Course guide
230909 - EDT - Differential Equations and Transforms

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 ELECTRONIC ENGINEERING AND TELECOMMUNICATION (Syllabus 2018). (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

Generical:
CG3. (ENG) GREELEC: Coneixmetn de matèries bàsiques i tecnològíes que el capacitin per a l'aprenentatge de nous mètodes i tecnologies, així com que el dotin d'una gran versatilitat per adaptar-se a noves situacions.

Transversal:
CT6. (ENG) GREELEC:APRENENTATGE AUTÒNOM: Detectar deficiències en el propi coneixement i superarles mitjançant la reflexió crítica i l'elecció de la millor actuació per ampliar coneixements.

Basic:
CB1. (ENG) GREELEC: Que els estudiants hagin demostrat tenir i comprendre coneixements en una àrea d'estudi que neix de la base de l'educació secundària general, i que sol trobar un nivell que, si bé es recolza en llibres de text avançats, inlou també alguns aspectes que impliquin coneixements procedents de la vanguardia del seu camp d'estudi.

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

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. Numerical methods to solve differential equations.

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. 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.

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

z Transform

Description:
Z transform unilateral and bilateral. Properties. Convergence region. Transforms of basic sequences. Inversion. Convolution of sequences. Applications.

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

GRADING SYSTEM

Short partial exams (40%). Final exam (60%). The final score of the course will be the maximum between the previous and the score of the final exam.

BIBLIOGRAPHY

Basic:
- 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 9780072863154.
- 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.