STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Mathematics		**1010701121010340001**
Field of study	Profile of study (general academic, practical)	Year /Semester
Chemical and Process Engineering	**general academic**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
First-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **30** Classes: **30** Laboratory: **-** Project/seminars: **-**		**5**
Status of the course in the study program (Basic, major, other)	(university-wide, from another field)	
basic	**university-wide**	
Education areas and fields of science and art		ECTS distribution (number and %)
the sciences		**5 100%**

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	The basic knowledge of differential and integral calculus.
2	**Skills**	Students should be able to reformulate some formulas and equations, and to calculate derivatives and integrals.
3	**Social competencies**	Students should know the boundedness of their knowledge and understand the need of further education.

Assumptions and objectives of the course:

The aim of subject is introduction to complex numbers and their some practical applications. The foundations of linear algebra like matrix calculus (with determinants) and solving of systems of algebraic linear equations are studied. The recognizing methods and applications of vector calculus, differential and integral calculus of functions of two and three variables. The getting to know applications of multiply integrals in mathematics and physics. The in-depth getting to know of differential equations. Using this knowledge both in the theory, and in applications in technical sciences.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. To mean the idea of partial derivatives, to be able calculate extrema for functions of two variables - [K_W01]
2. To comprehend the concept of multiple integrals and know methods of calculation and applications - [K_W01]
3. Students can classify different types of differential equations - [K_W01]
4. Students know different methods of solving ODE - [K_W01]

Skills:

1. To calculate partial derivatives, extrema for functions of two variables - [K_U01]
2. To calculate multiple integrals used in some technical problems - [K_U01]

Social competencies:

1. Students understand the importance of effective using of mathematics in other areas of science. - [K_K01]

Assessment methods of study outcomes

Lecture: written exam (both theoretical and practical parts)
Tutorials: two colloqia (during the 7th and 14th weeks)

Course description

Applied methods of teaching: lectures on the blackboard; tutorials ? solving problems on the blackboard and discussing solutions.

Complex numbers in algebraic, trigonometric and exponential forms. Operations on complex numbers. Solving systems with complex coefficients. Matrix calculus: arithmetic operations on matrices, determinants, the inverse of matrix, solving of systems of algebraic linear equations. Vectors, their coordinates and properties. Applications of vector calculus.

Equations of straight lines and planes in three-dimensional space.

Real-valued functions of several variables. Partial derivatives and the differential of f. Taylor?s theorem. Local extreme points. Integrals of functions of several variables. Multiple integrals and their applications. Change of variables in multiple integrals. Definition of first order ordinary differential equation (ode). General solutions, solution curves. Initial value problem. Direction fields.Equations without y. Equations without x. Equations with separated variables. Homogeneous equations. Homogeneous and nonhomogeneous linear first order differential equations.

UPDATE: 2016/2017

Basic bibliography:

1. W. Żakowski, Matematyka, T.1 i T.2, WNT, Warszawa 2003.
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (Definicje, twierdzenia, wzory), GiS, Wrocław 2011.
3. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (Przykłady i zadania), GiS, Wrocław 2011
4. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna 2, (Definicje, twierdzenia, wzory), GiS, Wrocław 2007.
5. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna 2, (Przykłady i zadania), GiS, Wrocław 2007.
6. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka, cz. I, II, III, Wyd. Politechniki Poznańskiej, Poznań, 2001.
7. M. Gewert, Z. Skoczylas, Elementy analizy wektorowej, GiS, Wrocław 2004.
8. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne, GiS, Wrocław 2007.
9. N.M. Matwiejew, Zadania z równań różniczkowych zwyczajnych, PWN, Warszawa 1976.

Additional bibliography:

1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T.1, T.2, PWN, Warszawa 2011.
2. M. Grzesiak, Liczby zespolone i algebra liniowa, Wydawnictwo PP, Poznań 1999.

Result of average student's workload

Activity	Time (working hours)
1. Lectures (15x2h)	30
2. Tutorials (15x2h)	30
3. Homeworks	15
4. Preparing for tests	15
5. Preparing for the exam	15
6. Meetings with the lecturer	6
7. Exam	4

Student’s workload

Source of workload	hours	ECTS
Total workload	115	5
Contact hours	70	3
Practical activities	45	2