30372 - Mathematics for Telecommunications

Información del Plan Docente

Academic Year	2018/19
Subject	30372 - Mathematics for Telecommunications
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	581 - Bachelor's Degree in Telecomunications Technology and Services Engineering
ECTS	6.0
Year	1
Semester	Second semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process that has been designed for this subject is based on the following:

Continuous work of the student; study of the theory using the provides notes and the bibliography; realization of problems and exercises; query and resolution of doubts.

Master classes in which the contents will be developed, illustrating them with examples and counter-examples sufficient, to facilitate their comprehension; exercises in group will be carried out.

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Practices in which, with the help of the computer, problems on different questions will be solved and numerical methods will be implemented using software.

Sessions of problems in which, in a participative way, problems that demand the comprehension of the concepts and the relations between concepts and techniques of the different subjects will be solved.

4.2.Learning tasks

The program offered to the student to help him achieve the expected results includes the following activities:

Type I: Master class (42 hours). Three hours by week will be devoted to theory and problem classes. These will be master classes in which the contents and theoretical results will be presented, complemented with the resolution of problems and practical exercises with an active participation of the student.

Type II: Problem's classes (6 hours). Models will be presented to students, with problems and exercises, in which some of the mathematical aspects appear of the subject. Some of them will be solved in class and others will serve as autonomous work material recommended for the student.

Type III: Practical classes (6 sessions of 2 hours each). With the students distributed in three subgroups, they will be developed in the classroom and schedule set by the center. In these sessions the students will use software to perform the proposed exercises.

4.3.Syllabus

Theme 1. Preliminaries: Complex variable functions

Theme 2. Linear differential equations

2.1. Equations of first order

2.2. Linear differential equations

2.3. Linear differential equations with constant coefficients

Theme 3. The Laplace transform

3.1. Definition and first properties

3.2. The Laplace transform of the Heaviside function

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3.3. The Laplace transform and the convolution product

3.4. Solving initial value problems with the Laplace transform

3.5. The Dirac's delta and the Laplace transform

3.6. The transference function in linear systems

Theme 4. Fourier series

4.1. Fourier coefficients. Harmonics. Fourier series. Spectrum of amplitudes and phases

4.2. Complex form of the Fourier series

4.3. Fourier series in sinus and cosines

4.4. Convergence of the Fourier series. Identity of Parseval

4.5. Punctual convergence. The Gibbs phenomenon

4.6. Application of the Fourier series: solving initial value and boundary value problems for the heat and wave equations

Theme 5. Fourier transform

5.1. Definition and first properties

5.2. Convolution and the Fourier transform

5.3. Fourier transform and The Dirac's delta

5.4. The Shannon sampling theorem

PRACTICES

1. Laboratory introduction

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2. Numerical methods for ordinary differential equations (initial value problems).

3. Numerical methods for ordinary differential equations (boundary value problems).

4. Application of the Laplace transform

5. Amplitude and phase spectrum. Signal reconstruction

6. Applications of the frequency domain to the transmission of analog signals

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4.4.Course planning and calendar

Master classes and problems in the classroom and laboratory sessions are taught according to the schedule established by the center (available on their website).

Each professor will inform about his tutoring schedule.

The rest of the activities will be planned according to the number of students and will be announced in advance.

The information will be available at http://add.unizar.es

4.5.Bibliography and recommended resources

Aguilar, G.; Clavero, C. Matemáticas III. Ecuaciones diferenciales, series de Fourier y aplicaciones (incluye prácticas con Maxima). Prensas de la Universidad de Zaragoza, 2014.

O'Neil, P.V. Matemáticas avanzadas para ingeniería. Análisis de Fourier, ecuaciones diferenciales parciales y análisis complejo. Quinta edición, México: Thomson, 2004.

Soliman, S.; Srinath, M.D. Señales y sistemas continuos y discretos. Prentice-Hall, 1999.