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| **1. Course title:** Statistics | | | | | |
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| **2. Code:** | | **3. Type (lecture, practice etc.):** lecture | | | |
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| **4. Contact hours:** 2 hoursper week | | **5. Number of credits (ECTS):** 3 | | | |
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| **6. Preliminary conditions (max. 3):**   * Probability Theory and Statistics lecture * Probability Theory and Statistics seminar | | | | | |
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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 lecture intends to introduce students to the world of statistics. The purpose of the course is to provide the students with the basic tools necessary to start comprehending the basic ideas and methodology of the subject..  **Learning outcomes:** students completing the course will have familiarity with questions and methods related to that segment of statistics that they are likely to encounter in their professional life. | | | | | |
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| **14. Course outline**   1. Review of the most important ideas from probability theory. 2. Basic notions of statistics. Sampling, statistical sample, realization. Empirical distribution. Theorem of Cantelli-Glivenko. 3. Statistical estimator. Statistical function, point or parameter estimator. Types of estimators: Unbiased estimator, asymptotically unbiased estimator, consistent and strongly consistent estimator. Examples. 4. Efficient estimator, unicity of an efficient estimator. Sufficient statistics. 5. Estimation methods I: Principle of maximal likelihood. Examples: parameter estimations of exponential, normal and other distributions. Fisher Information and its reciproc, the Information Limit. Cramér-Rao inequality. 6. Estimation methods II: Method of least squares. Linear regression. 7. Estimation methods III: Method of moments. Parameter estimation of a uniform distribution. 8. Confidence interval. Calculation of confidence interval for the expectation value of a normal distribution with known and unknown variance. Calculation of confidence interval for the variance of a normal distribution. 9. Statistical hypothesis testing. Null-hypothesis, alternative hypothesis. Error of first and second kind. Test function. Domain of acceptance and rejection. 10. Parametric tests I: one- and two-sample Z-tests for one- and two-sided hypothesis testing. 11. Parametric tests II: one- and two-sample t-tests for one- and two-sided hypothesis testing. F-test. 12. Non-parametric tests I: Goodness-of-fit test for discrete and continuous random variables using Chi-squared test. 13. Non-parametric tests II: Test for homogeneity and independence using Chi-squared test. | | | | | |
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| **15. Mid-semester works** | | | | | |
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| **16. Course requirements and grading**  The course ends with an oral exam. | | | | | |
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| **17. List of readings**   1. Freedman, David, Robert Pisani, and Roger Purves. *Statistics*. WW Norton & Company, 2007. 2. Wasserman, Larry. *All of statistics: a concise course in statistical inference*. Springer Science & Business Media, 2013. | | | | | |
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| **18. Recommended texts, further readings** | | | | | |
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| **Date** | 17 May, 2017 | **Prepared by** |  | | |
| András B. Frigyik, PhD  responsible teacher | | |
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| **Endorsed by** | | |  | | |
| László Tóth, PhD  program supervisor | | |