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| **1. Course title:** Probability and Statistics | | | | | |
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| **2. Code:** | | **3. Type (lecture, practice etc.):** seminar | | | |
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| **4. Contact hours:** 3 hoursper week | | **5. Number of credits (ECTS):** 3 | | | |
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| **6. Preliminary conditions (max. 3):** | | | | | |
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| **7. Announced:** ☐fall semester, ☒spring semester, ☐both | | | | | |
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| **8. Limit for participants:** | | | | | |
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| **10. Responsible teacher (faculty, institute and department):**  András B. Frigyik, PhD (Faculty of Science, Institute of Mathematics and Informatics, Department of Applied Mathematics) | | | | | |
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| **11. Teacher(s) and percentage:** | | András B. Frigyik, PhD | | 100 % | |
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| **12. Language:** English | | | | | |
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| **13. Course objectives and/or learning outcomes:**  **Objectives:** The seminar intends to introduce students to the world of probability and statistics. The course gives an insight into the basic ideas and ways of thinking encountered in probability theory and statistics.  **Learning outcomes:** students completing the course will have familiarity with questions and methods related to probabilistic problems that they are likely to encounter in life and during their work. | | | | | |
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| **14. Course outline**   1. The idea of mathematical models. The difference between deterministic and probabilistic models. An intuitive approach to probability. The concept of an event. 2. Working with events. The definition of probability and its properties. Classical probability space. Boole inequality. 3. The definition of the probability mass function (pmf) and its property. Events with equal probability and the Assumption of Uniformity. Independence. 4. Bernoulli trials. The concept of conditional probability and its interpretation. Total probability. Bayes’ theorem. 5. Definition of discrete random variables and their behavior. Probability mass function and distribution function associated to a random variable. Important discrete distributions. 6. Joint probability mass function and joint distribution function. Marginals. Expectation value and variance of a random variable. Independent random variables. 7. 1st midterm 8. Application of discrete random variables. Law of Large Numbers. Definition of continuous random variables and their description: Their distribution and density functions. Expectation value and variance. 9. Important continuous random variables. Joint distribution and joint density of continuous random variables. Independence and its description. Central Limit Theorem. 10. Basics of statistics. The idea of an estimator. Point and interval estimators. The concept of confidence interval. 11. Parametric statistical tests: Z-tests, Student-t test, chi-squared test, F-test, and their applications. 12. Non-parametric statistical test: test for homogeneity, test for fitness, test for independence 13. 2nd Midterm | | | | | |
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| **15. Mid-semester works**  In order to pass the class students are required to take the two midterms, one in the 7th week and the other one in the 13th weak. | | | | | |
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| **16. Course requirements and grading**  Each midterm worth 40-40 points. Depending on the score the grades are the following:  0%–33% fail (F)  34%–49% satisfactory (D)  50%–65% average (C)  66%–81% good (B)  82%–100% excellent (A) | | | | | |
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| **17. List of readings**   1. Feller, William. *An introduction to probability theory and its applications: volume I*. (3rd ed.) New York: John Wiley & Sons, 1968. 2. Wasserman, L., *All of statistics: a concise course in statistical inference*. Springer Science & Business Media, 2013. | | | | | |
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| **18. Recommended texts, further readings**   1. Gordon, H., *Discrete probability*, Springer Science & Business Media, 2012. 2. Freedman, D., Pisani, R., Purves, R., *Statistics 4th edition*, W. W. Norton & Company, 2007 | | | | | |
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| **Date** | 4 May, 2017 | **Prepared by** |  | | |
| András B. Frigyik, PhD  responsible teacher | | |
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| **Endorsed by** | | |  | | |
| László Tóth, PhD  program supervisor | | |