STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Selected Topics in Mathematics	**1010802111010342874**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electronics and Telecommunications	**general academic**	**1 / 1**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Information and Communication	**English**	**obligatory**

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

No. of hours	No. of credits
Lecture: **3** Classes: **3** Laboratory: **-** Project/seminars: **-**	**6**

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 %)
technical sciences	**6 100%**
Technical sciences	**6 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knowledge of mathematics at the level of the first cycle study.
2	**Skills**	Understanding and ability to use mathematical analysis, linear algebra and the theory of differential equations.. Programming in high level languages. Evaluation of the computational complexity of algorithms.
3	**Social competencies**	Aware of the need to broaden their knowledge and practical skills.

Assumptions and objectives of the course:

Getting acquainted with modern of mathematical methods (theoretical and practical) used in telecommunication and signal processing.

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

Knowledge:

1. Has extended, in-depth knowledge of those branches of mathematics which are used in formulating and solving problems in electronic and telecommunications. - [K2_W00]
2. Has a systematic knowledge, with the necessary theoretical background, of optimization methods used in solving engineering problems. - [K2_W03]
3. Has a systematic knowledge, together with the necessary mathematical background, related to information and coding theory. - [K2_W05]

Skills:

1. Is able to apply optimization methods to solve problems in electronics and telecommunication - [K2_U05]
2. Is able to select adequate numerical methods and simulation methods to solve typical tasks related to analysis, design and optimization of systems and computational tasks in telecommunication - [K2_U09]
3. Is able to communicate freely in English. Is able to discuss professional matters in English; is able to use knowledgeably English language sources (books, technical and scientific journals, application notes, catalogues, instructions, standards, etc.) - [K2_U01]

Social competencies:

1. Understands the role of information society in the country development. - [K2_K05]
2. Is aware of the necessity to approach solving technical problems with responsibility and professionalism. - [K2_K05]

Assessment methods of study outcomes

Practical sections. Control of the skills in the form of three quizzes. The final exam (in written and oral form).

Course description

Trigonometric and wavelets transforms (and applications). Algebraic systems of linear equations with special structure. Linear and nonlinear methods in data smoothing. Optimization (linear and non-linear) with constrains. Mathematical modeling. Methods of approximation theory used in the signal processing. Ill-posed problems. Inverse problems (with applications). Eigenvectors and eigenvalues. Matrix decompositions. Matrix functions. Web pages ranking.

Basic bibliography:

1. Trefethen, L. i Bau, D. Numerical Linear Algebra. SIAM Publishing, 1997.
2. Golub, G.H. i Van Loan, Ch. Matrix Computations, The Johns Hopkins University Press, 2013.
3. Maćkiewicz A. i Ciałkowski M. Numerical methods for linear ill-posed inverse problems (in Polish).Wydawnictwo PP. 2013.

Additional bibliography:

1. Langville A. N. i Meyer C. D. Google's PageRank and Beyond: The Science of Search Engine Rankings. Princeton 2006.
2. Moon T.K. i Stirling W.C. Mathematical Methods and Algorithms for Signal Processing, Prentice Hall 2000.
3. Van Loan Ch. Computational Frameworks for the Fast Fourier Transform, SIAM 1997

Result of average student's workload

Activity	Time (working hours)
1. Participation in the lectures	45
2. Participation in the exercises	45
3. Self-preparation for practical sections.	15
4. Solving homework problems.	20
5. Preparation of the exam	20
6. Participation in the exam	2
7. Consulting with teachers	3

Student's workload

Source of workload	hours	ECTS
Total workload	150	6
Contact hours	95	3
Practical activities	80	3