

**Stochastics processes**

Code: 100116  
ECTS Credits: 6

Degree	Type	Year	Semester
2500149 Mathematics	OT	4	0

**Contact**

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**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

**Prerequisites**

As a general requirement, in order to be able to follow this subject, good knowledge is required at the practical level of analysis and calculus or, more specifically, integration and series. As more specific requirements, it is necessary to have previously studied a course in Probability and Stochastic Modeling.

**Objectives and Contextualisation**

The aim of this subject is, on the one hand, to introduce the student in the part of the theory of probability called theory of stochastic processes, whose purpose is to study the random phenomena that evolve over time or in the space. We will see the basic generalities of these models and we will study some specific models.

The discrete Markov chains will be studied in general and in the particular case of the random walk. We will also study the continuous-time Markov chains, such as the Poisson process or the birth and death processes. Finally we will also introduce the Brownian motion.

**Content**

1. Discrete-time Markov chains.
  - 1.1. Motivation: the random walk.
  - 1.2. Definitions. Basic properties. Transition matrix.
  - 1.3. Stopping time. Strong Markov property.
  - 1.4. Recurrence and transience.
  - 1.5. Asymptotic behavior. Invariant distribution
  - 1.6. Ergodic theorem
  - 1.7. More aspects about random walk
2. Continuous-time Markov chains.
  - 2.1. Motivation: the Poisson process.
  - 2.2. Basic properties. Generating matrix. Recurrence and transience.
  - 2.3. Invariant distribution
  - 2.4. Ergodic theorem
  - 2.5. More aspects of the Poisson process.
3. The Brownian motion.

