linear differential equations and systems. Resolution by the Laplace transform.

Fourier Series

Learning time: 16h
Theory classes: 16h

Description:
Euclidean spaces of functions. Orthogonal sequences. Bessel inequality. Parseval's theorem. Trigonometric and complex exponentials Fourier series. Even and odd functions. Pointwise convergence. Term-by-term differentiation. Convolution theorems. Introduction to partial differential equations.

Fourier Transform

Learning time: 12h
Theory classes: 12h

Description:
Definition, convergence. Properties. Inversion. Transforms of the basic functions, the step function and the Dirac's delta. Asymptotic behavior. Parseval's theorem. Convolution theorems. Periodic functions. Dirac's comb. Poisson sum.

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z Transform	Learning time: 13h Theory classes: 13h

Description:
Z transform. Properties. Convergence region. Transforms of basic sequences. Inversion. Convolution of sequences. Applications. Discrete time Fourier transform. Discrete Fourier transform.

Qualification system

Short partial exams (40%). Final exam (60%)

Bibliography

Basic:

Boyce, W.E.; DiPrima, R.C. Ecuaciones diferenciales y problemas con valores en la frontera. 4a. ed. México: Limusa, 1998. ISBN 9681849744.

Beerends, R.J. Fourier and laplace transforms. Cambridge: Cambridge University Press, 2003. ISBN 9780521534413.

Complementary:

Simmons, G.F; Krantz, S.G. Ecuaciones diferenciales : teoría, técnica y práctica. Mèxic: McGrawHill, 2007. ISBN 9789701061435.