COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Digital signal processing and simulation	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: dr**.** Sandra Pralgauskaitė **Other(s):**	Institute of applied electrodynamics and telecommunication, Physics Faculty

Study cycle	Type of the course unit (module)
The second	Compulsory

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face-to-face	The first (Autumn) semester	Lithuanian

Requirements for students	
Prerequisites: Mathematics from the first cycle of the studies, basics of the digital signal processing or similar.	**Additional requirements (if any):**

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	140	64	76

Purpose of the course unit (module): programme competences to be developed		
The aim of the course is to acquire knowledge about digital signal analysis algorithms and tools for digital signal processing, to develop a competence to perform digital signal processing and analysis.		
Learning outcomes of the course unit (module)	**Teaching and learning methods**	**Assessment methods**
Knowledge and ability to apply various digital signal analysis algorithms and tools for digital signal processing.	Problem-based learning, laboratory works, task analysis and information search	Test, participation in laboratory work, preparation and presentation of a report
Ability to perform digital signal analysis.	Laboratory works, task analysis and information search	Participation in laboratory work, presentation, analysis and synthesis of results
Learn the principles of digital filters and their applications for signals detecting and extracting from noise.	Problem-based learning, laboratory works, task analysis and information search	Test, participation in laboratory work, preparation and presentation of a report
Competence to assess the productivity of the digital system by computer simulation.	Problem-based learning, laboratory works, task analysis and information search	Test, participation in laboratory work, preparation and presentation of a report

Content: breakdown of the topics	Contact hours							Self-study work: time and assignments	
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work placement	**Contact hours**	**Self-study hours**	**Assignments**
1. Introduction. Signals	2				4		**6**	**6**	Read the literature on the topic, prepare for the tests, prepare for laboratory works, prepare laboratory work description, describe and analyse the obtained results, prepare the report and its presentation.
2. Signal processing operations	2				4		**6**	**10**	
3. Discrete-time signals and systems	4				8		**12**	**14**	
4. z-transform	6				8		**14**	**14**	
5.The discrete-time transforms	4				4		**8**	**10**	
7. Finite-duration sequences	6				4		**10**	**10**	
8. Theorems of the discrete Fourier transform	2				0		**2**	**2**	Read the literature on the topic, prepare for the tests, prepare the report and its presentation.
9.Digital filters	6				0		**6**	**10**	
Total	**32**				**32**		**64**	**76**	

Assessment strategy	Weight,%	Deadline	Assessment criteria
Test No. 1	10	During the semester	**T1**: Test of 10 open questions. Assessment: 1 point is awarded for every full and correct answer.
Test No. 2	10	During the semester	**T2**: Test of 10 open questions. Assessment: 1 point is awarded for every full and correct answer.
Test No. 3	10	During the semester	**T3**: Test of 10 open questions. Assessment: 1 point is awarded for every full and correct answer.
Laboratory work	30	During the semester	**L**: Assessed, when attendance of laboratory works is at least 75 %. A description of the laboratory works (including the individual task selected from the list) is provided for the assessment. Assessment: L1: student's activity during the laboratory works (up to 1 point); L2: quality of the laboratory works' description (informativeness of the presentation of obtained results) (up to 1 point); L3: analysis and synthesis of the obtained results (up to 1 point). L=L1+L2+L3. In the case of the attendance is less than 75%, the student is offered to do one of the laboratory works by oneself (without using any of the auxiliary materials); assessment: laboratory work performed, analysis and synthesis of the obtained results.
Report and its presentation	40	By the end of the exam session	**R**: The report on the selected (from the list) topic: written description, presentation of the report. Assessment: R1: analysis and implementation of the task (up to 1 point); R2: analysis and synthesis of the obtained results (up to 1

			point); R3: quality of the description (informativeness of the presentation of obtained results, fulfilment of the VU Physics Faculty requirements for the written works) (up to 1 point); R4: the quality of presentation: fluent and focused speech, informative visual means, focusing on the audience (up to 1 point). R=R1+R2+R3+R4.
Exam (instead of tests)	30	During the exam session	**E:** 5 open questions. Assessment: 5 points – excellent knowledge, ability to analyse and summarize the knowledge gained during the course; 4 points – good knowledge, course material is mastered, minor mistakes can be present; 3 points – average knowledge, mistakes are present, not able to analyse and summarize the knowledge gained during the course; 2 points – knowledge and skills are below average, a fundamental errors are made; 1 point – knowledge and skills meet the minimum requirements, mastering only part of the course material; 0 points – knowledge and skills do not meet the minimum requirements.
Final (cumulative) score			=T1:10+T2:10+T3:10+L+R (in the case the tests were written) or = E·3:5+L+R (in the case the exam was taken).

Author	**Year of publication**	**Title**	**Issue of a periodical or volume of a publication**	**Publishing place and house or web link**
Compulsary reading				
V. Kalesinskas	2012	Skaitmeninių sistemų analizė ir modeliavimas (paskaitų konspektas)		Vilnius
V. K. Ingle, J. G. Proakis	1997	Digital Signal Processing Using MATLAB V. 4		PWS Publishing Company
Optional reading				
L. Tan, J. Jiang	2014	Digital Signal Processing: Fundamentals and Applications		Elsevier https://www.sciencedirect.com/science/article/pii/B9780124158931010015
F. C. Tenoudji	2016	Analog and Digital Signal Analysis: From Basics to Applications		Springer International Publishing Switzerla
M. S. Kumar	2006	Digital signal processing: a computer based approach		McGraw-Hill Higher Education
P. S. R. Diniz, E. A. B. da Silva, S. L. Netto	2002	Digital Signal Processing: System Analysis and Design		Cambridge Univ. Press.
P. S.R. Diniz	2008	Adaptive Filtering, Algorithms and Practical Implementation		Springer
J. G. Proakis, D. G. Manolakis	2007	Digital Signal Processing: Principles, Algorithms, Applications		Prentice Hall
C. Chi-Tsong	2001	Digital signal processing: spectral computation and filter design		New York, Oxford: Oxford University Press
G. Blanchet, M. Charbit	2014	Digital Signal and Image		John Wiley & Sons,

		Processing Using MATLAB, Volume 1 : Fundamentals		Incorporated https://ebookcentral.proquest.com/lib/viluniv-ebooks/detail.action?docID=1752711