

MODULE DESCRIPTION

Module code	full-time studies:	Z-ZIP1-E-104
	part-time studies:	Z-ZIPN1-E-104
Module name	Statistics	
Module name in Polish	Statystyka	
Valid from academic year	2019/2020	

MODULE PLACEMENT IN THE SYLLABUS

Field of study	MANAGEMENT AND PRODUCTION ENGINEERING
Level of education	1st degree
Studies profile	General
Form and method of conducting classes	Full-time and Part-time
Specialisation	All
Unit conducting the module	Department of Mathematics and Physics
Module co-ordinator	Andrzej Lenarcik, PhD
Approved by:	Dariusz Bojczuk, PhD, DSc

MODULE OVERVIEW

Type of subject / group of subjects	Basic
Module status	Compulsory
Language of conducting classes	English
Module placement in the syllabus - semester	Semester I
Initial requirements	No requirements
Examination (YES/NO)	YES
Number of ECTS credit points	5

Method of conducting classes		Lecture	Classes	Laboratory	Project	Other
Per semester	full-time studies:	20	20	20		
	part-time studies:	12	12	12		

TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Category	Symbol	Learning outcomes	Assignations to the directional learning outcomes
Knowledge	W01	A student at the advanced level knows and understands statistical notions.	ZIP1_W01
	W02	A student knows methods of incomplete statistical data analysis and understands the errors accompanying them.	ZIP1_W01
	W03	A student understands process variability and is able both to describe and reduce it using statistical tools.	ZIP1_W01
Skills	U01	A student can use diverse data visualisation tools; a student has sufficient calculation competence as regards determining basic statistical parameters and he/she can interpret the obtained data correctly.	ZIP1_U01 ZIP1_U02
	U02	A student can research cause and effect relationships as well as conduct a correlation analysis as regards pairs of statistical features.	ZIP1_U01 ZIP1_U02
	U03	A student can select an appropriate confidence interval or a statistical test as well as evaluate and interpret errors connected with statistical inference. A student can present his/her reasoning while solving statistical tasks and justify it accurately.	ZIP1_U01 ZIP1_U02
Social competences	K01	A student is ready to work in teams and understands the principles of teamwork while doing tasks which concern acquiring the knowledge as regards data.	ZIP1_K04
	K02	A student recognizes the need to deepen and constantly supplement knowledge and skills in the field of statistics while working in projects requiring the use of data analysis.	ZIP1_K01

TEACHING CONTENTS

Method of conducting classes	Teaching contents
Lecture	The role of statistics in the process of discovering knowledge from data in the field of management and production engineering, in supporting decision-making and in quality improvement systems. Statistics as a branch of science. Collectivities and statistical features. Measurement scales. Statistical series, graphical presentation of statistical data. Time series research. Individual and aggregate dynamics indicators. Trend estimation of a phenomenon - trends and their types. Stages of statistical research, full and partial research, sample selection. Measures of the location and differentiation of the value of a quantitative feature Analysis of the interdependence of phenomena. Investigation of the dependence of a pair of qualitative traits. Two-way table. Contingency coefficient. Analysis of the interdependence of a pair of quantitative features. Correlation table. Correlation coefficient and regression. A random variable and its distribution of a random variable. Cumulative distribution and density. Expected value and variance of a random variable. Basic theoretical distributions: two-point, Bernoulli, uniform, normal, t-Student, chi-square. Central Limit Theorem. Estimating the parameters of a trait in a community based on a sample. Point and interval estimation. Verification of statistical hypotheses. Confidence intervals and tests for the expected value and the difference of the expected values and for the structure index and the difference of structure indexes.

Classes	Determining the population and statistical features. Distribution series. Calculation of the mean and standard deviation. Count and frequency histogram. Empirical cumulative distribution function, smoothing cumulative distribution function. Median, quartiles and quantiles, ranges, box plot. Examples of practical tasks for studying the interdependence of a pair of qualitative, quantitative and mixed type features. Building two-way tables. Calculation of the correlation coefficient and the linear regression equation. Interpretation of the obtained results Determination of the expected value and variance of discrete and continuous random variables. Applications of the normal distribution. Examples of situations where statistical inference is applicable. Methods of selecting a representative sample. Determining parameter estimates using point estimation. Finding confidence intervals and verification of hypotheses for the population mean and the structure index. Statistical inference for the difference of the expected values and the difference of the structure indices.
Laboratory	Getting to know the statistical software available in Excel - add-on "Data analysis" and chart wizard. Getting to know the R environment - data analysis and visualization tools available in the graphical user interfaces of R Commander and R DataMiner Review of data analysis and visualization tools available in SAS Enterprise Guide. Determination of basic statistical parameters from real data and interpretation of the obtained results. Use of various data visualization tools. Conducting a study of the interdependence of a pair of qualitative, quantitative and mixed-type traits on real data. Formulating conclusions Examples of determining confidence intervals and verification of statistical hypotheses from real data with the use of available statistical software. Interpretation of the obtained results. Solving real tasks in the field of discovering knowledge from data, with the use of known techniques and tools for statistical data analysis and their visualization. Presentation of reports from performed analyzes on real data sets.

METHODS OF ASSESSING TEACHING RESULTS

Symbol	Methods of checking the learning outcomes (select X)					
	Oral exam	Written exam	Test	Project	Statement	Other
W01	X	X	X			
W02	X	X	X			
W03	X	X	X			
U01	X		X		X	X
U02	X		X		X	X
U03	X		X		X	X
K01	X					X
K02	X					X

FORM AND CONDITIONS OF PASSING

Form of classes	Form of credit	Passing conditions
Lecture	Exam	Correct solution of at least half of the examination tasks and providing a correct answer to at least one of the two randomly selected questions.
Classes	Credit with grade	Correct solution of at least half of the homework assignments
Laboratory	Credit with grade	Correct performance of at least half of the statistical analyses carried out on real data sets, using the tools available in Excel and in the R environment (included in the prepared report).

STUDENT WORKLOAD

Balance of ECTS points												
No.	Type of student's activity	Student's workload										Unit
		full-time					part-time					
1.	Participation in the activities	Lc	C	Lb	P	O	Lc	C	Lb	P	O	h
		20	20	20			12	12	12			
2.	Other (consultation, exam)	4	2	2			4	2	2			h
3.	Number of hours of a student's as- sisted work	68					44					h
4.	Number of ECTS credit points which are allocated for assisted work	2,7					1,8					ECTS
5.	Number of hours of a student's un- assisted work	57					81					h
6.	Number of ECTS credit points which a student receives for unassisted work	2,3					3,2					ECTS
7.	Work input connected with practical classes	83					83					h
8.	Number of ECTS credit points which a student receives for practical classes	3,3					3,3					ECTS
9.	Total number of hours of a stu- dent's work	125					125					h
10.	Punkty ECTS za moduł <i>1 ECTS=25 hours</i>	5										ECTS

LITERATURE

1. Bowerman B.L., O'Connell R.T (2010), *Business Statistics in Practice*, Fourth Edition, McGraw-Hill, Irwin.
2. Kowalczyk B., Witkowski B. (2015), *Mathematical Statistics for Management*, Wasaw School of Economic.
3. Moore D.S., McCabe G.P. (2016), *Introduction to the practice of statistics*, W. H. Freeman and Company.