Poznan University of Technology

Faculty of Chemical Technology

European **C**redit **T**ransfer **S**ystem

STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Mathematics**		Code
Field of study **Chemical and Process Engineering**	Profile of study (general academic, practical) **general academic**	Year /Semester **1/2**
Elective path/specialty	Subject offered in: **polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	

No. of hours				No. of credits **5**
Lecture: **2** Classes: **2** Laboratory: **-** Project/seminars: **-**				

Status of the course in the study program (Basic, major, other) **basic**	(university-wide, from another field) **from field**

Education areas and fields of science and art **technical sciences**	ECTS distribution (number and %**)** **5 100%**

Responsible for subject / lecturer:

dr Marian Liskowski
email: marian.liskowski@put.poznan.pl
tel. (61)665 2842
Wydział Elektryczny
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knowledge of mathematics defined by the core curriculum of mathematics education at the advanced level of secondary school. Knowledge of calculus of one variable functions.
2	**Skills**	Calculation of the function limits, the calculation of derivatives and integrals of one variable functions.
3	**Social competencies**	Understands the need to supplement education and increasing personal and professional competences.

Assumptions and objectives of the course:

1. Familiarize students with the methods of mathematical analysis of several variables functions, linear algebra in the section on complex numbers and matrix numbers and vector calculus and education skills to apply them to the analysis of the phenomena and problems in the field of engineering.

2. Knowledge of the key concepts and applications of calculus of several variables functions.

3. Knowledge of the methods of solving ordinary differential equations of selected types.

4. Presentation of the elements of the theory of series.

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

Knowledge:

1. The student has knowledge of the operations on complex numbers and matrices and their applications. – [K_W01]
2. The student has knowledge of vector calculus.
3. The student has a basic knowledge of differential calculus of several variables functions. - [K_W01]
4. The student has a basic knowledge of series. - [K_W01]
5. The student has knowledge of the methods of solving some types of ordinary differential equations. - [K_W01]

Skills:

1. The student applies matrix algebra to solve systems of linear equations.
2. The student uses vector calculus to describe the analytical line and plane in space and study their relative positions.
2. The student can apply the partial derivatives to study local extremes and to indicate the direction of the fastest growth in the value function of two variables.
3. The student can use the total differential functions in an approximate calculation.
4. The student can solve simple ordinary differential equations of the first, second and higher orders.

Social competencies:

1. The student understands the need to supplement education and increasing professional competences. - [K_K01]
2. The student can act and cooperate in the group accepting different roles. - [K_K03]

Assessment methods of study outcomes

Lecture: Exam at the end of the semester:

- Sat. 1 knowledge test (4 questions)

- Sat. 2 test of skills (4 jobs).

Method of evaluation: each answer/solution evaluated point system with a scale of 0-3 points.

Duration of test: 60 minutes.

Tutorials:

- 2 colloquia written during the semester (7 and 14 weeks),

- permanent evaluation for each course.

Course description

1. Complex numbers, complex variable polynomials and algebraic equations (the fundamental theorem of algebra).
2. Matrix algebra. Systems of linear equations.
3. Vectors and analytic geometry in space (vector calculus, lines in space, planes and examination of the relative positions of the point, line and plane in space).
4. Number series, the concept of convergence of the series. Selected convergence criteria.
5. The concept of function of several variables, domain, graph of a function, limits and continuity of functions.
6. Differential calculus of functions of several variables with selected applications in engineering practice (directional derivative, differential complete, local extremes).
7. The definition of ordinary differential equations, general solution and particular solution of equation. The Cauchy problem. Practical methods for solving some types of linear differential equations of the first order. Nonhomogeneous linear differential equations of higher order with constant coefficients.

Basic bibliography:

1. W. Żakowski, Matematyka, T.2, WNT, Warszawa 2003

2. W. Leksiński, W. Żakowski, Matematyka T. 4, WNT, Warszawa 2003

3. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (definicje, twierdzenia, wzory), Wydawnictwo GiS, Wrocław 2007.

4. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1, (Definicje, twierdzenia, wzory), Oficyna Wydawnicza GiS, Wrocław 2007.

5. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna, Oficyna Wydawnicza GiS, Wrocław 2011.

Additional bibliography:

1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T.1, T.2, PWN, Warszawa 2011

2. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka dla studentów uczelni technicznych, t.II i III, Wydawnictwo Politechniki Poznańskiej, Poznań 2004

3. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne (teoria, przykłady, zadania), Wydawnictwo GiS, Wrocław 2006

Result of average student's workload	

Activity	Time (working hours)
1. lecture	**30**
2. preparation for tutorials	**20**
3. tutorials	**30**
4. credit preparation	**16**
5. credit	**4**

Student's workload		

Source of workload	hours	ECTS
Total workload	100	5
Contact hours	60	3
Practical activities	0	0