POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Digital signal processing [S1EiT1E>CPS]

Course

Field of study	Year/Semester
Electronics and Telecommunications	2/4
Area of study (specialization)	**Profile of study**
–	general academic
Level of study	**Course offered in**
first-cycle	English
Form of study	**Requirements**
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other
30	30	0
Tutorials	**Projects/seminars**	
0	0	

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

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. Is able to extract information from Polish or English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions. Is capable of studying autonomously 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.

Course objective

Learning theoretical and practical digital signal processing basics, i.e. analysis and design of linear time invariant systems, and digital spectrum analysis (through discrete Fourier transform).

Course-related learning outcomes

Knowledge:
Has a systematic knowledge, together with necessary mathematical background, of basic digital signal

processing methods.

Skills:
1. Is able to determine basic parameters and properties of signals and telecommunication systems, under predefined constraints.
2. Is able to perform typical calculations and use appropriate software to design and analyze the operation of digital signal processing systems.

Social competences:
1. Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study.
2. Demonstrates responsibility and professionalism in solving technical problems. Is able to participate in collaborative projects.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Final exam following lectures - short written answers to 10 questions covering the whole lecture program Laboratory reports.
Knowledge testing on the fly during laboratories (entrance or final tests, knowledge checking during lab exercises) .
Grade breakdown:
<= 50% 2.0
51%-60% 3.0
61%-70% 3.5
71%-80% 4.0
81%-90% 4.5
91%-100% 5.0

Programme content

Signal sampling and discretization. Linear systems, time invariance, stability, causality, convolution and impulse response. Differnce equations and filters. z-Transform: definition, application to difference equations, convergence, computing of inverse z-transform. Fourier transform: discrete time Fourier transform (DTFT) and discrete Fourier transform (DFT), their relations to continuous Fourier transform, and Fourier series, and z-transform, hence, their properties. Structures of digital filters, their susceptibility to rounding errors. Design of infinite impulse response filters: starting point - analog filters, bilinear transform and invariant impulse response method, frequency transformations. Design of finite impulse response filters: Gibbs effect, linear phase filters, window method design, equiripple filters, frequency sampling method. Computation of the discrete Fourier transform: FFT, its use in fast convolution and correlation computation, note on DCT. Non-parametric methods of spectrum computation: theoretical background, averaging and smoothing of periodograms. Basic digital signal processing concepts in the multidimensional case. Introduction to multirate systems.

Course topics

none

Teaching methods

Lectures supported by multimedia presentations.
The laboratory experiments evaluate the acquired technical skills and expertise required to apply these methods to practical signal processing tasks.

Bibliography

Basic
1. Understanding Digital Signal Processing by Richard G. Lyons
2. J.G. Proakis, D.G. Manolakis, "Digital Signal Processing, Principles, Algorithms, and Applications", 4 ed., Prentice Hall, 2007.
Additional

1. Lathi, B. P, Signal Processing and Linear Systems, Oxford University Press, 1998.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	75	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	3,00