

STEVENS INSTITUTE OF TECHNOLOGY

FE 540 WS: Probability Theory for FE Syllabus

- Instructor:** Dragos Bozdog
Office: Babbio 429A
Email: dbozdog@stevens.edu
Phone: (201) 216-3527
- Time:** TBD
- Office Hours:** By appointment
- Objective:** The goals of this course is to provide FE students with the necessary probability theory background to ensure a better performance in the rest of the FE program while introducing them to the probabilistic models. In particular the concepts of sigma fields or algebras are not covered in classical probability courses; this is necessary for constructing information filtrations.
- Required Textbook:** Ghahramani, Saeed. *Fundamentals of Probability with Stochastic Processes*, 3rd Ed. Upper Saddle River, N.J.: Pearson/Prentice Hall, 2005. (ISBN: 0131453408)
- Recommended Textbook:** Dineen, Sean. *Probability Theory in Finance: A Mathematical Guide to the Black-Scholes Formula*, Graduate Studies in Math, Vol. 70, AMS publications. (ISBN: 0821839519)
- Other References:** Florescu, I. and Tudor, C., *Handbook of Probability*, Wiley, 2013. (ISBN: 9780470647271)
- Topics:** Sample space, events and probability; basic counting techniques and combinatorial probability; random variables, discrete and continuous; probability mass, probability density and cumulative distribution functions; expectation and moments; some common distributions; jointly distributed random variables, conditional distributions and independence, bivariate normal, transformations of variables. Some additional topics include Laws of large numbers, Markov chains and diffusion processes, prices in markets as random variables and processes, filtrations and information. Applications target financial engineering examples.
- Required Readings:** The students are expected to read the corresponding chapter before joining the session, to prepare questions, and to participate during the online meetings.
- Homework:** There will be homework assignments for all section covered in this course.
- Grading:** Assignments – 50%
Final – 50%

FE 540 WS - Course Schedule

	Topic	Readings
Week 1	Axioms of Probability	Ch. 1
Week 2	Combinatorial Methods	Ch. 2
Week 3	Conditional Probability and Independence	Ch. 3
Week 4	Distribution Functions and Discrete Random Variables	Ch. 4
Week 5	Probability, Sigma-Fields, Filtrations and Information Fair Games, Hedging and Arbitrage	Notes
Week 6	Special Discrete Distributions	Ch. 5
Week 7	Continuous Random Variables	Ch. 6
Week 8	Special Continuous Distributions	Ch. 7
Week 9	Bivariate Distributions Multivariate Distributions	Ch. 8 and Ch. 9
Week 10	More Expectations and Variances	Ch. 10
Week 11	Sums of Independent Variables and Limit Theorems	Ch. 11
Week 12	Introduction to Stochastic Processes: Poisson Processes, Markov Chains, Continuous-Time Markov Chains, and Brownian Motion	Ch. 12
Week 13	Review	