

Subject name	Statistics for Environmental Engineering	
Subject code	IS-SEE-24	
Department	Applied Mathematics	
Faculty	Environmental Engineering and Geodesy	
Subject supervisor/Lecturer	Joanna Kopcińska, Ph.D.	
General information	Teaching period	summer semester
	ECTS credit	6
	Lectures total	15
	Lab practicals	30
Objective and general description	<p>The main objective of the course is understanding basic rules of statistics, the proper analyses of data using statistical test. Using computer programs students learn how to estimate the value of measures of central and dispersion tendency, calculate the estimators of simple and multiple linear regression.</p>	
Lectures 15 hours	<ol style="list-style-type: none"> 1. Discrete and continuity variables. Measures of Central Tendency (expected value, median, mode) and measures of dispersion (variance, standard deviation, range) 2. Sample distributions of discrete and continuous variables (binomial distribution, Poisson distribution, the normal distribution, exponential distribution). 3. The method of describing the sample, the point and interval estimation 4. Significance tests, the significance level, the type I and II error, p-value 5. Non parametrical test: χ^2 test, Shapiro - Wilk test, Mann - Withney test, Kruskal - Wallis test 6. Analyses of correlation (the Pearson, Kendall and the Spearman coefficient) and regression. Multiple linear regression - coefficient of correlation and coefficient of determination. 	
Lab practicals 30 hours	<ol style="list-style-type: none"> 1. Discrete and continues variables. Calculating measures of central tendency and dispersion. Constructing a frequency distribution (histogram). The distribution of discrete and continues variables. 2. Examples of typical variables in environmental engineering. 3. Descriptive statistics, the empirical cumulative function, the typical graphs. 4. The interval estimation – the confidence interval of mean standard deviation, fraction. The significance test of one mean, variance, proportion, the significance level, p-value. 5. Comparing two population means, two population proportions, two population variances. 6. Non – parametric tests – the significant test – the χ^2 test, - Kolmogorow’s test, Shapiro-Wilk test, 7. Non parametric test – the Mann- Whitney test, the Mann-Kendal 	

	<p>test</p> <p>8. One way of ANOVA.</p> <p>9. Least square prediction equation – the simple linear regression. Calculating coefficient of correlation for different type of data. Significance test for coefficient of correlation. Coefficient of determination.</p>
<p>References</p>	<ol style="list-style-type: none"> 1. H. Browker, G. J. Lieberman “Engineering statistics”, Englewood Cliffs, 1961. 2. H. G. Tucker “Probability and mathematical statistics”, New York, 1962. 3. N. L. Johnson, F. C. Leone “Statistics and experimental design: in engineering and the physical science”, New York, John Wiley and Sons, 1969. 4. L. L. Chao “Statistics: methods and analyses”, McGraw – Hill Book Co., 1974. 5. J. T. McClave, Terry Sincich, “Statistics”, Upper Saddle River: Prentice Hall, 2000. 6. Paul Mac Berthouex, Linfield C. Brown, Statistics for environmental engineers, Lewis Publishers, 2002