Subject code	ECTS credits
INF5006	6

Course title in Lithuanian

SIGNALŲ ATPAŽINIMAS

Course title in English

SIGNAL PROCESSING AND RECOGNITION

Short course annotation in Lithuanian (up to 500 characters)

Šio kurso tikslas yra suteikti studentams teorinių ir praktinių žinių, reikalingų analizuojant atsitiktinių signalų ir dinaminių sistemų atpažinimą grindžiamą kompiuterių galimybių panaudojimu.

Short course annotation in English (up to 500 characters)

The goal of the study subject is to open for student's knowledge, skills and ability to investigate signal recognition theory problems and apply theory and modern information technologies for recognition of various nature stochastic signal and stochastic dynamic system.

Prerequisites for entering the course

Probability Theory, Mathematical Statistics, Software design

Course aim

The purpose of this course is to provide students with knowledge, skills and ability to investigate signal recognition theory problems and apply theory and modern information technologies.

Links between study programme outcomes, course outcomes, criteria of learning achievement evaluation, study methods and methods of learning achievement assessment

Course outcomes	Criteria of learning achievement evaluation	Study methods	Methods of learning achievement assessment
1. The knowledge and understanding of stochastic signal properties description and results application for development of stochastic signals recognition and stochastic dynamic systems recognition.	Knowledge demonstration of signal recognition theory, methods, information technology application and the ability to apply signal recognition theory and methods for a teacher supplied simulated problem.	Lectures, discussions, laboratory work, problem based and case studies, individual project and presentation	Mid-term exam
2. The skills to analyse and describe properties of natural and artificial processes for developing of stochastic signals recognition systems and recognition of non-stationary stochastic dynamic system	Skills demonstration in using stochastic signal recognition theory, signal processing software for analysing properties of stochastic signals, recognition of stochastic signals and recognition of the properties of stochastic dynamic systems.	Lectures, discussions, laboratory work, problem based and case studies, individual project and presentation	Mid-term exam
3. The ability to solve the problems of high quality stochastic signals recognition product development.	Ability demonstration to perform interdisciplinary R&D in stochastic signal recognition field and to apply research results in practical system development and design processes.	Lectures, discussions, laboratory work, problem based and case studies, individual project and presentation	Exam

Links between study programme outcomes and course outcomes

Study programme outcomes	Running number of course outcome		
	1	2	3
3. Broaden and apply the knowledge of reliability analysis and statistical methods for data analysis	+	+	+

4. Identify, select and understand the state-of-the-art literature of mathematics and apply the gained knowledge to specific scientific and practical tasks	+	+	+
7. Analyse, understand and use mathematical methods	+	+	+
8. Transform heuristic arguments into mathematical language; prove the propositions by using known patterns	+		+

Content

No	Content (topics)
1.	Signals. Signals types. Natural and artificial signals.
2.	Signal properties. Signal properties estimation.
3.	Dynamic systems and their properties.
4.	Modelling of signals.
5.	Recognition systems and their elements
6.	Stochastic signal recognition.
7.	Stochastic dynamic system functional state recognition.
8.	Linear and piece-vice linear classification
9.	Minimal average risk recognition. Bayes method.
10.	Recognition of changes in signal properties.
11.	Time scale warping.
12.	Recognition of speech signals. Hidden Markov models.
13.	Voice controlled systems.
14.	Ubiquitous moving freely subjects functional states recognition.
15.	Suboptimal recognition procedures. Recognition accuracy and fidelity.

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

Lectures	**45 hours**
Practical work	**15 hours**
Individual students work	**100 hours**
Total:	**160 hours**

Structure of cumulative score and value of its constituent parts

Final written exam (50%), mid-term test (17%), and assessments of laboratory (practical) work (33%).

Recommended reference materials

No.	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	*Self-study rooms*	*Other libraries*
Basic materials						
1.	2006	John G. Proakis, Dimitris G. Manoakis. *Digital Signal Processing. Principles, Algorithms, and Applications*. Fourth Edition.	Prentice-Hall	1	1	
2.	2001	Richard O. Duda, Peter E. Hart, David G. Stork. *Pattern Classification*.	John Wiley Sons Inc.	1	1	
3.	2011	Telksnys L.,Kaukėnas J. Recognition of short-time specific random elements in random sequences. Informatica. ISSN 0868-4952. 2011, vol. 22, no. 2, p. 279-288.		1	1	
4.	2009	S.Theodoridis, K.Koutroumbas. *Pattern Recognition*.	Elsevier Inc.	1	1	

Supplementary materials				
1.	2006	Fang Chen. Designing Human Interface in Speech Technology.	Springer	
2.	2012	Telksnys L., Kaukėnas J. Accuracy Estimation of Detection of Extrasystoles in Heart Rate Sequences	e-Health Networking, Applications and Services (Healthcom): 2012 IEEE 14th International Conference, 10-13 October, Beijing, China.	http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6379377

Course programme designed by

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