

MODULE SPECIFICATION

Module code	
Module title in Polish	Matematyka II
Module title in English	Mathematics 2
Module running from the academic year	2016/2017

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	Civil Engineering
Level of qualification	First cycle <i>(first cycle, second cycle)</i>
Studies profile	Academic <i>(academic/practical)</i>
Mode of study	Full-time <i>(full-time / part-time)</i>
Specialism	
Organisational unit responsible for module delivery	The Department of Mathematics
Module co-ordinator	Monika Skóra, PhD
Approved by	Marek Iwański, Professor

B. MODULE OVERVIEW

Module type	Core module <i>(core/programme-specific/elective HES*)</i>
Module status	Compulsory module <i>(compulsory / non-compulsory)</i>
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 <i>(winter / summer)</i>
Pre-requisites	None <i>(module code/module title, where appropriate)</i>
Examination required	Yes <i>(yes / no)</i>
ECTS credits	6

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

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

C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aims of the module include the following: familiarising students with complex numbers, fundamental algebraic theorem, basic notions of the matrix calculus and its application to solve the systems of linear equations.
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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 complex numbers and their application.	l/c	B_W01	T1A_W01 T1A_W07
W_02	A student is able to define matrix; moreover, a student knows the properties of operations on matrices.	l/c	B_W01	T1A_W01 T1A_W07
W_03	A student knows the properties of determinants.	l/c	B_W01	T1A_W01 T1A_W07
W_04	A student knows how to select an appropriate method in order to effectively solve a system of linear equations.	l/c	B_W01	T1A_W01 T1A_W07
W_05	A student knows basic operations on vectors; furthermore, a student can indicate their application.	l/c	B_W01	T1A_W01 T1A_W07
W_06	A student knows equations of straight lines and planes.	l/c	B_W01	T1A_W01 T1A_W07
U_01	A student efficiently conducts calculations on complex numbers.	c	B_U01	T1A_U08 T1A_U09
U_02	A student conducts operations on matrices and calculates determinants.	c	B_U01	T1A_U08 T1A_U09
U_03	A student solves the systems of linear equations.	c	B_U01	T1A_U08 T1A_U09
U_04	A student makes operations on vectors.	c	B_U01	T1A_U08 T1A_U09
U_05	A student can determine equations of planes and straight lines.	c	B_U01	T1A_U08 T1A_U09
K_01	A student is aware of the responsibility for his/her own work.	l/c	B_K02	T1A_K02 T1A_K05 T1A_K07
K_02	A student understands the necessity of continuous education and raising his/her competences as regards mathematical methods utilised to solve typical engineering problems.	l/c	B_K03	T1A_K01 T1A_K05 T1A_K06

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	Complex numbers (definitions and properties of operations determined in a set of complex numbers). Algebraic form and conjugation of a complex number. Geometrical interpretation. A trigonometric and exponential form of a complex number. Roots of complex numbers. A fundamental algebraic theorem.	W_01 K_02
2	Matrices and their definition. Basic operations on matrices. A determinant (definition, Laplace expansion as well as its properties). A rank of matrices.	W_02,W_03,K_02
3	Inverse matrix. The values and characteristic matrix vectors. Matrix equations. The systems of linear equations (inverse matrix method).	W_02,W_03, W_04 K_02

4	Systems of linear equations (Cramer's theorem, the Kroenecker-Capelli theorem, and Gaussian elimination method).	W_02, W_03, W_04 K_02
5	Vectors in R^3 . Linear vector independence. A scalar, vector, and mixed product. Sample applications: surface area of a triangle and a volume of a parallelepiped.	W_05 K_02
6	A straight line and a plane in R^3 . A general and parametric equation of a plane. Edge, canonical, and parametrical equation of a straight line. Mutual position of straight lines and planes.	W_06 K_02
7	A rectangular projection, a projection in the direction of a vector. Curve of second order.	W_05, W_06, K_02

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1	Operations in a set of complex numbers. Geometrical interpretation.	U_01, K_01, K_02
2	A trigonometric and exponential form of a complex number as well as their application in task solving.	U_01, K_01, K_02
3	Roots from complex numbers as well as the application of the fundamental algebraic theorem.	U_01, K_01, K_02
4	Matrices (determining the dimension and making basic operations on matrices).	U_01, U_02, K_01, K_02
5	Calculating the determinant with the application of Laplace expansion (discussing its properties).	U_02, K_01, K_02
6	Inverse matrix. Matrix equations. Values and characteristic matrix vectors.	U_01, U_02, K_01, K_02
7	Systems of linear equations (their application). Cramer's theorem; Gaussian elimination method for Cramer systems.	U_02, U_03, K_01, K_02
8	Gaussian elimination method. Kroenecker-Capelli theorem.	U_02, U_03, K_01, K_02
9	Vectors in R^3 . Linear vector independence. Scalar, vector, and mixed product.	U_04, K_01, K_02
10	Sample applications: surface area of a triangle, the volume of parallelepiped.	U_03, U_04, K_01, K_02
11	Parametric and canonical equations of straight lines and planes.	U_03, U_04, U_05, K_01, K_02
12	Mutual position of straight lines and planes.	U-02,

		U_03, U_04, U_05, K_01, K_02
13	The distance of a point from a straight line and a plane in R^3 . The distance between straight lines (also between a straight line and a plane). The distance between planes.	U_02, U_03, U_04, U_05, K_01, K_02
14	The projection of a point on a straight line and a plane. The projection of a straight line on a plane.	U_02, U_03, U_04, U_05, K_01, K_02
15	Second degree curves.	U_02, K_01, K_02

3. Topics to be covered in the laboratories
4. Topics to be covered in the projects

Assessment methods

Module outcome code	Assessment methods <i>(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)</i>
W_01	A written test and a written examination
W_02	A written test and a written examination
W_03	A written test and a written examination
W_04	A written test and a written examination
W_05	A written test and a written examination
W_05	A written test and a written examination
U_01	A written test and a written examination
U_02	A written test and a written examination
U_03	A written test and a written examination
U_04	A written test and a written examination
U_05	A written test and a written examination
K_01	Observing a student's involvement during the classes, a discussion during the classes
K_02	Observing a student's involvement during the classes, a discussion during the classes

C. 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)	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	4
8		
9	Number of contact hours	57 <i>(total)</i>
10	Number of ECTS credits for contact hours <i>(1 ECTS credit =25-30 hours of study time)</i>	2.3
11	Private study hours: background reading for lectures	20
12	Private study hours: preparation for classes	20
13	Private study hours: preparation for tests	30
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	23
19		
20	Number of private study hours	93 <i>(total)</i>
21	Number of ECTS credits for private study hours <i>(1 ECTS credit =25-30 hours of study time)</i>	3.7
22	Total study time	150
23	Total ECTS credits for the module <i>(1 ECTS credit =25-30 hours of study time)</i>	6
24	Number of practice-based hours <i>Total practice-based hours</i>	8
25	Number of ECTS credits for practice-based hours <i>(1 ECTS credit =25-30 hours of study time)</i>	0.3