Course guide
230085 - MATEL - Mathematics for Telecommunications

Last modified: 25/05/2023

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

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

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura

Others: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

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

Type	Hours	Percentage
Hours large group	65,0	43.33
Self study	85,0	56.67

Total learning time: 150 h

CONTENTS

Laplace Transform

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

Full-or-part-time: 12h
Theory classes: 12h

Introduction to ordinary differential equations

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.

Full-or-part-time: 12h
Theory classes: 12h

Fourier Series

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.

Full-or-part-time: 16h
Theory classes: 16h

Fourier Transform

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.

Full-or-part-time: 12h
Theory classes: 12h

z Transform

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

Full-or-part-time: 13h
Theory classes: 13h

GRADING SYSTEM

Short partial exams for continous evaluation (40%). Final exam (60%). The final grade will be the maximum between the grade obtained with continuous evaluation or the one obtained with 100% of the final exam.

BIBLIOGRAPHY

Basic:
- Beerends, R.J. Fourier and laplace transforms. Cambridge: Cambridge University Press, 2003. ISBN 9780521534413.
- Boyce, W.E.; DiPrima, R.C. Ecuaciones diferenciales: y problemas con valores en la frontera. 5a ed. México: Limusa Wiley, 2010. ISBN 9786070501517.

Complementary:
- Simmons, G.F; Krantz, S.G. Ecuaciones diferenciales : teoría, técnica y práctica [on line]. Mèxic: McGrawHill, 2007 [Consultation: 16/11/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4312. ISBN 9789701061435.