Universitat Autònoma de Barcelona

2018/2019

Differential equations and modelling I

Code: 100100
ECTS Credits: 9

Degree	Type	Year	Semester
2500149 Mathematics	OB	3	1

Contact

Name: Francesc Mañosas Capellades
Email: Francesc.Manosas@uab.cat

Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Iván Sánchez Sánchez

Prerequisites

Ñinear Algebra

Calculus in Several variables.

Objectives and Contextualisation

The Theory of Differential Equations is distinguished both by the richness of ideasand methods as well as by its applicability. Thus the subject Differential Equations and Modeling I has a theoretical aspect (that will be used in theory and problem lessons) as well as a very applied aspect (which will be introduced in the theory sessions and will be developed in problems and practical sessions). Practical lessons will be carried out in the computer lab. On the one hand we will emphasize the presentation of the theory and the demonstration of the results and on the other hand the students will learn how to model real situations that allow them to predict the studied behaviors.

We think that this subject is good to show to the students that certain theoretical results that they already know about other subjects (topological properties of normed spaces and Jordan canonical forms, for example) can be applied to develop the theory of differential equations.

Content

1. Differential Equations of the first order.

1.1 Introduction to differentia equations. Separable equatiuons. Exact equations.

1.2 Applications to modelling.

2. The linear equation.

2.1 Uniqueness and existence theorems. Algebraic properties of the space of solutions. Liouville's theoreme.

2.2 The autonomous case: Exponencial of a matrix.

2.3 The linear equation of order n.

3. Uniqueness and existence theorems

3.1 The Cauchy's problem. Picard and Peano theorems.

3.2 Prolongation of solutions. Wintner's. lemma

3.3 Continuous and differentiable dependence on initial data and parameters.

4. Qualitative theory of autonomous systems.

4.1 Dynamical systems.Critical points and periodic orbits. Stability. Conjugation of dynamical systems.

4.2 Tubular flow theorem. Hartman's theorem.

4.3 Qualitative study of the autonomous linear equation..