

Identification	Subject	MATH180, Mathematics and statistics for biological sciences, 6 ECTS
	Department	Life Sciences
	Program	Bachelor
	Term	Spring 2026
	Instructor	Assoc. Prof. Javid Ojaghi
	E-mail:	javid.ojaghi@khazar.org
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	Classroom/hours	Mahsati str., 11 (Neftchiler campus).
	Consultation hours	
Language	English	
Compulsory/Elective	Compulsory	
Textbooks and supplementary literature	<p>Main textbooks:</p> <ol style="list-style-type: none"> 1. Agresti A. 2013. <i>Categorical Data Analysis</i>, 3rd edn. Wiley Series in Probability and Statistics. Wiley-Interscience. 2. Australian Bureau of Statistics. 2003. <i>Themes - Education and Training Statistics National Centre: Review of Statistics on Higher Education</i>. 3. Brown G., Pocock A., Zhao M., Lujan M. 2012. Conditional likelihood maximisation: A unifying framework for information theoretic feature selection. <i>Jour. of Mach. Learn. Res.</i> 13, 27–66. 4. Hastie T., Tibshirani R., Friedman J. 2009. <i>The Elements of Statistical Learning</i> (2nd edition, Springer, New York). 5. Fox S. 2013. <i>Data Analysis Using Dot Plots, Measures of Central Tendency, and Interquartile Range</i>. Flexbook. 6. McDonald J.H. 2014. <i>Handbook of Biological Statistics</i> (3rd ed.). Sparky House Publishing, Baltimore, Maryland. 7. Moghaddam M. 2009. <i>Biometrics</i>, pp. 444 8. Singh R.K and Chaudhary B.D. 2010. <i>Biometrics in Agriculture</i>, pp. 432. 9. Sivia D. and J. Skilling. 2006. <i>Data Analysis: A Bayesian Tutorial</i>, (Oxford University Press). 10. SPSS (2003). <i>SPSS Base 12.0 for Windows User's Guide</i>, SPSS Inc., Chicago, IL. 11. Wholey, J., Hatry, H., & Newcomer, K. (eds). 2004. <i>Handbook of practical program evaluation</i>. San Francisco, CA. Jossey-Bass 	
Course description	<p>The subject of Biometry or Biostatistics defines the methods for analyzing results obtained during biological phenomena and observations through the application and development of statistical and mathematical techniques. Biometry is widely used in modern biology, agriculture, and various fields of medicine, including clinical studies that allow the evaluation of the relative effectiveness of different therapy methods, investigations of the causes of diseases, their control, epidemiological research on public health issues, and solving various genetic problems, such as determining the nucleotide sequences of the genomes of different organisms.</p>	

	<p>Although the terms biometry and biostatistics are often used synonymously, the concept of biometry is more commonly applied in agricultural and biological research, whereas biostatistics is primarily applied in medical studies. Biometry plays a key role in the development of modern biology and its main applied fields, including agriculture and medicine.</p> <p>Although the rediscovery of Gregor Mendel's laws of inheritance in 1900 initially led to conceptual gaps between geneticists and some evolutionary scientists, such inconsistencies in biology, agriculture, and medicine were eventually resolved through multi-faceted statistical discussions conducted at different periods. These discussions formed the basis of biometrical models, which ensured continuity and consistency in these fields of science.</p>		
Course objectives	<p><i>General objective:</i> The course aims to familiarize undergraduate students with how to analyze experimental results using modern biometric methods, teach them to apply biometric techniques in selection research based on their objectives, help them master key statistical methods, instill effective use of these methods in their scientific research, and develop practical skills.</p> <p><i>Specific objectives:</i></p> <ul style="list-style-type: none"> - To identify students' academic potential, encourage their interest in science, and help them realize their abilities; - To motivate students to participate actively in the course and to ensure an environment of mutual respect and understanding. 		
Learning outcomes	<p>By the end of the course, students should know :</p> <ul style="list-style-type: none"> ➤ Will be able to explain the fundamental concepts of biometrics and biostatistics and their fields of application. ➤ Will be able to calculate and interpret key statistical measures used in biological research (means, variance, standard deviation, etc.). ➤ Will be able to apply statistical distributions and analysis of variance (ANOVA) to biological data. ➤ Will be able to formulate and test statistical hypotheses and scientifically justify the obtained results. ➤ Will be able to perform biometric analyses using SPSS and other statistical software independently. ➤ Will be able to accurately present statistical analysis results using tables, graphs, and appropriate scientific terminology. 		
Teaching methods	Case analysis		X
	Group discussion		X
	Lecture		X
	Simulation		X
Evaluation criteria	Components	Date/deadline	Percent (%)
	Individual laboratory work	During the semester	-
	Quiz	Four times during the semester	10
	Individual topic presentation	During the semester	10

	Attendance	During the semester	-
	Activity	During the semester	10
	Midterm exam		30
	Final exam		40
	Total		100

Policy	<p>Organization of the course</p> <ul style="list-style-type: none"> - General information related to the subject will be delivered to students during the class - New topics will be explained using visual aids (PPT presentations and video files). - Before midterm and final exams, students' comprehension levels will be assessed through quizzes. - During classes, students' understanding of previous topics will be evaluated in each lesson through oral and written questioning; a cumulative grade for participation will be assigned at the end of the semester. - It is mandatory to deliver individual topic presentations during the semester. Each presentation, including discussion at the end, should not exceed 15 minutes. The presentation must also be submitted in a printed format. Detailed guidance on presentation topics and rules will be provided during class. - Conducting individual laboratory work during the semester is required. Laboratory sessions must be attended in a white lab coat. The results of laboratory work must be recorded in a notebook, and detailed instructions regarding these rules will be provided during class. <p>Attendance Students are required to attend all classes. If a student misses classes for valid reasons (such as illness, family circumstances, etc.), they must inform the faculty administration. Students who miss more than 20% of the classes will not be allowed to take the exam.</p> <p>Examinations All matters related to a student's participation in exams or missing an exam are resolved by the faculty administration. Topics for the midterm and final exams are provided to students before the exams. Questions from the midterm exam will not be repeated on the final exam.</p>
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Tentative Schedule

Week	Date (Planned)	Topics	Textbook/Assignments
1		<p>Topic №1: The Importance of Biometry in Biotechnology Summary: Biometry as an independent subject; the significant role of biometry in biological sciences, including the field of biotechnology.</p>	<p>Main textbook 6, page 18 Main textbook 7, page 6</p>

2		<p>Topic №2: Statistical Indicators Summary: Key statistical indicators: quantitative and qualitative traits, variability, variation, population, sample, and sampling concepts. Statistical totals in biological research: general and specific statistical totals; fundamental laws of statistical totals.</p>	<p>Main textbook 1, page 24 Main textbook 2, page 14 Main textbook 4, page 17</p>
3		<p>Topic №3: Solving Problems Related to Statistical Indicators</p>	<p>Main textbook 1, page 36 Main textbook 2, page 21 Main textbook 4, page 25</p>
4		<p>Topic №4: Frequency Distributions Summary: Use of statistical distributions in biological research; binomial distribution, normal distribution, Poisson distribution; parameters of discrete distributions.</p>	<p>Main textbook 3, page 23 Main textbook 4, page 26 Main textbook 5, page 15</p>
5		<p>Topic №5: Normal Distribution and Its Characteristics</p>	<p>Main textbook 9, page 20 Main textbook 11, page 33</p>
6		<p>Topic №6: Solving Problems Related to Frequency Distributions</p>	<p>Main textbook 3, page 41 Main textbook 4, page 31 Main textbook 5, page 22</p>
7		<p>Topic №7: Measures of Central Tendency Summary: Use of average quantities in biological research. Simple and higher-order averages: arithmetic mean, quadratic mean, cubic mean, geometric mean, and harmonic mean. Key characteristics of the arithmetic mean. Weighted averages. General weighted mean. Non-parametric measures of central tendency: mode and median.</p> <p><u>Midterm exam</u></p>	<p>Main textbook 3, page 46 Main textbook 4, page 38 Main textbook 5, page 29 Main textbook 6, page 39</p>
8		<p>Topic №8: Variation or Dispersion Analysis Summary: Use of variation indicators in biological research. Variation indicators: range, measure of variation, linear deviation, mean linear deviation, variance; properties of variance; standard deviation.</p>	<p>Main textbook 4, page 47 Main textbook 5, page 39 Main textbook 6, page 45 Main textbook 7, page 22 Main textbook 8, page 16 Main textbook 9, page 29 Main textbook 11, page 43</p>
9		<p>Topic №9: Solving Problems on Measures of Central Tendency</p>	<p>Main textbook 3, page 46 Main textbook 4, page 47</p>
10		<p>Topic №10: Variation or Dispersion Analysis Brief summary: Use of variation indicators in biological research. Variation indicators: range,</p>	<p>Main textbook 3, page 58 Main textbook 4, page 55 Main textbook 5, page 47</p>

		measure of variation, linear deviation, mean linear deviation, variance; properties of variance; standard deviation.	
11		Topic №11: Covariance Analysis Brief summary: Covariance; coefficient of variation; normalized deviation; precision indicator. Statistical errors in biology: standard error, Pearson correction.	Main textbook 1, page 65 Main textbook 2, page 48 Main textbook 3, page 64 Main textbook 4, page 67 Main textbook 5, page 67
12		Topic №12: Solving Problems on Variation or Dispersion Analysis	Main textbook 1, page 65 Main textbook 2, page 48 Main textbook 3, page 64
13		Topic №13: Computer Programs Used in Variation Analysis Brief summary: Application of computer programs SPSS and MSTATC in statistical analyses.	Main textbook 10, page 8
14		Topic №14: Statistical Hypotheses Brief summary: Basic concepts of statistical hypotheses and testing hypotheses. One-tailed and two-tailed hypotheses. Confidence interval for the mean of a general total. Null hypothesis.	Main textbook 4, page 72 Main textbook 5, page 82
15		Topic №15: Solving Problems on Covariance Analysis	Main textbook 4, page 72 Main textbook 5, page 82
		Final exam	