

FACULTY OF MICROSYSTEM ELECTRONIC AND PHOTONICS
SUBJECT CARD

Name in English: **MATHEMATICS**
 Name in Polish: **MATEMATYKA (EiT, II STOPIEŃ)**
 Main field of study (if applicable):
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory / university-wide**
 Subject code: **MAT001449**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	30			
Number of hours of total student workload (CNPS)	60	60			
Form of crediting	exam	crediting with grade			
For group of courses mark (X) final course					
Number of ECTS points	2	2			
including number of ECTS points for practical (P) classes	0	4			
including number of ECTS points for direct teacher-student contact (BK) classes					

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of differential and integral calculus of functions of one and several variables.
2. Knowledge of the properties and applications of complex numbers and matrices.
3. Knowledge of the theory and applications of number series and power series.

SUBJECT OBJECTIVES

- C1 Understanding of the basic concepts of linear spaces.
 C2 Understanding of the basic properties of Fourier series and Fourier transforms.
 C3 Understanding of the basic concepts, theorems, methods and applications relating to ordinary differential equations using the equations of the first and second order and linear systems of ordinary differential equations of the first order.
 C4 Understanding of the basic concepts, theorems and methods for simple partial differential equations and integral equations of type Volterra and Fredholm.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge a student:

- PEK_W01 has a basic knowledge of linear space.
 PEK_W02 has a basic knowledge of Fourier series and Fourier transforms.
 PEK_W03 has a basic knowledge of ordinary differential equations with a particular focus on equations of first and second order and linear systems of ordinary differential equations of the first order.
 PEK_W04 has a basic knowledge of partial differential equations of first and second order and integral equations of type Volterra and Fredholm.

relating to skills a student:

PEK_U01 can calculate Fourier series and Fourier transform of basic functions.

PEK_U02 is able to solve the equations of the first order with separated variables, linear, homogenous and Bernoulli, second-order equations reducible to first order, and the equation with constant coefficients, systems of linear ordinary differential equations of the first order by matrix methods.

PEK_U03 can solve simple partial differential equations and apply iterative methods for solving integral equations of type Volterra and Fredholm.

relating to social competences a student:

PEK_K01 is able to search and use the literature recommended for the course and independently acquire knowledge

PEK_K02 understands the need for a systematic and independent work on the mastery of course material

PROGRAMME CONTENT

Form of classes - lecture		Number of hours
Wy1	The finite-dimensional and infinite-dimensional linear spaces. Examples.	2
Wy2	Trigonometric Fourier series.	3
Wy3	Fourier transform and its basic properties. Convolution.	3
Wy4	Ordinary differential equations of the first order. The initial value problem for the first order differential equation. A direction field. Picard's theorem on the existence and uniqueness of solutions of Cauchy initial value problem for the equation of the first order.	2
Wy5	Linear differential equations of the first order. The method of integrating factor. Bernoulli equation. Orthogonal curves.	3
Wy6	Ordinary differential equations of the second order. Initial value problems for ordinary differential equations of second-order. Ordinary differential equations of second order differential equations reducible to first order.	3
Wy7	Ordinary differential equations of second order linear homogeneous and heterogeneous. The method of variation of parameters.	2
Wy8	Homogeneous systems of linear differential equations. The Euler method.	2
Wy9	Partial differential equations of the first order. The integral of linear homogeneous equation. Clairaut equation. Transport equation.	3
Wy10	Partial differential equations of the second order. Wave equation. The heat equation. Laplace equation.	3
Wy11	Integral equations of the first and second kind, Fredholm and Volterra equations. Examples. Abel integral equation. Fredholm equation with degenerate kernel.	4
Total hours		30

Form of classes - Class

Form of classes - Class		Number of hours
Ćw1	Analyzing the issues related to the concepts of linear space.	3
Ćw2	Determination and study of Fourier series.	3
Ćw3	Determination of the Fourier transform and convolution.	2
Ćw4	Solving of linear differential equations of the first order of separated variables, homogenous and Bernoulli equations. Application of the above equations.	4

Ćw5	Solving differential equations of the second order and their applications.	3
Ćw6	Solving systems of linear differential equations.	3
Ćw7	Solving partial differential equations of the first order.	3
Ćw8	Solving partial differential equations of the second order.	3
Ćw9	Solving integral equations of the Volterra and Fredholm kind.	4
Ćw10	Tests	2
	Total hours	30

TEACHING TOOLS USED

1. Lecture - traditional method.
2. Exercises - traditional method.
3. Consultations.
4. Student's own work - preparation for exercises.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Oceny: F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P - Ćw	PEK_U01-PEK_U03 PEK_K01-PEK_K02	Oral answers, quizzes, tests
P - Wy	PEK_W01-EK_W04 PEK_K02	Exam

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] J. D. Logan, A first course in differential equations, SpringerVerlag, NY 2006.
- [2] M. Gewert i Z. Skoczylas, Równania różniczkowe zwyczajne. Teoria, przykłady, zadania, Oficyna Wydawnicza GiS, Wrocław 2006.
- [3] F. Bierski, Funkcje zespolone – Szeregi Fouriera i przekształcenie Fouriera, przekształcenie całkowe Laplace'a, przekształcenie Laurenta, Uczelniane Wydawnictwa Naukowo-Dydaktyczne, Kraków, 1999.
- [4] A. Piskorek, Równania całkowe. Elementy teorii i zastosowania, WNT, Warszawa, 1997.

SECONDARY LITERATURE:

- [1] P. Blanchard, R. L. Devany, and G. R. Hall, Differential Equations, 3rd ed., Thompson, Brook/Cole, Belmont, CA, 2006.
- [2] A. Palczewski, Równania różniczkowe zwyczajne, WNT, Warszawa 2004.
- [3] A. N. Tichonow, A. A. Samarski, Równania fizyki matematycznej, PWN, Warszawa 1963.
- [4] K. T. Tang, Mathematical Methods for Engineerd and Scientis 2, Springer-Verlag, Berlin Heidelberg, 2007.
- [5] K. T. Tang, Mathematical Methods for Engineerd and Scientis 3, Springer-Verlag, Berlin Heidelberg, 2007.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
MATHEMATICS MAT001449 (EiT 2 stopień)
 AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY

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 AND SPECIALIZATION

Przedmiotowy efekt kształcenia	Odniesienie przedmiotowego efektu do efektów kształcenia zdefiniowanych dla kierunku studiów i specjalności (o ile dotyczy)	Cele przedmiotu	Treści programowe	Numer narzędzia dydaktycznego
PEK_W01		C1	Wy1	1,3,4
PEK_W02		C2	Wy2, Wy3	1,3,4
PEK_W03		C3	Wy4 – Wy8	1,3,4
PEK_W04		C4	Wy9 – Wy11	1,3,4
PEK_U01		C2	Ćw2, Ćw3	2,3,4
PEK_U02		C3	Ćw4 – Ćw6	2,3,4
PEK_U03		C4	Ćw7 – Ćw9	2,3,4
PEK_K01		C1 – C4	Wy2 – Wy11, Ćw2 – Ćw9	1,2,3,4
PEK_K02		C1 – C4	Wy1 – Wy11, Ćw1 – Ćw9	1,2,3,4