

Course literature. Boualem Djehiche, *Stochastic Calculus. An Introduction with Applications*, KTH compendium, available at THS Karbokhandel, Drottning Kristinas vagen 15-19.

Reading suggestions.

- Lecture 1: Conditional expectation. Chapters 1-4 in the notes.
- Lecture 2: Martingales I. Chapter 5 in the notes.
- Lecture 3: Martingales II. Chapters 6.1 (Kolmogorov-Doob inequality only) and 8 in the notes.
- Lecture 4: Discrete stochastic integrals and discrete Brownian motion. Chapters 9-10 in the notes.
- Lecture 5: Girsanov theorem I and continuous martingales I. Chapters 10.3 and 11.1-2 in the notes.
- Lecture 6: Exercise session 1.
- Lecture 7: Bracket of a continuous martingale and Brownian motion I. Chapters 11.3 and 12.1-3 in the notes.
- Lecture 8: Repetition learning unit I (Conditional expectation, martingales and stochastic integrals in discrete time). Chapters 3.1-7 of Timo Koski's lecture notes for SF2940 ([pdf](#)).
- Lecture 9: Martingale properties of Brownian motion. Chapters 12.4-9 in the notes.
- Lecture 10: Exercise session 2.
- Lecture 11: Ito integral I. Chapter 13.1 in the notes.
- Lecture 12: Ito integral II. Chapter 13.2 in the notes.
- Lecture 13: Ito integral III and Ito Lemma. Chapters 13.3, 13.6, 14.1 and 14.4 in the notes.
- Lecture 14: Exercise session 3.
- Lecture 15: Martingale representation theorem. Chapters 15.1-2 in the notes.
- Lecture 16: Exercise session 4.
- Lecture 17: Girsanov theorem II, Black-Scholes market model, Introduction to stochastic differential equations. Chapters 14.2, 15.3.1 and 16.1 in the notes.
- Lecture 18: Linear SDEs, existence and uniqueness of strong solutions to SDEs. Chapters 16.2 and 16.4 in the notes.
- Lecture 19: Exercise session 5.
- Lecture 20: Homogeneous diffusions and their generators, Dynkin's formula and Kolmogorov forward equation. Chapters 16.5-6, 17, 18.1 in the notes.
- Lecture 21: Exercise session 6.
- Lecture 22: Feynman-Kac representation, Kolmogorov backward equation. Chapters 18.2-3 in the notes.

Further literature.

- R. Durrett, *Probability: Theory and Examples*, Cambridge university press, 2010. Chapters 5 and 8.
- J. Jacod and P. Protter, *Probability Essentials*, Springer Science & Business Media, 2003. Chapters 24-28.
- T. Koski, *Probability and Random Processes at KTH*, available as ([pdf](#)), 2014. Chapter 3.
- G. Lawler, *Introduction to Stochastic Processes*, CRC Press, 2006. Chapters 5, 8 and 9.
- B. Oksendal, *Stochastic Differential Equations: an Introduction with Applications*, Springer Science & Business Media, 2013. Chapters 1-5, 7 and 8.
- D. W. Stroock and S. R. S. Varadhan, *Multidimensional Diffusion Processes*, Springer, 2007. Extensive advanced treatise, for personal interests only.