MODULE SPECIFICATION

Module code	
Module title in Polish	**Matematyka III**
Module title in English	**Mathematics 3**
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** *(first cycle, second cycle)*
Studies profile	**Academic** (*academic/practical)*
Mode of study	**Full-time** *(full-time / part-time)*
Specialism	
Organisational unit responsible for module delivery	**The Department of Mathematics**
Module co-ordinator	**Maciej Sękalski, PhD** **Monika Skóra, PhD**
Approved by	**Marek Iwański, Professor**

B. MODULE OVERVIEW

Module type	**Core module** (*core/programme-specific/elective HES*)*
Module status	**Compulsory module** *(compulsory / non-compulsory)*
Language of module delivery	**English**
Semester in the programme of study in which the module is taught	**Semester 2**
Semester in the academic year in which the module is taught	**Summer semester** *(winter / summer)*
Pre-requisites	**None** (*module code/module title, where appropriate)*
Examination required	**Yes** *(yes / no)*
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 aim of the module includes acquainting students with basic types of differential equations. Other aims include: indicating the methods of examining functions with two variables; defining a double integral and line integrals and indicating the applications of these applications concerning these tools to calculate surface areas of plane, curved-arches length, side surfaces, and volume of solids.

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 recognise the types of differential equations.	l/c	B_W01	T1A_W01 T1A_W07
W_02	A student can define partial derivatives of functions and (with the use of them) describe the description of a function with two variables (an extreme and a directional derivative).	l/c	B_W01	T1A_W01 T1A_W07
W_03	A student is able to characterise the behaviour of an implicit function with one variable.	l/c	B_W01	T1A_W01 T1A_W07
W_04	A student is able to select the methods of calculating double and contour integrals; a student can also indicate geometrical and technical application of an integral calculus.	l/c	B_W01	T1A_W01 T1A_W07
U_01	A student is capable of making calculations.	c	B_U01	T1A_U08 T1A_U09
U_02	A student can solve simple ordinary differential equations.	c	B_U01	T1A_U08 T1A_U09
U_03	A student can calculate partial derivative and apply them to examine critical points of functions with two variables as well as examining implicit functions.	c	B_U01	T1A_U08 T1A_U09
U_04	A student can calculate double and line integrals; a student can use them in geometry and engineering applications.	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	Differential equations. Equations with separated variables. First-order linear equations, variation of parameters method.	W_01, K_01, K_02
2	Linear differential equations with constant coefficients, the method of predictions.	W_01, K_01, K_02
3	Functions with two variables, partial derivatives, and a directional derivative.	W_02, K_01, K_02

4	An implicit function with one variable. Critical points of a function with two variables.	W_02, W_03 K_01, K_02
5	A double integral, volume. Calculating double integrals.	W_04, K_01, K_02
6	The change of variables in a double integral. Sample applications to calculate plane surface areas and the volume of solids.	W_04, K_01, K_02
7	Line undirected integrals. A vector field and definite integral. Physical applications. Green's theorem.	W_04, K_01, K_02

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1	Differential equations. Equations with separated variables.	U_01, U_02, K_01, K_02
2	First-order linear equations, variation of parameters method.	U_01, U_02, K_01, K_02
3	Linear differential equations with constant variables, the method of predictions.	U_01, U_02, K_01, K_02
4	Partial derivatives, a directional derivative, function gradient.	U_01, U_03, K_01, K_02
5	An implicit function with one variable.	U_01, U_03, K_01, K_02
6	Critical points of a function with two variables.	U_01, U_03, K_01, K_02
7	The smallest and greatest value of a function in a closed and limited area.	U_01, U_03, K_01, K_02
8	Second-order curves. Second-order surface areas.	U_01, U_04, K_01, K_02
9	Calculating a double integral. Fubini's theorem.	U_01, U_04, K_01, K_02
10	The change in the order of integration.	U_01, U_04, K_01,

		K_02
11	The change of variables in a double integral.	U_01, U_04, K_01, K_02
12	Calculating the volume of solids as well as surface areas with the use of a double integral.	U_01, U_04, K_01, K_02
13	Contour undirected integrals. Calculating curved arches.	U_01, U_04, K_01, K_02
14	A definite contour integral. The work of a vector field along a curved line.	U_01, U_04, K_01, K_02
15	Green's theorem and its application.	U_01, U_04, 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 *(Method of assessment; for module skills − reference to specific project, laboratory and similar tasks)*
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
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
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** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2.3**
11	Private study hours: background reading for lectures	**15**
12	Private study hours: preparation for classes	**23**
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	**25**
19		
20	**Number of private study hours**	**93** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**3.7**
22	**Total study time**	**150**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**6**
24	**Number of practice-based hours** *Total practice-based hours*	**8**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**0.3**