# Stochastic Processes in Astrophysics and Cosmology

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LECTURE PROGRAM
Bat. 18, Salle 117, 10:00 AM, Observatoire de Paris, MEUDON Campus

**Day 1**

Introduction & Fundamentals:

- Introduction Stochastic Systems
- Random Variables & Probability Distributions
- Moments & Generating Functions
- Binomial, Poisson & Gaussian Distributions

TD: Statistic problems & Random Number Generator Algorithms

**Day 2**

Elements of Stochastic Models:

- Discrete Random Walks
- Continuous Limit: Fokker-Planck Equation & Diffusion
- Langevin Equation

TD: Analytical Solutions of Stochastic Problems

- Stochastic Processes
- Kramers-Moyal Expansion

**Day 3**

Stochastic Differential Equations (SDE) & Numerical Methods:

- Ito's Integral & Ito's Lemma

TD: Monte Carlo Simulations of SDE

**Day 4**

Astrophysical Applications:

- Cosmic Ray Diffusion
- Dark Matter Halo Abundance: Excursion Set Theory

TD: Analytical Modeling/Simulations of Astrophysical Problem Examples