



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics [N2EiT1>MAT]

### Course

Field of study

Electronics and Telecommunications

Year/Semester

1/1

Area of study (specialization)

–

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

part-time

Requirements

compulsory

### Number of hours

Lecture

30

Laboratory classes

0

Other

0

Tutorials

15

Projects/seminars

0

### Number of credit points

4,00

### Coordinators

dr Anna Iwaszkiewicz-Rudoszańska

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### Lecturers

dr Anna Iwaszkiewicz-Rudoszańska

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### Prerequisites

Basic mathematical knowledge from calculus and linear algebra. Skills to logical thinking. Understanding of limitation of own knowledge and motivation for further education.

### Course objective

Basic knowledge in abstract algebra which is necessary to study cryptography. Skills for solving differential and partial differential equations.

### Course-related learning outcomes

Knowledge:

1. Knows basic algebraic structures.
2. Knows various methods of solving ordinary and partial differential equations.

Skills:

1. Orthogonalizes the basis of a linear space.
2. Can encrypt and decrypt using RSA and ElGamal system.
3. Solves ordinary linear differential equations of the second order by various methods.

4. Converts selected partial differential equations of the second order to the canonical form and them solves.

Social competence:

1. Knows the limitations of his own knowledge and skills, understands the need for further training.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified by a written exam consisting of six equally scored tasks, two from each part of the material. Exam topics are given at least two weeks before the exam. Skills acquired during classes verified by 3 tests written during the semester. Each consists of 4-5 equally scored tasks.

Passing threshold (concerns lectures and exercises): 50% of the sum of all possible points. Each 10% more points equals half a grade higher.

### Programme content

Lecture: Algebraic structures (groups, subgroup, cyclic group, rings, fields and its applications in cryptography - RSA, Diffie-Hellman key exchange protocol, ElGamal system; linear spaces, vector linear dependence and independence, basis of vector space, Euclidean spaces, vector orthogonality, orthogonal and orthonormal bases, Gram-Schmidt orthogonalization). Differential equations (linear equations of first and second order - method of undetermined coefficients and variation of constants, systems of differential equations, Laplace transformation, operator method of solving differential equations). Partial differential equations (first-order homogeneous equations, second-order equations - determining the type of the equation, reducing the equation to a canonical form, wave equation in one space dimensions - d'Alembert's method, bounded string - Fourier's method, Fourier's method for other types of equations).

Tutorials: Groups, subgroups, cyclic groups, RSA, ElGamal system, linear dependence and independence of vectors, base of space, Euclidean spaces, vector orthogonality, orthogonal and orthonormal bases, Gram-Schmidt orthogonalization. Linear first and second order differential equations - method of undetermined coefficients and variation of constants, systems of differential equations, Laplace transformation, operator method of solving differential equations. Partial differential equations - first-order homogeneous equations, second-order equations - determining the type of equation, reducing the equation to a canonical form, wave equation in one space dimensions - d'Alembert's method, bounded string - Fourier's method.

### Course topics

none

### Teaching methods

1. Lecture - multimedia presentation accompanied with examples presented on the blackboard and with questions to the group of students.
2. Classes - solving problems on the board.

### Bibliography

Basic

1. D.A. McQuarrie, Matematyka dla przyrodników i inżynierów, cz. 1 i 2
2. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 2
3. M. Gewet, Z. Soczylas, Równania różniczkowe zwyczajne
4. D. Bobrowski, J. Mikołajski, J. Morchało, Równania różniczkowe cząstkowe w zastosowaniach

Additional

1. N. Koblitz, Wykład z teorii liczb i kryptografii
2. D. Stinson, Kryptografia: w teorii i w praktyce

### Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	55	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	2,00