Probability A4 SYLLABUS (2024/2025 first semester)

1. Combinatorial analysis. Permutations, variations, combinations.
2. Axioms of probability. Sample space and events. Combinatorial and geometrical probability spaces.
3. Conditional probability and independence. Bayes Theorem.
4. Random variables. Distribution functions, expectation, and variance. Independence and joint distribution of random variables.
5. Discrete random variables: Bernoulli, Binomial, Multinomial, Geometric, Negative Binomial (Pascal), Hypergeometric, and Poisson distributions together with their mode, expectation, variance, applications and relations between them.
6. Absolutely continuous random variables: Uniform, Exponential, Normal (Gaussian) and Gamma distributions. Density and distribution functions. Relation between discrete and continuous distributions, Poisson process.
7. Chebysev's inequality and the weak law of large numbers. The Central Limit Theorem, Moivre–Laplace Theorem.
8. Functions of random variables, independent sums (convolution). Joint distributions, marginal distributions, conditional expectation.
9. Two-variate normal and uniform distributions, covariance, correlation.
10. Regression curve, linear regression.
11. Statistical notions, basic statistics. Point and interval estimation, maximum likelihood estimation. Confidence interval, hypothesis testing (z- and t-tests).

Bibliography: S. Ross: A First Course in Probability, Prentice-Hall, 1992.

Schedule of midterm tests:

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