MODULE SPECIFICATION

Module code	
Module title in Polish	**Matematyka 2**
Module title in English	**Mathematics 2**
Module running from the academic year	**2016/17**

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	**Environmental Engineering**
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	**Department of Mathematics and physics**
Module co-ordinator	dr Marcin Stępień
Approved by:	**prof. Arkadiusz Płoski, PhD hab.**

B. MODULE OVERVIEW

Module type	core module (core/programme-specific/elective HES*)
Module status	compulsory module (compulsory/optional)
Language of module delivery	**Polish/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	winterer semester (winter semester/summer semester)
Pre-requisites	None (module code/module title, where appropriate)
Examination required	Yes (Yes/No)
ECTS credits	4

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

Mode of instruction	lectures	classes	laboratories	project	others
Total hours per semester	15	30			

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C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to familiarise students with: matrix calculus, the theory of solving systems of linear equations as well as the fundamentals of vector calculus and analytical geometry in the R^3 space.

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 can distribute rational functions into the sum of partial fractions.	l/c	IŚ_W01	T1A_W01 T1A_W02
W_02	A student has knowledge on basic notions of the matrix calculus.	l/c	IŚ_W01	T1A_W01 T1A_W02
W_03	A student has knowledge as regards of solving the systems of linear equations.	l/c	IŚ_W01	T1A_W01 T1A_W02
W_04	A student has basic knowledge as regards a vector calculus and analytical geometry in the R^3 space.	l/c	IŚ_W01	T1A_W01 T1A_W02
W_05	A student knows the notion of a numerical series as well as the tested convergence.	l/c	IŚ_W01	T1A_W01 T1A_W02
U_01	A student can make operations on matrices, calculate and solve Cramer's systems with the matrix, determinant, and Gaussian elimination methods.	l/c	IŚ_U01	T1A_U08 T1A_U09
U_02	A student can make operations on vectors and utilise a vector calculus to solve simple tasks of analytical geometry in the R^3 space.	l/c	IŚ_U01	T1A_U08 T1A_U09
K_01	A student understands the necessity of continuous improvement of his/her knowledge as regards mathematics.	l/c	IŚ_K03	T1A_K01 T1A_K02 T1A_K04

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	Polynomials. A homographic function. A distribution of a rational function into the sum of partial fractions.	W_01
2	Matrices. Operations on matrices. Linear transformations. Determinants and their properties. The Laplace theorem.	W_02
3,4	A system of linear equations and its matrix record. Inverse matrix and its application to solve the systems of linear and matrix equations. Solving the systems of linear equations with the Gaussian method. Cramer's theorems.	W_02 W_03
5	Vector calculus in R^3. Linear vector independence. A scalar, vector, and mixed vector. Matrix eigenvalues and eigenvectors. Matrix diagonalisation.	W_04 W_02 K_01
6	Linear analytical geometry in R^3. A plane and a straight line in the R^3 space.	W_04 K_01
7	Numerical series and sequences. Basic convergence criteria concerning numerical series.	W_05

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1	Polynomial and rational equations and inequalities. Drafting the diagrams of homographical functions.	W_01
2	The distribution of rational functions into the sum of partial fractions.	W_01
3	Transforming algebraic expressions to a simpler form.	W_01
4	Operations on matrices. Calculating determinants from their properties. The Laplace theorem.	W_02 U_01
5,6,7	Determining an inverse matrix. Solving matric equations. Solving the systems of linear equations with the matrix and Gaussian methods as well as using Cramer's theorems.	W_02 W_03 U_01
8,9,10	Operations on vectors. The application of a vector calculus to solve simple tasks of analytical geometry in the R^3 space. Matrix eigenvalues and eigenvectors.	W_04 U_02 K_01
11,12	The tasks of analytical geometry in R^3. Mutual position of a point, a straight line and a plane. Distances and projections.	W_04 U_02 K_01
13,14	Calculating the limits of numerical sequences. Examining the convergence of numerical series.	W_05
15	Written tests.	W_01,W_02, W_03,W_04, W_05, U_01, U_02, K_01

3. Topics to be covered in the laboratories
None

Assessment methods

Module outcome code	**Assessment methods** *(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)*
W_01	An examination in a written form
W_02	An examination in a written form
W_03	An examination in a written form
W_04	An examination in a written form
U_01	Tests during the classes and a student's involvement during the classes
U_02	Tests during the classes and a student's involvement during the classes
K_01	Comments during the lectures and a discussion during the classes

D. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	**Study time/ credits**
1	Contact hours: participation in lectures	**15**
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)	**3**
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**	**50** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2**
11	Private study hours: background reading for lectures	**10**
12	Private study hours: preparation for classes	**15**
13	Private study hours: preparation for tests	**15**
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	**10**
19		
20	**Number of private study hours**	**50** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**2**
22	**Total study time**	**100**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**4**
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	1. T. Jankowski, Linear Algebra, skrypt Politechniki Gdańskiej, Gdańsk 1997.
Module website	