KAZAKH-BRITISH TECHNICAL UNIVERSITY

KBTU

SYLLABUS

Academic year 2025-2026
Semester Fall 2025

Discipline: Statistics

Volume of credits: 3 (2/0/1)

Course/Syllabus designer: Shaimerdenova Altynay Kassymkhanovna, PhD,Assistant Professor

Instructor's e-mail	altynay.kaznu@gmail.com
Class Schedule	According to the schedule
Office Hours	To be announced
Office	312

1. Course Overview

This course introduces students to the concepts and applications of statistics, including elements of probability theory, descriptive statistics, discrete and continuous random variables, confidence intervals, statistical inferences with hypothesis testing, and regression analysis. The goal of the course is to show the students that statistics is a useful science with many practical applications.

Prerequisites: Calculus I, II.

Postrequisites: Algorithms and Programming Languages, Data Analysis.

2. Aims and Objectives

The aims of the course are to familiarize students with essential concepts and methods of statistics that has various important applications.

3. Learning Outcomes

By the end of this course, the students will be able to

1) understand key definitions, terms, and terminology used in statistics;
2) understand the concepts of probability theory and use various probability approaches and rules;
3) successfully apply different sampling methods;
4) graphically present and numerically describe statistical data;
5) make statistical inferences and numerically measure reliability of the inferences using various types of statistical distributions;
6) use linear regression models and assess the validity of the models.

4. Textbooks and Readings

Primary textbook

1) Valerie Watts. Introduction to Statistics: An Excel-Based Approach, Fanshawe, 2022, 936 p.

Supplementary textbooks

1) Barbara Illowsky, Susan Dean. Introductory Statistics, 2nd Ed., OpenStax, 2023, 849 p.

5. Course Program

Week	Classes				
	Topic	Lecture	Laboratory	Seminar	Textbook Chapter
1	**Sampling and Data.** Introduction to Sampling and Data. Definitions of Statistics, Probability, and Key Terms. Frequency, Frequency Tables, and Levels of Measurement. Experimental Design.	2	0	1	[1], Ch.1 (1.1-1.5, pp. 3-35) Problem set: Ch.1.6, pp. 36-54
2	**Descriptive Statistics.** Introduction to Descriptive Statistics. Histograms, Frequency Polygons, and Time Series Graphs. Measures of Central Tendency.	2	0	1	[1], Ch.2 (2.1-2.3, pp. 63-97) Problem set: Ch.2.7, pp. 134-165
3	**Descriptive Statistics.** Skewness and the Mean, Median, and Mode. Measures of Location. Measures of Dispersion.	2	0	1	[1], Ch.2 (2.4-2.6, pp. 98-133) Problem set: Ch.2.7, pp. 134-165
4	**Probability.** Introduction to Probability. Terminology. Contingency Tables. The Complement Rule. The Addition Rule. Conditional Probability. Joint Probabilities.	2	0	1	[1], Ch.3 (3.1-3.7, pp. 169-224) Problem set: Ch.3.8, pp. 225-235
5	**Discrete Random Variables.** Introduction to Discrete Random Variables. Probability Distribution of a Discrete Random Variable. Expected Value and Standard	2	0	1	[1], Ch.4 (4.1-4.5, pp. 239-283) Problem set: Ch.4.6, pp. 284-302

	Deviation. The Binomial Distribution. The Poisson Distribution.				
6	**Continuous Random Variables and the Normal Distribution.** Introduction to Continuous Random Variables. Probability Distribution of a Continuous Random Variable. The Normal Distribution. The Standard Normal Distribution. Calculating Probabilities for a Normal Distribution.	2	0	1	[1], Ch.5 (5.1-5.5, pp. 305-345) Problem set: Ch.5.6, pp. 346-357
7	**The Central Limit Theorem and Sampling Distributions.** Introduction to Sampling Distributions and the Central Limit Theorem. Sampling Distribution of the Sample Mean. Sampling Distribution of the Sample Proportion.	2	0	1	[1], Ch.6 (6.1-6.3, pp. 361-387) Problem set: Ch.6.4, pp. 388-391
8	**Confidence Intervals for Single Population Parameters.** Confidence Intervals for a Single Population Mean with Known and Unknown Population Standard Deviations. Confidence Intervals for a Population Proportion. Sample Size for a Confidence Interval.	2	0	1	[1], Ch.7 (7.1-7.5, pp. 395-449) Problem set: Ch.7.6, pp. 450-458
9	**Hypothesis Tests for Single Population Parameters.** Null and Alternative Hypotheses. Outcomes and the Type I and Type II Errors. Distributions Required for a Hypothesis Test. Rare Events, the Sample, Decision, and Conclusion. Hypothesis Tests for a Population Mean with Known and Unknown Population Standard Deviations. Hypothesis Tests for a Population Proportion.	2	0	1	[1], Ch.8 (8.1-8.8, pp. 461-533) Problem set: Ch.8.9, pp. 534-543
10	**Statistical Inference for Two Populations.** Statistical Inference for Two Population Means with Known and Unknown Population Standard Deviations. Statistical Inference for Matched Samples. Statistical Inference for Two Population Proportions.	2	0	1	[1], Ch.9 (9.1-9.5, pp. 547-630) Problem set: Ch.9.6, pp. 631-640
11	**Statistical Inferences Using the Chi-Square Distribution.** The Chi Square Distribution. Statistical Inference for a Single Population Variance. The Goodness-of-Fit Test. The Test of Independence.	2	0	1	[1], Ch.10 (10.1-10.5, pp. 645-699) Problem set: Ch.10.6, pp. 700-711

12	**Statistical Inference Using the F-Distribution.** The F-Distribution. Statistical Inference for Two Population Variances. One-Way ANOVA and Hypothesis Tests for Three or More Population Means.	2	0	1	[1], Ch.11 (11.1-11.4, pp. 715-756) Problem set: Ch.11.5, pp. 757-764
13	**Simple Linear Regression and Correlation.** Linear Equations. Scatter Diagrams. Correlation. The Regression Equation. Coefficient of Determination. Standard Error of the Estimate.	2	0	1	[1], Ch.12 (12.1-12.7, pp. 769-814) Problem set: Ch.12.8, pp. 815-830
14	**Multiple Regression.** Introduction to Multiple Regression. Standard Error of the Estimate. Coefficient of Multiple Determination. Testing the Significance of the Overall Model.	2	0	1	[1], Ch.13 (13.1-13.5, pp. 833-872) Problem set: Ch.13.8, pp. 892-898
15	**Multiple Regression.** Testing the Regression Coefficients. Multicollinearity.	2	0	1	[1], Ch.13 (13.6-13.7, pp. 873-891) Problem set: Ch.13.8, pp. 892-898

6. Course Requirements and Grades

COURSE ASSESSMENT PARAMETERS

Attendance, activity in seminars and homework	20 %
Quizzes	20 %
Midterm/endterm exams	20 %
Final exam	40 %
Total	**100 %**

№	Assessment criteria	Weeks															16 17	Tot al
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1.		Attendance has to be more than 70%																
2.	Activity in seminars and homework	1	2	1	2	1	2	1	1	1	2	1	2	1	1	1		20
3.	Quizzes				10							10						20
4.	Midterm/endterm exams								10						10			20
5.	Final examination																40	40
	Total	60															40	100

Grading policy:

Intermediate attestations (on 7th and 14th week) join topics of all lectures, homework, quiz and materials for reading discussed to the time of attestation. Maximum number of points within attendance, activity, homework, quiz and seminars for each attestation is 30 points.

Final exam joins and generalizes all course materials, is conducted in the complex form with questions and problems. Final exam duration is 120 minutes. Maximum number of points is 40. At the end of the semester, you receive overall total grade (summarized index of your work during semester) according to conventional KBTU grading scale.

Grade		Achievement percentage	Assessment criterion
«Excellent»	A	95-100%	This grade is given when the student: demonstrated a complete understanding of the course material; did not make any errors or inaccuracies; completed control and laboratory work in a timely and correct manner, and submitted reports on them; demonstrated original thinking; submitted control quizzes on time and without any errors; completed homework assignments; engaged in research work; independently used additional scientific literature in studying the discipline; was able to independently systematize the course material.
	A -	90-94%	
«Good»	B+	85-89%	This grade is given when the student: mastered the course material at no less than 75%; did not make gross errors in responses; timely completed control and laboratory work and submitted them without fundamental remarks; correctly completed and timely submitted control tests and homework assignments without fundamental remarks; utilized additional literature as indicated by the instructor; engaged in research work, made non-fundamental errors, and fundamental errors corrected by the student themselves; managed to systematize the course material with the help of the instructor.
	B	80-84%	
	B-	75-79%	
	C+	70-74%	
«Satisfactory»	C	65-69%	This grade is given when the student: mastered the course material no less than 50%; required assistance from the instructor when completing control and laboratory work, homework assignments; made inaccuracies and non-fundamental errors when submitting control tests; did not demonstrate activity in research work, relied solely on the educational literature indicated by the instructor; experienced more difficulty in systematizing the material.
	C-	60-64%	
	D+	55-59%	
	D	50-54%	

7. General Rules

Academic Integrity

Students are required to:

- be respectful to the teacher and other students;
- switch off mobile phones during classes;
- DO NOT cheat. Plagiarized papers will be graded with zero points!
- come to classes prepared and actively participate in classroom work;
- meet the deadlines;
- enter the classroom before the teacher starts the lesson;
- attend all classes. No make-up tests or quizzes are allowed unless there is a valid reason for missing it;
- follow KBTU academic policy including **W, AW, I, F** grades.

When students have a score of 29 or less for attestation 1 added to attestation 2, then their grade is F.
When students have a score of 19 or less (less than 50%) for their final exam, then their grade is F.

Students are encouraged to

- consult the lecturer on any issues related to the course;
- make up within a week's time for the works undone for a valid reason without any grade deductions.

Attendance policy

Class attendance is mandatory. If students are absent for 30% of the lessons or more, then they automatically obtain the grade F. If students do not attend the final exam, then their grade is F.

Course Instructor: _____ Shaimerdenova Altynay Kassymkhanovna

Approved by the meeting of the SAM
Meeting number: #2
Date: 18 « 08 » 2025