Outline

1 semester 2024-2025

Topic 0. Basic notations of Probability

Topic 1. Statistics sampling.

Topic 2. Statistical estimation of distribution parameters.

Topic 3. Hypothesis tests.

Topic 4. The analysis of variance

Assessment methods of mid-term and final examinations, assessment criteria

Course progress structure	Weight in the course grade	Number of points in the course grade structure
Mini-tests /HomeWorks	(10%)	10
Test 1	(20%)	20
Test 2	(20%)	20
Exam	(50%)	50
Total	(40%)	100

List of questions (in progress)

1) Population, sample. Empirical distribution function and density. Cumulative distribution function graph and histogram.
2) Sample characteristics (mean, variance, mode, median, quantiles, outliers, IQR)
3) Formulation of the problem of statistical estimation of distribution parameters. The concept of point and interval estimates of parameters. Basic requirements for point estimates: unbiasedness, consistency, efficiency.
4) Point estimates of the parameters using the method of moments. The properties of these evaluations.
5) Maximal likelihood methods
6) Interval estimation of the parameters of the distribution. Confidence intervals and confidence level.
7) An algorithm for constructing the confidence interval.
8) The confidence interval for an unknown population mean of a normally distributed random variables (the variance is known),
9) The confidence interval for an unknown population mean of a normally distributed random variables (the variance is UNknown),
10) The confidence interval for variance normally of distributed random values;
11) The confidence interval of the parameter of the exponential distribution.
12) The confidence interval of the parameter of the binomial distribution.
13) •General concept of statistical hypotheses. Simple and complex hypotheses.
14) The concept of hypothesis testing and the critical areas. Types of critical areas. Type I and type II The confidence interval for an unknown population mean of a normally

distributed random variables (the variance is Unknown), errors. The level of significance and power of the test.

15) Parametric and nonparametric hypothesis. An algorithm for testing statistical hypotheses.
16) Criteria for testing goodness of fit of distribution models: Kolmogorov, Pearson (chi-square),
17) Uniformity criteria for two or more samples (Kolmogorov Smirnov test, Mann–Whitney test, Wilcoxon Test).
18) Parametric hypothesis. Testing the hypothesis on the value of mean of a normally distributed random variable.
19) Parametric hypothesis. Testing the hypothesis on the value of variance of a normally distributed random variable.
20) Parametric hypothesis. Testing the hypothesis on the value of parameter of a binomial distribution
21) Testing hypotheses about the equality of the means of two normally distributed random variables.
22) Testing hypotheses about the equality of the variances of two normally distributed random variables.
23) Non-Parametric Hypotheses. Median test. Single-sample sign test
24) Kruskal–Wallis test
25) Mood's median test