



MODULE SPECIFICATION

Module code	
Module title in Polish	Statystyczne metody opracowania wyników pomiarów geodezyjnych
Module title in English	Statistical Methods of Surveying Results Analysis
Module running from the academic year	2016/2017

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	Surveying and Cartography
Level of qualification	first cycle (first cycle, second cycle)
Programme type	academic (academic/practical)
Mode of study	full-time (full-time/part-time)
Specialism	all
Organisational unit responsible for module delivery	The Department of Geotechnical Engineering, Geomatics and Waste Management
Module co-ordinator	Małgorzata Sokala, PhD
Approved by:	Ryszard Florek-Paszowski, PhD, Eng.

B. MODULE OVERVIEW

Module type	core module
Module status	Elective field-of-study modules
Language of module delivery	English
Semester in the programme of study in which the module is taught	Semester 4
Semester in the academic year in which the module is taught	summer semester
Pre-requisites	None
Examination required	Yes
ECTS credits	5

* elective HES – elective modules in the Humanities and Economic and Social Sciences



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Mode of instruction	lectures	classes	laboratories	project	others
Total hours per semester	30	30			



C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to prepare students for conscious application of analytical and statistical tools to analyse survey results.
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Module outcome code	Module learning outcomes	Mode of instruction (l/c/lab/p/ others)	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student knows statistical fundamentals of preparing observation (including advanced methods); moreover, a student is knowledgeable about the methodology of agreeing on survey results in angular and linear networks (together with accuracy analysis).	l	GiK_W03 GiK_W13 GiK_W27	T1A_W03 T1A_W04 T1A_W07
W_02	A student knows the analysis of statistical data; a student also has knowledge on point and interval estimation; furthermore, a student is familiar with the principles of estimating linear models according to the method of least squares.	l	GiK_W03	T1A_W01 T1A_W04 T1A_W07
W_03	A student knows the principles of the concatenation variances for both uncorrelated and correlated values.	l	GiK_W03	T1A_W01 T1A_W04 T1A_W07
U_01	A student is able to independently adjust survey results in diverse types of geodetic control network as well as the analysis of the obtained results.	c	GiK_U14 GiK_U15 GiK_U18	T1A_U08 T1A_U09
U_02	A student can consciously apply mathematical statistics tools to prepare observations as regards geomatics.	c	GiK_U15	T1A_U08 T1A_U09
U_03	A student can consciously apply variance concatenation law of both uncorrelated and correlated values.	c	GiK_U15	T1A_U08 T1A_U09
K_01	A student understands the necessity and knows the possibilities of continuous education as well as raising his/her professional competences.	l/c	GiK_K01	T1A_K01

Module content:

1. Topics to be covered in the lectures
2. Topics to be covered in the classes

No.	Topics to be covered in the lectures	Module outcome code
1-3	Basic notions as regards mathematical statistics. The distribution of variables and their applications in geomatics. Point estimation of observation results occurring in geomatics. Continuous random variables. Standard distribution and its characteristic parameters. The diagram of probability density and its geometrical interpretation. The selected distributions of a step random variable (chi-square and Student's). Two-dimensional standard distribution. Interval estimation of measurements occurring in geomatics.	W_01 W_02
4-6	The law of variance summation (the law of mean error transfer) in surveying. The Gauss-Markov parametric model of determining surveying results in geomatics.	W_01 W_02 W_03
7-9	Observation equations for surveying: length, vertical and horizontal angles. Determining surveying results in angular and linear networks. Accuracy analysis as regards determining	W_01 W_02



	the coordinates of survey network points.	K_01
10-11	Gauss-Markov conditional model in determining results in geomatics.	W_01 W_02
12-15	The issues of correlation and regression.	W_01 W_02 W_03
13-15	Adjustment issues in geomatics and engineering practice. Practical issues of formulating and solving adjustment issues. Engineering applications of the method of least squares. Sample adjustments solved with the parametric method.	W_02 W_03 K_01
	Topics to be covered in the classes	
1-4	Calculations based on the examples of continuous random variables which have their applications in geomatics. Point and interval estimation of observation results occurring in geomatics.	U_02 W_02
5-7	Accuracy analysis of terrain detailed measurements (the application of the law of variance accumulation). The application of Gauss-Markov models for determining measurement results in geomatics.	U_02 U_03
8-11	Observation equations for surveying values (the lengths of vertical and horizontal angles). Calculations connected with determining survey results in angular and linear networks together with accuracy analysis.	U_01 U_02 W_01 W_02 K_01
12-15	Identifying correlation dependencies in engineering issues.	W_03 U_01

Assessment methods

Module outcome code	Assessment methods <i>(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)</i>
U_01 U_02 U_03 W_01 W_02 W_03	An examination
U_01 U_02 U_03	Computational assignments and a test
K_01	Observing a student's involvement during the classes. A discussion during the classes. Project tutorials.



D. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	Study time/ credits
1	Contact hours: participation in lectures	30
2	Contact hours: participation in classes	30
3	Contact hours: participation in laboratories	
4	Contact hours: attendance at office hours (2-3 appointments per semester)	11
5	Contact hours: participation in project-based classes	
6	Contact hours: meetings with a project module leader	
7	Contact hours: attendance at an examination	4
8		
9	Number of contact hours	75 <i>(total)</i>
10	Number of ECTS credits for contact hours <i>(1 ECTS credit = 25-30 hours of study time)</i>	3
11	Private study hours: background reading for lectures	10
12	Private study hours: preparation for classes	10
13	Private study hours: preparation for tests	10
14	Private study hours: preparation for laboratories	
15	Private study hours: writing reports	10
16	Private study hours: preparation for a final test in laboratories	
17	Private study hours: preparation of a project/a design specification	
18	Private study hours: preparation for an examination	10
19		
20	Number of private study hours	50 <i>(total)</i>
21	Number of ECTS credits for private study hours <i>(1 ECTS credit = 25-30 hours of study time)</i>	2
22	Total study time	125
23	Total ECTS credits for the module <i>(1 ECTS credit = 25-30 hours of study time)</i>	5
24	Number of practice-based hours <i>Total practice-based hours</i>	0
25	Number of ECTS credits for practice-based hours <i>(1 ECTS credit = 25-30 hours of study time)</i>	0

E. READING LIST

References	<ol style="list-style-type: none"> 1. Harvey, Bruce R., "Practical least squares and statistics for surveyors", Monograph 13, Third Edition, School of Surveying and Spatial Information Systems, University of New South Wales, 2006 2. Huaan Fan, "Theory of Errors and Least Squares Adjustment", Royal Institute of Technology (KTH), Division of Geodesy and Geoinformatics, Stockholm, Sweden, 2010 3. Charles D. Ghilani, "Adjustment Computations: Spatial Data Analysis", John Wiley & Sons, 2011
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