
Advanced Mathematics for Statistics
Probability Theory
A.A. 2019 / 2020
Stefano Pagliarani, Athena Picarelli

Course schedule

October 2019

1. Tuesday 22 (Picarelli, 4 hours, 10.00-12.00 and 14.00-16.00).
Basics on probability spaces and random variables (Ch.1 [Sev]). Multi-variate random variables;
2. Tuesday 29 (Picarelli, 3 hours, 10.00-13.00).
Independence of random variables. Conditional distribution and expectations.

November 2019

3. Tuesday 5 (Picarelli, 4 hours, 10.00-12.00 and 14.00-16.00).
Characteristic and moment generating functions (Ch.3,4 [Sev]). Functions of random variables (Ch.7 [Sev]);
4. Tuesday 19 (Picarelli, 4 hours, 10.00-12.00 and 14.00-16.00).
Applications (order statistics and martingales, Ch.2,7 [Sev], Ch 7 [Gut]) and exercises;
5. Tuesday 26 (Picarelli, 3 hours, 10.00-13.00).
Normal distribution theory (Ch.5 [Gut], Ch.8 [Sev]).

December 2019

6. Tuesday 3 (Picarelli, 3 hours, 10.00-13.00).
Convergence of random variables (Ch.6 [Gut], Ch.11 [Sev]);
7. Tuesday 10 (Picarelli, 3 hours, 10.00-13.00).
The law of large numbers (Ch.6 [Gut], Ch.11 [Sev]).

January 2020

8. Tuesday 7 (Pagliarani, 3 hours, 10.00-13.00).
The Central Limit Theorem (Ch.6 [Gut], Ch.12 [Sev]);
9. Wednesday 8 (Pagliarani, 3 hours, 10.00-13.00).
Discrete time Markov models (Ch.2 [Bre]);
10. Monday 20 (Pagliarani, 3 hours, 10.00-13.00).
Recurrence and ergodicity (Ch.3 [Bre]);
11. Tuesday 21 (Pagliarani, 3 hours, 10.00-13.00).
Long time behavior and MCMC methods (Ch.4 [Bre]);

12. Wednesday 29 (Pagliarani, 3 hours, 10.00-13.00).
Stochastic processes in continuous time: Poisson processes and continuous time Markov models (Ch. 8 [Bre]);
13. Thursday 30 (Pagliarani, 3 hours, 10.00-13.00).
Exercises

References:

- [Gut] A. Gut, An intermediate course in probability, Springer Verlag, 1995.
- [Bre] P. Bremaud, Markov chains, Gibbs fields, Monte Carlo simulation and queues, Springer Verlag, 1998.
- [Sev] T.A. Severini, Elements of distribution theory, Cambridge University Press, 2005.