

Course guide 230085 - MATEL - Mathematics for Telecommunications

 Last modified: 18/06/2024

 Unit in charge:
 Barcelona School of Telecommunications Engineering

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

 Academic year: 2024
 ECTS Credits: 6.0
 Languages: Catalan, Spanish

Coordinating lecturer:	JORGE LUIS VILLAR SANTOS
Others:	Primer quadrimestre: MARIA BRAS AMOROS - 10 GERMAN SAEZ MORENO - 10, 40
	Segon quadrimestre: GERMAN SAEZ MORENO - 10 ODÍ SOLER I GIBERT - 30 ALBA TACORONTE HERNANDEZ - 40

JORGE LUIS VILLAR SANTOS - 20

PRIOR SKILLS

LECTURER

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

Туре	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: 11h

Theory classes: 11h

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: 11h

Theory classes: 11h

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: 11h Theory classes: 11h



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: 11h Theory classes: 11h

GRADING SYSTEM

One or more partial exams (40%). Final exam (60%). The final grade will be the maximum between the grade obtained with the weighting of the partial exams (40%) and the final exam (60%), and the one obtained only with the final exam (100%).

BIBLIOGRAPHY

Basic:

- Boyce, W.E.; DiPrima, R.C. Ecuaciones diferenciales: y problemas con valores en la frontera. 5a ed. México: Limusa Wiley, 2010. ISBN 9786070501517.

- 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 [on line]. Mèxic: McGrawHill, 2007 [Consultation: 16/11/2020]. Available on: <u>http://www.ingebook.com/ib/NPcd/IB BooksVis?cod primaria=1000187&codigo libro=4312</u>. ISBN 9789701061435.