



Course unit English denomination	Probability Theory
SS	MATH-03/B
Teacher in charge (if defined)	Athena Picarelli
Teaching Hours	42
Number of ECTS credits allocated	7
Course period	11/2025-01/2026
Course delivery method	<input checked="" type="checkbox"/> In presence <input type="checkbox"/> Remotely <input type="checkbox"/> Blended
Language of instruction	English
Mandatory attendance	<input checked="" type="checkbox"/> Yes (100% minimum of presence, apart from exceptional absences that must be justify in advance) <input type="checkbox"/> No
Course unit contents	<ul style="list-style-type: none">- Basics on probability spaces and random variables. Independence of random variables.- Conditional distribution and expectations. Characteristic and moment generating functions. Functions of random variables- Order statistics and martingales. Normal distribution theory.- Convergence of random variables and review of limit theorems: Laws of Large Numbers and Central Limit Theorems.- Stochastic processes: general definitions, filtrations, martingales, stopping times.- Discrete time Markov processes: Markov property and transition matrix. Canonical representations. Communication, irreducibility and periods. Stationarity. Convergence to steady state. Renewal equation and renewal theorem. Time to absorption and probability of absorption.- Generalities on continuous-time stochastic processes. Poisson process. Continuous time Markov chains: transition semigroup, infinitesimal generator. Diffusion processes.
Learning goals	<div>theory</div> <p>The students are supposed to achieve a deep knowledge of probability starting from basic concepts to more advanced ones.</p> <div>use</div> <p>Objective of the course is to provide theoretical insights on the topics and them for solving practical exercises.</p>
Teaching methods	Lectures
Course on transversal, interdisciplinary,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No



transdisciplinary
skills

Available for PhD
students from other
courses

☒ Yes

☐ No

Students from other PhD courses may be admitted subject to CV evaluation
by the Faculty Board

Prerequisites
(not mandatory)

Basic notions on Probability

Examination
methods
(if applicable)

Written Test

Suggested readings

Course material available from the instructor

Additional
information

max 3750 caratteri
