MODULE DESCRIPTION

Module code	**Z-ZIP-0530**
Module name	**Analiza Matematyczna II**
Module name in English	**Calculus 2**
Valid from academic year	**2016/2017**

A. MODULE PLACEMENT IN THE SYLLABUS

Field of study	**Management and Production Engineering**
Level of education	**1st degree** *(1st degree / 2nd degree)*
Studies profile	**General** *(general / practical)*
Form and method of conducting classes	**Full-time** *(full-time / part-time)*
Specialisation	**All**
Unit conducting the module	**Department of Applied Computer Science and Applied Mathematics**
Module co-ordinator	**Leszek Hożejowski, PhD**
Approved by:	

B. MODULE OVERVIEW

Type of subject/group of subjects	**Basic** *(basic / major / specialist subject / conjoint / other HES)*
Module status	**Compulsory** *(compulsory / non-compulsory)*
Language of conducting classes	**English**
Module placement in the syllabus - semester	**2nd semester**
Subject realisation in the academic year	**Summer semester** *(winter semester/ summer)*
Initial requirements	**Calculus 1** *(module codes / module names)*
Examination	**Yes** *(yes / no)*
Number of ECTS credit points	**5**

Method of conducting classes	Lecture	Classes	Laboratory	Project	Other
Per semester	**30**	**20**			

C. TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Module target	Knowledge and understanding of the foundations of single-variable calculus. Foundations of calculus of two variables and application to modeling problems in engineering.

Effect symbol	Teaching results	Teaching methods *(l/c/lab/p/other)*	Reference to subject effects	Reference to effects of a field of study
W_01	A student knows antiderivative and single variable integration.	l/c	K_W01	T1A_W01
W_02	A student knows differential calculus of two variables and its application to finding extrema.	l/c	K_W01	T1A_W01
W_03	A student knows integration of functions of two variables.	l/c	K_W01	T1A_W01
U_01	A student can use basic techniques of integration (integration by substitution and by parts) and compute definite and indefinite integrals of rational, irrational and trigonometric functions.	l/c	K_U01	T1A_U01
U_02	A student can differentiate functions of two variables and find relative and constrained extrema.	c	K_U01 K_U14	T1A_U01
U_03	A student can evaluate double integrals and apply them in engineering problems.	c	K_U01 K_U14	T1A_U01
K_01	A student is aware of the need of broadening his knowledge of mathematical methods when it is needed in his job	l/c	K_K01	T1A_K01
K_02	A student understands the importance of the links between mathematics and engineering and other areas beyond engineering practice.	l/c	K_K02	T1A_K02
K_03	A student can assess the utility of basic mathematical methods to solving simple engineering problems.	l/c	K_K02	T1A_K02

Teaching contents:

1. Teaching contents as regards lectures

Lecture number	Teaching contents	Reference to teaching results for a module
1	Antiderivative. Indefinite integration and its properties.	W_01 U_01 K_01 K_02
2	List of elementary integrals. Basic rules of integrating functions of one variable.	W_01 U_01 K_01 K_02
3	Integration of rational, irrational and trigonometric functions.	W_01 U_01 K_01 K_02
4	Riemann integral. Fundamental theorem of calculus. Rules of integration. Geometric applications of definite integrals.	W_01 U_01 K_01 K_02 K_03

5	Two-dimensional sets. Function of two variables and its geometric interpretation. Limits and continuity of functions of two variables.	W_02 U_02 K_01 K_02
6	Partial derivatives of functions of two variables. Partial derivatives of composite functions. Exact differential.	W_02 U_02 K_01 K_02
7	Extrema of a function of two variables. Absolute extremum in a compact set. Implicit function and its extrema.	W_02 U_02 K_01 K_02
8	Constrained extremum. Lagrange multipliers.	W_02 U_02 K_01 K_02 K_03
9	Double integral in a rectangle. Double integrals over normal regions. Iterated integrals.	W_03 U_03 K_01 K_02 K_03
10	Polar coordinates. Double integral in polar coordinates.	W_03 U_03 K_01 K_02 K_03
11	Integration by substitution for two variables. Jacobian matrix and determinant.	W_03 U_03 K_01 K_02 K_03
12	Application of double integrals in geometry and physics.	W_03 U_03 K_01 K_02 K_03
13	Function of three variables. Triple integral (volume integral) over a cuboid.	W_03 U_03 K_01 K_02 K_03
14.	Evaluating integrals over three-dimensional regions	W_03 U_03 K_01 K_02 K_03
15	Triple integral in cylindrical and spherical coordinates. Applications of triple integrals	W_03 U_03 K_01 K_02 K_03

2. Teaching contents as regards classes

Class number	**Teaching contents**	**Reference to teaching results for a module**
1	The notion of antiderivative. Indefinite integrals and their properties.	W_01 U_01 K_01

		K_02
2	Integration of elementary functions. Integration rules. Evaluating definite integrals and geometric applications of definite integrals.	W_01 U_01 K_01 K_02
3	Two-dimensinal plane regions. Function of two variables and its domain. Limits and continuity of a function of two variables.	W_02 U_02 K_01 K_02
4	Partial differentiation. Derivatives of composite functions. Exact differentials of a function of two variables.	W_02 U_02 K_01 K_02
5	Relative and absolute extrema of a function of two variables. Improper functions.	W_02 U_02 K_01 K_02 K_03
6	Extrema of implicit functions. Finding constrained extrema – Lagrange multipliers.	W_02 U_02 K_01 K_02 K_03
7	Double integral over a rectangle. Iterated integral. Double integral over a normal region.	W_03 U_03 K_01 K_02 K_03
8	Evaluating double integrals in polar coordinates. Change of variables in double integrals and the Jacobian.	W_03 U_03 K_01 K_02 K_03
9	Applications of double integrals in geometry and engineering.	W_03 U_03 K_01 K_02 K_03
10	Written test.	

3. Teaching contents as regards laboratory classes

Laboratory class number	Teaching contents	Reference to teaching results for a module

4. The characteristics of project assignments

The methods of assessing teaching results

Effect symbol	Methods of assessing teaching results *(assessment method, including skills – reference to a particular project, laboratory assignments, etc.)*
W_01	A written test, math exam and tests archives on a learning platform Moodle, observing

	a student's involvement during the classes.
W_02	A written test, math exam and tests archives on a learning platform Moodle, observing a student's involvement during the classes.
W_03	A written test, math exam and tests archives on a learning platform Moodle, observing a student's involvement during the classes.
U_01	A written test, math exam and tests archives on a learning platform Moodle, observing a student's involvement during the classes.
U_02	A written test, math exam and tests archives on a learning platform Moodle, observing a student's involvement during the classes.
U_03	A written test, math exam and tests archives on a learning platform Moodle, observing a student's involvement during the classes.
K_01	Observing a student's involvement during the classes; discussions during the classes.
K_02	Observing a student's involvement during the classes; discussions during the classes.
K_03	Observing a student's involvement during the classes; discussions during the classes.

D. STUDENT'S INPUT

ECTS credit points		
	Type of student's activity	**Student's workload**
1	Participation in lectures	**30**
2	Participation in classes	**20**
3	Participation in laboratories	
4	Participation in tutorials (2-3 times per semester)	**10**
5	Participation in project classes	
6	Project tutorials	
7	Participation in an examination	**3**
8		
9	**Number of hours requiring a lecturer's assistance**	**63** *(sum)*
10	**Number of ECTS credit points which are allocated for assisted work** *(1 ECTS point=25-30 hours)*	**2.4**
11	Unassisted study of lecture subjects	**15**
12	Unassisted preparation for classes	**10**
13	Unassisted preparation for tests	**15**
14	Unassisted test practice	**10**
15	Preparing reports	
15	Preparing for a final laboratory test	
17	Preparing a project or documentation	
18	Preparing for an examination	**15**
19		
20	**Number of hours of a student's unassisted work**	**65** *(sum)*
21	**Number of ECTS credit points which a student receives for unassisted work** *(1 ECTS point=25-30 hours)*	**2.6**
22	**Total number of hours of a student's work**	**128**
23	**ECTS points per module** *1 ECTS point=25-30 hours*	**5**
24	**Work input connected with practical classes** *Total number of hours connected with practical classes*	**60**
25	**Number of ECTS credit points which a student receives for practical classes** (1 ECTS point=25-30 hours)	**2.6**

E. LITERATURE

Literature list	1. Hożejowska S., Hożejowski L., Maciąg A., *Matematyka w zadaniach dla studiów ekonomiczno-technicznych*, Politechnika Świętokrzyska, Kielce 2003. 2. Żakowski W., Decewicz G., *Matematyka, Analiza Matematyczna, część I*, seria eit, WN-T, Warszawa 2003. 3. Żakowski W., W.Kołodziej, *Matematyka, Analiza Matematyczna, część II*, seria eit,WN-T, Warszawa 2003. 4. Leja F., *Rachunek różniczkowy i całkowy,* PWN, Warszawa 1969. 5. Płoski A., *Wstęp do analizy matematycznej*, Politechnika Świętokrzyska, Kielce 1997. 6. Tests, drills and math exam archives on a learning platform Moodle: http://wzimk-moodle.tu.kielce.pl/
Module website	