

**FE 520**  
**Financial Calculus**  
**Spring 2021**

This course presents an introduction to stochastic models in financial decision making. We first introduce discrete time models: Martingales, risk-neutral probability measure and change-of-measure in discrete time. Then, we discuss Brownian motion, Ito's formula and Black-Scholes-Merton equation. We present various applications of risk-neutral pricing equation.

Topic	
1	Introduction and a binomial pricing model
2	Conditional expectation, martingales, and risk-neutral pricing
3	Pricing European options in discrete-time model
4	Construction of the Brownian Motion and its properties
5	Stochastic integral and Ito's formula
6	Black-Sholes model and extensions

**Instructor:** Refik Güllü, [refik.gullu@boun.edu.tr](mailto:refik.gullu@boun.edu.tr)

**Midterm Dates:** April 24, 2021 (Midterm 1), June 12, 2021 (Midterm 2).

**References:** Students are strongly encouraged to attend classes and take notes. Lecture notes are mostly based on Shreve Volume I and Volume II.

1. Shreve, S. E. (2004). *Stochastic Calculus for Finance I*. Springer.
2. Shreve, S. E. (2004). *Stochastic Calculus for Finance II*. Springer.
3. Baxter, M. and Rennie, A. (1996), *Financial Calculus: an introduction to derivative pricing*, Cambridge University Press.

**Grading:** Midterm 1 (30 %), Midterm 2 (30%), Final (40 %).

**Moodle:** <http://moodle.boun.edu.tr/>

**Weekly course plan:**

- The lecture notes (pdf files and video file) will be posted on the moodle page ([moodle.boun.edu.tr](http://moodle.boun.edu.tr/)) regularly, well before we start covering the related topic in the zoom session.
- You are expected to review the lecture notes before we cover it in the class.
- We will be holding zoom classes. Some of the details that are not covered in the lecture notes (such as detailed derivations) will be delivered in the zoom class. The depth of conduct will be determined by your questions and feedback.
- I will be posting some study questions before the exams (will not be graded)