ETSIT
Escuela Técnica Superior de
Ingenieros de Telecomunicación

| Advanced Mathematics (AM) | | | |
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| Code number: | 48068 | Number of ECTS: | 6 ECTS |
| Semester: | Spring | Language: | English |

Lecturer(s) and contact:

- Dr. Eduardo Cuesta Montero (eduardo.cuesta@uva.es)

Learning goals:

At the end of this course, the student should be able to:

- Manage problems involving complex variable and vector calculus, differential geometry, and differential equations.
- Solve analytically the most common ordinary and partial differential equations in engineering .
- Model mathematically a wide range of problems arisen in the degree.
- Numerically solve some common theoretical problems arisen in engineering.
- Discover the relationship between the subjects of the present course and other subjects, in fact the ones related to Telecommunication and Electronic Engineering.
- Use recommended bibliography to assess ideas and results.
- Understand further mathematical models related to Telecommunication and Electronic Engineering.

Contents:

1. PARAMETRIC CURVES AND COMPLEX VARIABLE:

   Parametric curves, elementary complex functions, complex derivation and integration. Applications in practical instances.

2. FOURIER ANALYSIS:

   Fourier series, Fourier transform, and discrete Fourier transform. Applications in signal processing.

3. POWER SERIES AND LAPLACE TRANSFORM:

   Power series, Laurent series, Z-transform, and Laplace transform. Applications in the study of linear systems.

4. ORDINARY DIFFERENTIAL EQUATIONS:

   Ordinary differential equations (ODEs) of order one and two. Applications in electric and electronic circuits analysis.

5. NUMERICAL METHODS FOR ORDINARY DIFFERENTIAL EQUATIONS:

   Explicit and implicit Euler method, and higher order methods.

6. PARTIAL DIFFERENTIAL EQUATIONS:

   Separation of variable method, Fourier method, and nonhomogeneous problems. Applications in wave propagation and diffusion processes.

7. NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS:

   Difference equations schemes, for 1- and 2-dimensional problems.

Prerequisites:

Some background on linear algebra and calculus is strongly recommended.

Assessment:

Written exam for the theoretical part and laboratory assignments for the part related to numerical methods.