COURSE DETAIL

INTRODUCTION TO PROBABILITY AND THE MATHS OF RISK

Country
Italy

Host Institution
University of Bologna

Program(s)
University of Bologna

UCEAP Course Level
Upper Division

UCEAP Subject Area(s)
Mathematics

UCEAP Course Number
169

UCEAP Course Suffix

UCEAP Official Title
INTRODUCTION TO PROBABILITY AND THE MATHS OF RISK

UCEAP Transcript Title
PROBILTY &MATH RISK

UCEAP Quarter Units
6.00

UCEAP Semester Units
4.00

Course Description

This course is part of the Laurea Magistrale degree program and is intended for advanced level students. Enrollment is by permission of the instructor. This course is a problem-based introduction to probability and stochastic processes. No previous knowledge of probability is assumed, but knowledge of calculus in one or more variables is required.

The course is divided into 6 parts:

1. Axiomatic definition of probability. Uniform probability spaces. Counting methods: replacement, ordering. Conditional probability. Independence for events. The law of total probability. Bayes' rule.
2. Discrete random variables. Independence for random variables. Joint, marginal, and conditional densities. Common random variables and their interpretation: Bernoulli, discrete uniform, binomial, hypergeometric, geometric, Poisson, Pascal.
3. Expectation of discrete random variables. Variance and its properties. Expectation and variance of common random variables. Covariance and correlation. Variance of a sum. Null correlation and independence. Linear prediction.
4. Conditional expectation and its properties. Conditional Variance. Sigma-algebras, Continuous Random variables. The Uniform and Exponential distributions. Distribution functions and densities.
5. Marginal, joint and conditional densities. Gamma, Normal and Cauchy distribution. Derived Distributions: monotonic and general case. Conditional Expectation. Law of total expectation. Markov and Chebishev Inequalities.
6. Convergence of Random Variables. The Weak and Strong Laws of Large Numbers. Characteristic Functions and their properties. CF of a sum. CF of common random variables. The Central Limit Theorem.

At the end of the course the student has good knowledge of probability theory of discrete and continuous random variables. Particular attention is paid to the theory of stochastic processes, both diffusive and with jumps. The student masters the main techniques of stochastic calculus applied to

finance, such as stochastic differential and integral domain and change of measure techniques.

Language(s) of Instruction

English

Host Institution Course Number

98721

Host Institution Course Title

INTRODUCTION TO PROBABILITY AND THE MATHS OF RISK

Host Institution Course Details

https://www.unibo.it/en/study/course-units-transferable-skills-moocs/course-uni...

Host Institution Campus

BOLOGNA

Host Institution Faculty

Host Institution Degree

LM in GREENING ENERGY MARKET AND FINANCE

Host Institution Department

STATISTICS

Course Last Reviewed

2025-2026

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