



PROBABILITY

Enrollment year	2015/2016
Academic year	2016/2017
Regulations	DM270
Academic discipline	
Department	DEPARTMENT OF MATHEMATICS "FELICE CASORATI"
Course	MATHEMATICS
Curriculum	PERCORSO COMUNE
Year of study	2°
Period	1st semester (03/10/2016 - 13/01/2017)
ECTS	9
Lesson hours	84 lesson hours
Language	ITALIAN
Activity type	ORAL TEST
Teacher	DOLERA EMANUELE (titolare) - 6 ECTS REGAZZINI EUGENIO - 3 ECTS
Prerequisites	Study of intermediate analysis and measure theory will provide helpful background
Learning outcomes	Deep analysis of the Kolmogorov theory of probability, with a view to its application to the study of the general theory of stochastic processes.
Course contents	1.- Kolmogorov probability space. Construction through the extension theorems of Kolmogorov and Ionescu-Tulcea. Analysis of the condition of stochastic independence. 2.- Expectation, basic inequalities (Tchebyshev, Jensen maximal Kolmogorov) convergence of sequences of random elements: in probability and almost sure: Borel-Cantelli lemmata and other 0-1 laws (Kolmogorov, Hewitt-Savage). 3.- Integral transformations of probability distributions. 4.- Laws of large numbers: Khintchin weak law, Etemadi strong law.

5.- Weak convergence of probability laws: the Prokhorov theory. The central limit theorem: the Lindeberg formulation for triangular arrays of independent random numbers.

5.- Conditional expectation as Radon-Nikodym derivative and as projection (regression function). Existence of regular conditional distributions.

6.- Sequences of random numbers forming a (s)martingale: convergence, optional stopping theorems and applications to real analysis, maximal inequalities, gambler ruin problem, strong laws of large numbers.

Teaching methods

Lectures on the theory and introduction to problem solving through exercises assigned in the form of homework.

Recommended or required readings

In addition to teacher's notes, see: Erhan Cinlar (2011) Probability and Stochastics. Springer.

Assessment methods

Oral examination together with check of some of the problems assigned as homework.

Further information

Oral examination together with check of some of the problems assigned as homework.

Sustainable development goals - Agenda 2030

[Sbl legenda sviluppo sostenibile](#)