

Subject code	Credits
INF3004	6

Course title in Lithuanian

DUOMENŲ KODAVIMAS IR SUSPAUDIMAS

Course title in English

CODING AND COMPRESSION

Short course annotation in Lithuanian (up to 500 characters)

Kurse analizuojami sistemos, signalai ir duomenų kodavimo problemos. Studentai susipažįsta su signalų analize ir modeliavimu, įgauna praktikos signalų analizės uždavinių sprendime, išmoksta taikyti duomenų suspaudimo algoritmus, susipažįsta su kodavimo klaidų valdymo pagrindais, taip pat su kriptografijos algoritmu pagrindais.

Short course annotation in English (up to 500 characters)

Systems, signals, and coding issues are analysed. Students learn approaches to signal analysis and system modelling, gain introductory practice in signal analysis; application of data compression algorithms and essentials of error control coding, as well as essentials of cryptographic algorithms.

Prerequisites for entering the course

Mathematics, Programming Fundamentals; Discrete Structures and Mathematical Logic.

Course aim

Provide knowledge in the field of lossless and lossy compression, error-control coding and cryptographic algorithms

Content

No	Content (topics)
1.	Systems, signals, noise and information. Introduction to the field of system modelling, correspondences between system and its signal, measures of the amount of information and entropy, concept of noise
2.	Elementary signal analysis. Signal discretization and quantization, interpretation of vector transforms in multidimensional spaces, Fourier transform and its applications, wavelet transform.
3.	Introduction to filtering. Linear filtering, filtering in time and frequency domains, wavelet filtering, nonlinear filter examples.
4.	Lossy compression methods, of the example of JPEG. Demonstration how previously studied signal analysis techniques help in JPEG compression schemes.
5.	Lossless Compression. Boundaries of how much one can compress. Huffman and arithmetic coding. Adaptive Huffman and arithmetic coding, dictionary based approaches: LZW compression, semantic compression methods.
6.	Error control coding. Block coding: linear codes, cyclic codes, convolutional coding, Viterbi algorithm.
7.	Cryptography. Essentials of private and public key cryptographic algorithm.

Distribution of workload for students (contact and independent work hours)

Lectures	45 hours
Laboratory work	30 hours
Individual students work	85 hours
Total:	160 hours

Structure of cumulative score and value of its constituent parts

Written final examination (50%), written mid-term examination (17%) and assessment of laboratory works (33%).

Recommended reference materials

No.	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				<i>University library</i>	<i>Self-study rooms</i>	<i>Other libraries</i>
<i>Basic materials</i>						
1.	2007	David Salomon, G. Motta, and D. Bryant. Data Compression: The Complete Reference	Springer-Verlag, London	1		
2.	2001	Khalid Sayood. Introduction to Data Compression, Third Edition	Morgan Kaufman Publishers, Elsevier	1		
3.	1998	Haykin, S. Communication Systems	John Wiley & Sons, New York	1		
4.		Minija Tamošiūnaitė. Informacijos teorija. Sistemos ir signalai		10		

Course programme designed by

Prof. Dr. Minija Tamošiūnaitė