Partial Differential Equations

ECTS: 6 ECTS

COORDINATOR: María Begoña Cid Iglesias (bego@dma.uvigo.es)

UNIVERSITY WHERE THE COORDINATOR IS: UVigo

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? No

LECTURER 1: José Durany Castrillo (durany@dma.uvigo.es)

UNIVERSITY WHERE THE LECTURER 1 IS: UVigo

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? No

SUBJECT CONTENTS

1. Classical analysis of linear partial differential equations.

   a) Classic examples: the equations of Laplace, heat and wave.

   b) Classification of linear partial differential equations.

   c) Existence and uniqueness.

   d) Study of analytical techniques of resolution: the Laplace equation in a circle, in a ring and in a box.

   e) The heat equation in an isolated finite bar, non-isolated and general case.

   f) The wave equation in an isolated finite string, non-isolated and general case.

2. Variational formulation of elliptic problems, linear elasticity and Stokes system.

3. Introduction to the variational formulation of evolutionary problems: parabolic and hyperbolic problems.

METHODOLOGY

1) Master sessions: the contents of the subject will be given in these sessions.

2) Formulation, analysis and resolution of problems and exercises related to the subject.

Classes via videoconferencing system.

LANGUAGE USED IN CLASS: Spanish

IS IT COMPULSORY TO ATTEND CLASS? Students can attend via conference system.

BIBLIOGRAPHY

Brezis, Analyse fonctionelle. Masson, 1983.

E. Casas, Introducción a las ecuaciones en derivadas parciales. Univ. Cantabria, 1992.

E. di Benedetto, Partial differential equations. Birkhauser, 1995.

D. Gilbarg, N.S. Trudinger, Elliptic partial differential equations of second order. Springer, 1983.

J.L. Lions, Quelques methodes de resolution des problemes aux limites non lineaires. Dunod, 1969.

V.P. Mijailov, Ecuaciones diferenciales en derivadas parciales. MIR-Moscú, 1976.

J. Necas, Les methodes directes en theorie des equations elliptiques. Masson, 1967.

I. Peral, Primer curso de ecuaciones en derivadas parciales. Addison-Wesley. Univ. Autónoma Madrid, 1995.

P.A. Raviart, J.M. Thomas, Introduction a l'analyse numerique des equations aux derivees partielles. Masson, 1983.

Showalter, R. E., Monotone Operators in Banach Space and Nonlinear Partial Differential Equations. Mathematical Surveys and Monographs Volume 49. American Mathematical Society (AMS), 1997. (Chapter I & II)

R. Temam, Navier-Stokes equations. North-Holland, 1977.

SKILLS

Basic:

CG1: To have knowledge that provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context, knowing how to translate industrial needs in terms of R & D in the field of mathematics Industrial.

CG4: To have the ability to communicate the findings to specialist and non-specialist audiences in a clear and unambiguous way.

CG5: To have the appropriate learning skills to enable them to continue studying in a way that will be largely self-directed or autonomous, and also to be able to successfully undertake doctoral studies.

Specific:

CE3: To determine if a model of a process is well made and well mathematically formulated from a physical standpoint.

Modelling specialization:

CM1: To be able to extract, using different analytical techniques, both qualitative and quantitative models.

WILL YOU BE USING A VIRTUAL PLATFORM? Yes. faitic.uvigo.es

WILL YOU BE USING ANY SPECIFIC SOFTWARE? No.

CRITERIA FOR THE 1ST ASSESSMENT OPPORTUNITY

The assesment will take into account:

1) individual exercises that will result in 60% of the grade.

2) a test that will result in 40% of the grade.

CRITERIA FOR THE 2ND ASSESSMENT OPPORTUNITY

Same as the 1st assessment opportunity.