RIGAS TEHNISKĀ UNIVERSITĀTE

RTU Course "Real-Time Communication Systems (study project)"

13107 null

General data

Code	TRT313
Course title	Real-Time Communication Systems (study project)
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Ernests Pētersons
Academic staff	Elans Grabs
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN
Annotation	Modern telecommunications rely heavily on digital signal processing. FFT algorithm is commonly used for many purposes, even as a part of modulators/demodulators. The study course provides insight into FFT algorithm implementation and performance analysis. The study course is practically oriented, meaning the students will spend most of their time working on programming assignments, benchmarking different devices as well as performing spectral analysis for real car engine audio records to. All the results and findings will be presented in the form of the study project.
Goals and objectives of the course in terms of competences and skills	The main goal of the study course is to teach students how to perform practical research with further preparation of the report in the form of a study project. During the development of such a study project, the students are expected to improve their knowledge of programming, including Android devices, and also to master skills of conducting practical experiments in performance evaluation of different devices. The main tasks of the study course: to provide a theoretical background on Fourier Transform application for discrete signals; to provide a theoretical background on computer hardware and its performance; to develop practical skills of FFT algorithm implementation in C programming language; to develop practical skills of performance evaluation and analysis for different devices; to develop practical skills of spectral analysis application by using the periodograms method.
Structure and tasks of independent studies	Individual work is an inseparable part of the study course. The students are expected to work individually on performing measurements for computers and Android devices with different parameters and analyse obtained results. The individual work also includes work with literature and preparation of the study project report.
Recommended literature	Obligātā/Obligatory: 1. M.Vetterli, J.Kovacevic, V.Goyal. Foundations of Signal Processing. 2014. https://fourierandwavelets.org/FSP_v1.1_2014.pdf 2. A.Oppenheim, R.Schafer. Discrete-Time Signal Processing, 3rd edition, Pearson, 2010. 3. B.Wescott. The Every Computer Performance Book, Chapter 3: Useful laws, CreateSpace, 2013. 4. T.Cormen, C.Leiserson, R.Rivest, C.Stein. Introduction to Algorithms, 3rd Edition. The MIT Press, 2016. Papildu/Additional: 1. V.Narnicka, S.Šarkovskis, A.Zeļenkovs. Ciparu spektrālās anālizes pielietošanas pamati: Mācību līdzeklis. Prof A.Zeļenkova redakcijā. -Rīga, RTU, 2007.
Course prerequisites	Networking and mathematics.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Discrete Fourier Transform and Fast Fourier Transform.	6	0	0	0
Designing, implementing and testing Fast Fourier Transform algorithm.	8	6	0	0
Development of testing program for PC and performance measurements.	6	8	0	0
Development of testing program for Android smart devices and performance measurements.	6	8	0	0
Processing and analysing results. Approximation and course project report preparation.	8	10	0	0
Fast Fourier Transform application for car engine sound analysis.	8	6	0	0
Total:	42	38	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is able to summarize the theoretical background on Fourier Transform of discrete signals.	Report on study project.
Is able to develop testing program with FFT algorithm for PC performance benchmarking.	Report on study project.
Is able to develop the testing program with FFT algorithm for Android smart device performance benchmarking.	Report on study project.

Is able to analyse performance for different devices by processing results produced by designed testing programme.	Report on study project.
Is able to use FFT algorithm for analysis of car engine sound by periodogram method.	Report on study project.

Evaluation criteria of study results

Criterion	%
Report on study project	100
Total:	100

Study subject structure

Part	CP	Hours per Week			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	2.0	0.0	2.0	0.0			*