STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Introduction to digital signal processing	**1010804141010830942**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electronics and Telecommunications	**general academic**	**2 / 4**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

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

No. of hours	No. of credits
Lecture: **20** Classes: **-** Laboratory: **20** Project/seminars: **-**	**7**

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

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**7 100%**
Technical sciences	**7 100%**

Responsible for subject / lecturer:

dr hab. inż. Anna Domańska prof.PP, prof. nadzw.
email: domanska@et.put.poznan.pl
tel. 61 665 3865
Faculty of Electronics and Telecommunications
ul. Polanka 3, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has a systematic knowledge of mathematical analysis, algebra and theory of probability Has a systematic knowledge, together with necessary mathematical background, of 1D signal theory; this knowledge allows him/her to understand the representation of signals and signal analysis in time domain and frequency domain
2	**Skills**	Is able to use known mathematical analysis, algebra and theory of probability concepts to solve basic problems in electronics and telecommunication Demonstrates the ability to solve problems related to signal analysis in time domain and frequency
3	**Social competencies**	Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study Demonstrates responsibility and professionalism in solving technical problems. Is able to participate in collaborative projects

Assumptions and objectives of the course:

The possess of the skill of the application of tools and algorithms of the digital signal processing, digital methods of the analysis of discreet signals and systems in the field of the time and the frequency.

The capture of issues of concerning properties and methods of the designing of digital filters.

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

Knowledge:

1. Has a systematic knowledge, together with necessary mathematical background, of basic digital signal processing methods - [K1_W19]

Skills:

1. Is able to determine basic parameters and properties of signals and telecommunication systems, under predefined constraints - [K1_U15]

2. Is able to perform typical calculations and use appropriate software to design and analyze the operation of digital signal processing systems - [K1_U18]

Social competencies:

1. Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study - [K1_K01]

2. Demonstrates responsibility and professionalism in solving technical problems. Is able to participate in collaborative projects - [K1_K02]

Assessment methods of study outcomes

1. Exam from the range of programmatic contents
2. Laboratory reports

The current check of the knowledge on the laboratory (tests, questions concerning of the current performed task)

Course description

Lectures:

1. Comparison of digital and analog techniques of signal processing
2. Discretisation of signals (sampling, quantisation)
3. Z transform
4. Discrete signals and systems , discrete-time Fourier series, discrete-time Fourier transform, processing of discrete signal through discreet LTI system
5. Digital filters FIR and IIR (properties, designing)
6. Discrete Fourier transform,algorithm FFT
7. Multirate systems and filter banks
8. Interpolation and decimation

Laboratory exercises:

1. Discrete-time Fourier series
2. Sampling and reconstruction of the signal from samples
3. The quantization, basic properties of operation, parameters of signal after quantization and signal of error
4. Discrete systems, transmittance, dependent properties from zeros and poles, stability
5. The discrete Fourier transform, linearity, leakage of spectrum, windows
6. Digital filters FIR, designing, test of property
7. Digital filters IIR, designing, test of property
8. Moving average filter, test of property
9. Coherent averaging, test of effectiveness of filtration
10. Improvement of accuracy of DFT result, averaging multiple FFT
11. Median filter
12. Interpolation and decimation, design of digital transducers, test of property

Basic bibliography:

1. Zieliński T., Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, WKŁ, Warszawa, 2009.
2. Lyons R., Wprowadzenie do cyfrowego przetwarzania sygnałów, WKŁ, Warszawa, 2010.
3. Smith S., Cyfrowe przetwarzanie sygnałów. Praktyczny poradnik dla inżynierów i naukowców, BTC, Warszawa, 2007.
4. Kwiatkowski W., Wstęp do cyfrowego przetwarzania sygnałów, BEL Studio, Warszawa, 2012.

Additional bibliography:

1. Owen M., Przetwarzanie sygnałów praktyce, WKŁ, Warszawa, 2009.
2. Stranneby D., Cyfrowe przetwarzanie sygnałów. Metody algorytmy zastosowania, BTC, 2004.
3. Sawicki J., Bogucka H., Dziech A.; Elementy cyfrowego przetwarzania sygnałów z przykładami zastosowań i wykorzystaniem środowiska MATLAB; Wydawnictwo Fundacji Postępu Telekomunikacji, Kraków, 1999.
4. Mrozek B., Mrozek Z., Matlab i Simulink. Poradnik użytkownika, Helion, Gliwice, 2010.

Result of average student's workload

Activity	Time (working hours)
1. Lectures	20
2. Preparation to exam	15
3. Exam	2
4. Laboratory exercises	20
5. Preparation to laboratory exercises	10
6. Elaboration of lab reports	10
7. Consultations	2

Student's workload

Source of workload	hours	ECTS
Total workload	175	7
Contact hours	45	2
Practical activities	60	3