MODULE SPECIFICATION

Module code	
Module title in Polish	**Matematyka 1**
Module title in English	**Mathematics 1**
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	Marcin Stępień, Ph. D.
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	winter 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 present basic definitions and theorems concerning differential and integral calculus of a function with one real variable. Another aim includes the application of derivatives to examine the course of function variability and solving optimisation tasks. Sample applications of definite integrals in geometry and physics.

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 has knowledge on basic notions of differential and integral calculus (limit, derivative, definite and indefinite integral).	l/c	IŚ_W01	T1A_W01 T1A-_W02
W_02	A student has knowledge on the application of derivatives and definite integrals in the description of phenomena and processes.	l/c	IŚ_W01	T1A_W01 T1A-_W02
W_03	A student has basic knowledge on functional series.	l	IŚ_W01	T1A_W01 T1A-_W02
U_01	A student can calculate derivatives and integrals of simple elementary functions.	l/c	IŚ_U01	T1A_U08 T1A-_U09
U_02	A student can apply derivatives to examine the course of function variability concerning solving simple optimisation tasks.	l/c	IŚ_U01	T1A_U08 T1A-_U09
U_03	A student has the ability of applying definite integrals in processes and phenomena.	l/c	IŚ_U01	T1A_U08 T1A-_U09

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. Complex and inverse function. Exponential and logarithmic function.	W_01
2	Limit of a function and function continuity according to Cauchy.	W_01
3	Function derivative. Geometrical and physical interpretation of a derivative. The derivatives of elementary functions and theorems concerning calculating derivatives.	W_01 W_02 K_01
4	The application of derivatives to examine the behaviour of function variability. De l'Hospital's rule. Asymptotes.	W_01 W_02 K_01
5	Primitive function. An indefinite integral and its properties. Integrating by parts and by substitution. Integrating rational functions.	W_01 W_02 K_01
6	A definite integral. Geometrical and physical interpretation of a definite integral. Newton-Leibniz theorem. Geometrical and physical interpretation of a definite integral.	W_01 W_02 K_01
7	Functional and Fourier's series.	W_03

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1	Diagrams and the properties of elementary functions: linear, quadric, and power. Equations and inequalities.	W_01
2	Diagrams and the properties of elementary functions: exponential and	W_01

	logarithmics. Equations and inequalities.	
3	Diagrams and the properties of elementary functions: trigonometric functions. Equations and inequalities	W_01
4	Determining function limits. Calculating limits in interval limits of function domains.	W_01 U_01
5	Calculating function derivatives. Determining a tangent to a function diagram.	W_01 U_01
6	Calculating function derivatives. The application of a differential for approximate calculations.	W_01 U_01
7	Determining monotonicity intervals, extrema, convexity intervals and points of bending.	W_01 U_01 U_02
8	Optimisation problems.	W_01 U_01 U_02
9	Calculating function limits with the use of de l'Hospital's rule. Determining the asymptotes of a function diagram.	W_01 U_01 U_02
10-12	An indefinite integral. Basic theorems. Integrating by parts and by substitution. Calculating the integrals of rational functions and trigonometric functions.	W_01 U_01 U_02
13	Calculating definite integrals. Geometrical applications of a definite integral (surface area of a figure).	W_02 U_01 U_03 K_01
14	Geometrical application of a definite integral: the length of the arch of a curve, volume and side surface area of a rotating solid.	W_02 U_01 U_03 K_01
15	Written tests.	W_01,W_02, W_03,U_01, U_02, U_03, 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 and a test
W_02	An examination and a test
W_03	An examination
U_01	A test
U_02	A test
U_03	A test
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)*	
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. D. Hughes-Hallet, A. M. Gleason et al., Calculus. Single and multivariable. International Student Version, John Wiley & Sons, Inc. 2010. 2. О. Н. Афанасьева, Я. С. Бродский, И. и. Гуткин, А. Л. Павлов, Сборник задач по математике для техникумов на базе средней школы, Издательство "Наука" Москва 1987 (in Russian) English translation: O. N. Afanasyeva, Ya. S. Brodsky, I. I. Gutkin, A. L. Pavlov, Problem Book in Mathematics for Technical Colleges, Mir Publishers, Moscow 1989 3. Solutions manual to accompany Raymond A Burnett and Michael R. Ziegler's Apllied Calculus for

	Business and Economics, Life Sciences and Social Sciences, Third Edition, Dallen Publishing Company 1988, San Francisco, California 1988.
Module website	