MODULE DESCRIPTION

Module code	full-time studies:	**Z-ZIP1-E-103**
	part-time studies:	**Z-ZIPN1-E-103**
Module name	**Calculus I**	
Module name in Polish	**Analiza matematyczna I**	
Valid from academic year	**2019/2020**	

MODULE PLACEMENT IN THE SYLLABUS

Field of study	**MANAGEMENT AND PRODUCTION ENGINEERING**
Level of education	**1st degree**
Studies profile	**General**
Form and method of conducting classes	**Full-time and Part-time**
Specialisation	**All**
Unit conducting the module	**Department of Mathematics and Physics**
Module co-ordinator	**Leszek Hożejowski, PhD**
Approved by:	**Dariusz Bojczuk, PhD, DSc**

MODULE OVERVIEW

Type of subject / group of subjects	**Basic**
Module status	**Compulsory**
Language of conducting classes	**English**
Module placement in the syllabus - semester	**Semester I**
Initial requirements	**No requirements**
Examination (YES/NO)	**NO**
Number of ECTS credit points	**4**

Method of conducting classes		**Lecture**	**Classes**	**Laboratory**	**Project**	**Other**
Per semester	full-time studies:	**30**	**30**			
	part-time studies:	**18**	**18**			

TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Category	Symbol	Learning outcomes	Assignations to the directional learning outcomes
Knowledge	W01	A student knows the concept and the properties of a function.	ZIP1_W01
	W02	A student knows fundamental concepts in Calculus.	ZIP1_W01
	W03	A student knows how to examine the behavior of a function.	ZIP1_W01
	W04	A student can find the domain of a function, find the inverse of a function and superposition of functions. He can evaluate the limits and find the asymptotes of a rational function.	ZIP1_W01
Skills	U01	A student understands the notion of derivative and knows its physical and geometrical interpretation. He knows differentiation rules and can differentiate (including higher-order derivatives) composite functions.	ZIP1_U14
	U02	A student can apply derivatives for finding extrema, concavity and points of inflation.	ZIP1_U14
	U03	A student is aware of the need of broadening his knowledge of mathematical methods when it is needed in his job.	ZIP1_U17
Social competences	K01	A student understands the importance of the links between mathematics and engineering and other areas beyond engineering practice.	ZIP1_K01
	K02	A student knows the concept and the properties of a function.	ZIP1_K04

TEACHING CONTENTS

Method of conducting classes	Teaching contents
Lecture	Number sequence and its properties. Limit of an infinite sequence. The number e. Functions and their basic properties of functions. Inverse function. Review of elementary functions (including cyclometric functions). Composing a function. Limit of functions. One-sided borders. Asymptotes of a rational function. Continuous functions. The derivative of a function. Geometric and kinematic interpretation of the derivative. Basic formulas of differential calculus and rules of differentiation. Function differential. Derivatives of higher order. Derivative versus monotonicity and extremum of a function. Calculation of uncertainty - de l'Hospital rule. Taylor formula and its applications. Indefinite integral. Basic formulas, integration by the change of the variable and by parts. Distribution of a rational function into simple fractions. Integration of rational functions. Integrals reducible to integrals of rational functions - examples. Reimann's definite integral and its properties. Calculation of the definite integral, replacement of a variable in a definite integral. Relation of the definite integral with the area. Geometric applications of integrals. Applications of definite integrals in physics, technology and economics.

Classes	Calculating limits of sequences (e.g. with the use of the three-sequence theorem). Making graphs of simple elementary functions and describing their properties. Finding inverse functions. Composition (superposition) of functions. Calculation of function limits (including one-sided limits). Continuity of functions. Calculation of derivatives, also logarithmic derivative. Calculation of derivatives of higher orders. Study of monotonicity and determination of extremes of functions. Calculating limits using the de l'Hospital rule. Approximating a function with a polynomial according to the Taylor formula. Examples of the estimation of the residue in the Taylor formula. Calculation of the indefinite integral, incl. integration by substitution and by parts. Integration of uncomplicated rational functions. Calculating the definite integral. Calculating geometrical quantities by means of an integral (area of a figure limited by given curves, volume of a revolved solid, length of an arc). Other applications of the definite integral - calculating the mean value of a given function, paths moving at variable speed, excess supply / demand, etc.

METODS OF ASSESSING TEACHING RESULTS

Symbol	Methods of checking the learning outcomes *(select X)*					
	Oral exam	**Written exam**	**Test**	**Project**	**Statement**	**Other**
W01			X			
W02			X			
W03			X			
W04			X			
U01			X			
U02			X			
U03			X			
K01						X
K02						X

FORM AND CONDITIONS OF PASSING

Form of classes	Form of credit	Passing conditions
Lecture	Credit with grade	Obtaining at least 50% of points from test.
Classes	Credit with grade	Obtaining at least 50% of points from two tests altogether (test weights: 0.6 and 0.4, respectively).

STUDENT WORKLOAD

Balance of ECTS points												
No.	Type of student's activity	Student's workload										Unit
		full-time					part-time					
1.	Participation in the activities	Lc	C	Lb	P	O	Lc	C	Lb	P	O	h
		30	30				18	18				
2.	Other (consultation, exam)	2	2				2	2				h
3.	**Number of hours of a student's assisted work**	**64**					**40**					h
4.	**Number of ECTS credit points which are allocated for assisted work**	**2,6**					**1,6**					ECTS
5.	**Number of hours of a student's unassisted work**	**36**					**60**					h
6.	**Number of ECTS credit points which a student receives for unassisted work**	**1,4**					**2,4**					ECTS
7.	**Work input connected with practical classes**	**50**					**50**					h
8.	**Number of ECTS credit points which a student receives for practical classes**	**2,0**					**2,0**					ECTS
9.	**Total number of hours of a student's work**	**100**					**100**					h
10.	**Punkty ECTS za moduł** *1 ECTS=25 hours*	**4**										ECTS

LITERATURE

1. Stewart J. (2016), *Calculus,* Cengage Learning.
2. Weir M.D, Hass J.R., Heil Ch.E. (2014), *Thomas' Calculus: Early Transcendentals*, Pearson.
3. Zill D.G., Wright W.S. (2011), *Calculus: Early Transcendentals*, Jones & Bartlett Publishers.