STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Mathematics		**1010322311010340025**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**(brak)**	**1 / 1**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **30**	Classes: **15**	Laboratory: **-**	Project/seminars: **-**	**2**

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

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student has knowledge of complex numbers and real mathematical analysis of strings, series of numbers and powers, ordinary and partial derivatives, integrals, ordinary differential equations.
2	**Skills**	Student can perform operations on complex numbers, calculate derivatives and integrals, solve first-order and second-order ordinary differential equations.
3	**Social competencies**	The student understands the need for continuous improvement of language, occupational and social competences and knows the importance of higher mathematics in the description of physical and technical issues.

Assumptions and objectives of the course:

The main aim is the understanding of basic notions and methods theory in order to apply them to solving technical problems.

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

Knowledge:

1. Student has knowledge of complex functions of the real variable, their geometrical interpretation and properties - [K_W01]
2. Student has knowledge of complex functions of complex variables, their differentiation and integration and knows basic functions - [K_W01]
3. Student knows methods of solving first-order linear and quasilinear differential equations - [K_W01]
4. Student knows how to bring selected electrotechnical problems into second order linear differential equations and solve these equations - [K_W01]

Skills:

1. Student is able to determine the image of a given complex function and calculate the derivative and integral of the complex function of the real variable - [K_U01]
2. Student is able to determine the real and imaginary part of the complex function of the complex variable, to determine the holomorphic function based on its real part, to integrate the integral function on the plane curve and to develop the function in the Laurent series - [K_U01]
3. Student can solve the first-order linear or quasilinear partial differential equation - [K_U01]
4. Student can bring the system of two partial differential equations to the second order equation and canonical form and solve the problem - [K_U01]

Social competencies:

1. Student is aware of the importance of mathematical methods in the description of physical and technical issues and responsibility for decisions - [K_K02], [K_K04]

Assessment methods of study outcomes

Lectures: a short written test concerning mainly the theoretic part of the subject and ability to use it in practical issues.

Classes: Evaluation of written tests during the semester and the direct activity during the classes. Getting extra points related with activity (use of literature, discussion of problems, presenting reports concerning applications of the theory).

Course description

Actualisation 2017/2018

Applied methods of education:

1) Lectures:

- interactive lecture with questions to students or specific students,
- theory presented in connection with the current knowledge of students,
- presenting a new topic preceded by a reminder of related content known to students from other subjects,
- taking into account various aspects of the issues presented,
- student activity is taken into account during the course of the assessment.

2) Classes:

- solving sample tasks on the blackboard,
- initiate discussion on solutions,
- sets of tasks to do homework / additional tasks.

Issues:

Complex numbers and sequences.

Complex functions of the real variable: geometric interpretation, derivative, integral.

Composite Functions of Complex Variables: Basic Types of Complex Functions and Their Properties, Derivative, Cauchy-Riemann Equations for Holomorphic Functions, integral, Cauchy's integral theorem, Taylor series and Laurent series, zero points, singular points, residues, and methods of determining it.

Fourier series.

First-order linear and quasi-linear partial differential equations: properties and methods of solving.

Secondary linear partial differential equations: reduced to canonical form and solved.

Interpretation of solutions of hyperbolic and parabolic equations under appropriate initial and boundary conditions.

Telegraph equations, long line equation.

Particular attention is paid to the application of mathematics in technical sciences.

Basic bibliography:

1. D. Bobrowski, J. Mikołajski, J. Morchało, Równania różniczkowe cząstkowe, Wydawnictwo PP, Poznań 1995.
2. E. Kącki, L. Siewierski, Wybrane działy matematyki wyższej z ćwiczeniami, PWN, Warszawa 1981.
3. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, PWN, Warszawa 1974.
4. W. Leksiński, W. Żakowski, Matematyka, T.4, WNT, Warszawa 2003.
5. L. Siewierski, Ćwiczenia z analizy matematycznej z zastosowaniami, T.1, T.2, PWN, Warszawa 1981.
6. W. Stankiewicz, J. Wojtowicz, Zadania z matematyki dla wyższych uczelni technicznych, T. 2, PWN, Warszawa 2001.

Additional bibliography:

1. F. Leja, Rachunek różniczkowy i całkowy, PWN, Warszawa 1971.
2. F. Leja, Teoria funkcji analitycznych, PWN, Warszawa 1987.
3. W. Leksiński, J. Nabiałek, W. Żakowski, Matematyka, WNT, Warszawa 2002.
4. A.N. Tichonow, A.A. Masarski, Równania fizyki matematycznej, PWN, Warszawa 1963.

Result of average student's workload

Activity	Time (working hours)
1. Active participation in lectures and classes.	45
2. Preparation for classes and tests.	8
3. Solving exercises to work independently.	5
4. Participation in consultations.	2

Student's workload

Source of workload	hours	ECTS
Total workload	60	2
Contact hours	47	1
Practical activities	13	1