MODULE SPECIFICATION

Module code	
Module title in Polish	**Matematyka I**
Module title in English	**Mathematics 1**
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 Mathematics**
Module co-ordinator	**Małgorzata Sokała, PhD**
Approved by:	

B. MODULE OVERVIEW

Module type	core module (core/programme-specific/elective HES*)
Module status	compulsory module (compulsory/optional)
Language of module delivery	**English**
Semester in the programme of study in which the module is taught	**semester 1**
Semester in the academic year in which the module is taught	**Winter semester** (winter semester/summer semester)
Pre-requisites	None (module code/module title, where appropriate)
Examination required	**Yes** *(yes / no)*
ECTS credits	**6**

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

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

semester					

C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aims of the module are as follows: familiarising students with basic notions of mathematical analysis for describing physical phenomena; discussing functions with one real variable, function derivative and its applications; familiarising students with the fundamentals of the vector calculus of a function with one variable; presenting complex numbers, basic notion of the matrix calculus and their application in solving the systems of linear equations.

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 is knowledgeable about elementary functions and their properties.	l/c	GiK_W01	T1A_W01
W_02	A student knows the fundamentals of the differential calculus of a function with one variable and its selected applications.	l/c	GiK_W01	T1A_W01
W_03	A student knows the fundamentals of an integral calculus of a function with one variable.	l/c	GiK_W01	T1A_W01
W_04	A student knows complex numbers.	l/c	GiK_W01	T1A_W01
W_05	A student knows the fundamentals of a matrix and vector calculus.	l/c	GiK_W01	T1A_W01
W_06	A student knows the selected methods of solving the systems of linear equations.	l/c	GiK_W01	T1A_W01
U_01	A student can solve equations and inequalities.	l/c	GiK _U03	T1A_U01, T1A_U05,
U_02	A student is able to characterise the properties of a function.	l/c	GiK _U03	T1A_U01, T1A_U05,
U_03	A student can calculate function boundaries and recognise its asymptotes.	l/c	GiK _U03	T1A_U01, T1A_U05,
U_04	A student can calculate function derivatives.	l/c	GiK _U03	T1A_U01, T1A_U05,
U_05	A student can solve polynomial equations in the set of complex numbers.	l/c	GiK _U03	T1A_U01, T1A_U05,
U_06	A student can make operations on matrices; a student is also able to calculate determinants.	l/c	GiK _U03	T1A_U01, T1A_U05,
U_07	A student can solve systems of linear equations.	l/c	GiK _U03	T1A_U01, T1A_U05,
K_01	A student understands the necessity of continuous education and raising his/her competences as regards mathematical methods utilised in solving typical engineering problems.	l/c	GiK _K01	T1A_K01

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	Functions with one real variable and their basic properties. A complex and inverse function.	W_01 U_01 U_02 K_01
2	Polynomials, trigonometric, circular, exponential, and logarithmic functions.	W_01 U_01

		U_02 K_01
3	Continuity and boundary of a function. Asymptotes.	W_01 U_02 U_03 K_01
4	Function derivative. Tangent to a diagram.	W_01 W_02 U_04 K_01
5	The applications of a derivative – monotonicity and function extremes.	W_01 U_02 W_02 U_01 U_04 K_01
6	Primitive function. Basic theorem of the integral and differential calculus. Integrating by substitution and by parts.	W_01 W_02 W_03 U_04 K_01
7	Integrating rational, irrational, and trigonometric functions.	W_01 W_03 U_04 K_01
8	A definite integral, area of a plane surface.	W_01 W_03 K_01
9,10	Complex numbers – definitions and properties of operations determined in the set of complex numbers. An algebraic form and a feedback of a complex number. Geometrical interpretation. A trigonometric and exponential form of complex number. Complex number roots. Basic algebraic theorem.	W_04 U_05 K_01
11	Matrices and their definition. Basic operations on matrices.	W_05 U_06 K_01
12	A determinant. Properties. Laplace expansion. Inverse matrix.	W_05 U_06 K_01
13-14	Systems of linear equations. Cramer's theorem. The Kroenecker-Capelli theorem. Gaussian elimination.	W_05 W_06 U_06 U_07 K_01
15	Vectors in R^3. Linear vector independence. A scalar, vector, and mixed vector. Sample applications: the area of a triangle, the volume of a parallelepiped.	W_05 K_01

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1	Functions with one real variable and their basic properties. A complex and inverse function.	W_01 U_01 U_02 K_01
2	Polynomials, trigonometric, circular, exponential, and logarithmic functions.	W_01 U_01 U_02 K_01
3	Continuity and boundary of a function. Asymptotes.	W_01 U_02 U_03 K_01
4	Function derivative. Tangent to a diagram.	W_01 W_02 U_04

		K_01
5	The applications of a derivative – monotonicity and function extremes.	W_01 U_02 W_02 U_01 U_04 K_01
6	Primitive function. Basic theorem of the integral and differential calculus. Integrating by substitution and by parts.	W_01 W_02 W_03 U_04 K_01
7	Integrating rational, irrational, and trigonometric functions.	W_01 W_03 U_04 K_01
8	A definite integral, area of a plane surface.	W_01 W_03 K_01
9,10	Complex numbers – definitions and properties of operations determined in the set of complex numbers. An algebraic form and a feedback of a complex number. Geometrical interpretation. A trigonometric and exponential form of complex number. Complex number roots. Basic algebraic theorem.	W_04 U_05 K_01
11	Matrices and their definition. Basic operations on matrices.	W_05 U_06 K_01
12	A determinant. Properties. Laplace expansion. Inverse matrix.	W_05 U_06 K_01
13-14	Systems of linear equations. Cramer's theorem. The Kroenecker-Capelli theorem. Gaussian elimination.	W_05 W_06 U_06 U_07 K_01
15	Vectors in R^3. Linear vector independence. A scalar, vector, and mixed vector. Sample applications: the area of a triangle, the volume of a parallelepiped.	W_05 K_01

Assessment methods

Module outcome code	Assessment methods *(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)*
W_01	A written examination and tests
W_02	A written examination and tests
W_03	A written examination and tests
W_04	A written examination and tests
W_05	A written examination and tests
W_06	A written examination and tests
U_01	A written examination and tests
U_02	A written examination and tests
U_03	A written examination and tests
U_04	A written examination and tests
U_05	A written examination and tests
U_06	A written examination and tests
U_07	A written examination and tests
K_01	Observing a student's involvement during the classes, a discussion during the classes

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)	**8**
5	Contact hours: participation in project-based classes	
6	Contact hours: meetings with a project module leader	
7	Contact hours: attendance at an examination	**2**
8		
9	**Number of contact hours**	**70** *(sum)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2.8**
11	Private study hours: background reading for lectures	**10**
12	Private study hours: preparation for classes	**25**
13	Private study hours: preparation for tests	**25**
14	Private study hours: preparation for laboratories	
15	Private study hours: writing reports	
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	**20**
19		
20	**Number of private study hours**	**80** *(sum)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**3.2**
22	**Total study time**	**150**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**6**
24	**Number of practice-based hours** *Total practice-based hours*	**0**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**0**

E. READING LIST

References	
Module website	