

## SYLLABUS 2019/2020

Level of study	Master's Course
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Course title in Ukraine	Комп'ютерні методи обробки сигналів		
Course title in English	Computer methods of signal processing		
Course code		ECTS credits	3
Lecturer(s)	PhD. Andreev M.V. Email address: fftkaf@i.ua		

Course objectives (learning outcomes)	The purpose of the course is to study and master students corresponding specialty of methods of representation and analysis of characteristics of various signals, and as well as the construction of linear discrete and digital signal processing devices.
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### Prerequisites:

Knowledge	Knowledge of signal and circuit theory, electromagnetic theory on the level of bachelor of physics or applied physics.
Skills	The skills to use the physics conceptions for practical applications.
Courses completed	The bachelor of physics or applied physics.

### Learning effects:

	Learning effects of the course	Relation of the learning effects to the specialization
Knowledge	<b>Student knows:</b> <b>W01</b> Identification and classification of signals; <b>W02</b> Spectral representations and transformations; <b>W03</b> Basis of sampling; <b>W04</b> Difference in the methods of presentation and processing of analog and discrete signals; <b>W05</b> Methods for describing analog and discrete signal processing systems; <b>W06</b> The basic algorithms of digital filtering and smoothing; <b>W07</b> Algorithms of rapid spectral transformations, <b>W08</b> Structures of digital filters; <b>W09</b> Basic methods and algorithms for designing digital filters; <b>W010</b> Problems that arise when digitally processing signals.	W01 – W10

	Learning effects of the course	Relation of the learning effects to the specialization
Skills	<b>U01</b> Use modern software systems that allow automate digital signal processing; <b>U02</b> To make spectral transformations in different bases; <b>U03</b> To use fast algorithms for spectral transformations; <b>U04</b> To sample a variety of signals; <b>U05</b> To perform analog filtering and smoothing; <b>U06</b> Perform digital filtering and smoothing; <b>U07</b> To use algorithms of rapid spectral transformations; <b>U08</b> Synthesize the structure of digital filters; <b>U09</b> Calculate analog and digital filters with specified characteristics; <b>U010</b> Choose the method of designing the digital filter, which is the most suitable solution applied task; <b>U011</b> To study the quality of the developed filter by simulation.	U01 –U07

	Learning effects of the course	Relation of the learning effects to the specialization
Social skills	<b>K01.</b> A student has the creativity and the ability to conceptual thinking. <b>K02</b> A student is able to present and justify the personal point of view. <b>K03</b> A student is able to use the information technologies for the communication with the scientific community. <b>K04</b> A student is aimed to expand personal knowledge and skills. <b>K05</b> A student has the legal erudition. <b>K06</b> A student concerned about the environmental safety of physical experiment.	K_K01 – K_K06

### Course organization:

Form of classes	Lecture (W)	Group-exercises							
		A (large group)	K (small group)	L (Lab)	S (Seminar)	P (Project)	Exam		
Contact hours	14			14				Credit with a grade	
Semester	2								
Language	English, Ukrainian								

### Teaching methods:

Classes will be performed in tutorial system on a weekly basis using multimedia presentation and internet in a form of the lectures open for discussion and questions.  
 In-class exercises are designed to probe knowledge with emphasis on how well students have understood the underlying topics of course.  
 The students will prepare two of individual presentation.

**Assessment methods:**

	Test	Written exam	Oral exam	written assignment (essay)	Student's presentation	Discussion participation	Group project	Individual project	Laboratory tasks	Field classes	Classes in schools	Didactic games	E – learning
W01	X					X							
W02	X				X	X		X					
W03	X					X		X					
W04	X				X	X		X					
W05	X					X							
W06	X				X	X		X					
W07	X					X		X					
W08	X				X	X		X					
W09	X					X							
W10	X					X		X					
U01	X					X	X	X					
U02	X					X	X	X					
U03	X					X	X	X					
U04	X					X	X	X					
U05	X					X	X	X					
U06	X					X	X	X					
U07	X					X	X	X					
U08	X					X	X	X					
U09	X					X	X	X					
U10	X					X	X	X					
U11	X					X	X	X					
K01	X					X	X	X					
K02	X				X	X	X	X					
K03	X				X	X	X	X					
K04	X				X	X	X	X					
K05	X					X	X						
K06	X						X						

**Assessment criteria:**

Grades	<p>The grading scale will be as follows:</p> <p>90 – 100 % - <b>A</b> including <b>A- excellent</b> (eq. in Ukraine: відмінно (very good))</p> <p>82–89 % : <b>B</b> including <b>B – very good</b> (eq. in Ukraine: добре ( good))</p> <p>74–81 % : <b>C</b> including <b>C – good</b> (eq. in Ukraine: добре ( good))</p> <p>64–73 % : <b>D</b> including <b>D – satisfactory</b> (eq. in Ukraine: задовільно (satisfactory))</p> <p>60–63 % : <b>E</b> including <b>E – acceptable</b> (eq. in Ukraine: задовільно (satisfactory))</p> <p>&lt; 59 %: <b>F failed</b> (eq. in Ukraine: незадовільно (unsatisfactory))</p>
Criteria	<p><b>A.</b> A student knows all terms and concepts mentioned in W1-W4, U1- U4 and K1-K6. A student can work without any assistances, his/her knowledge's are creative and easily applied to decision of specific problem.</p> <p><b>B.</b> A student knows all terms and concepts mentioned in W1-W4, U1- U4 and K1-K6, yet needs a little help when decision of specific problem.</p> <p><b>C.</b> A student knows all terms and concepts mentioned in W1-W4, U1- U4 and K1-K6, however needs a help when decision of specific problem.</p> <p><b>D.</b> A student knows the most of terms and concepts mentioned in W1-W4, U1- U4 and K1-K6 and has difficulty in decision of specific problem.</p> <p><b>E.</b> A student knows only several terms and concepts mentioned in W1-W4, U1- U4 and K1-K6 and can solve only a simple problem.</p> <p><b>F.</b> A student does not know most of terms and concepts mentioned in W1-W4, he/she did not reach the satisfactory level of knowledge this course.</p>

**Course content (topic list):**

Topics	<p><b>W1.</b> Purpose and objectives of the course.</p> <p><b>W2.</b> Fourier series.</p> <p><b>W3.</b> Fourier transform.</p> <p><b>W4.</b> Random Signals</p> <p><b>W5.</b> Discrete signals.</p> <p><b>W6.</b> Method of spectral analysis of discrete signals.</p> <p><b>W7.</b> Spectral analysis using a fast Fourier transform.</p> <p><b>W8.</b> Analog systems.</p> <p><b>W9.</b> Principles of digital filtering.</p> <p><b>W10.</b> Recursive and non-recursive discrete filters.</p> <p><b>W11.</b> Designing discrete filters.</p> <p><b>W12.</b> Quantization effects in digital systems.</p>
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**Literature:**

Compulsory reading	<p>1. Бабак В.П., Хандецький В.С., Шрюфер Е. Обробка сигналів. Друге видання. Перероблене й доповнене. Допущено Міністерством освіти України. Підручник для студентів технічних спеціальностей вищих навчальних закладів.-Київ, «Либідь», 2000, 480с.</p> <p>2. А. Б. Сергиенко А. Б. Цифровая обработка сигналов— СПб.: Питер, 2012, 604с.</p> <p>3. Методичні рекомендації до виконання лабораторних робіт із дисципліни «ЦИФРОВА ОБРОБКА СИГНАЛІВ». Укладачі: Крохін В.В., Сівцов Д. П. РВВ ДНУ. 2014 рік, 48с.</p>
Recommended	<p>1. Хандецький В.С. та інш. Нечітка логіка. Рекомендовано МОН України як навчальний посібник для студентів вищих навчальних закладів, що навчаються за</p>

reading	спеціальностями інформаційних напрямів.Дніпропетровськ, 2005, 230 с. 2. Дьяконов В. П. MATLAB 6 / 6/1 / 6.5 + Simulink 4/5 Основы применения. Полное руководство пользователя. М.: СОЛОН-Пресс, 2002. — 240 с.
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**Estimation of the total working time of students:**

Contact hours	Lectures	14
	Lab	14
	Other (consultation, meetings)	17
Students' work hours (without the lecturer)	Reading books and preparation for the lectures	10
	Preparation to the lab	10
	Preparation of an individual presentation	5
	Preparation to the text	5
Total works' hours		75
ECTS credits 1ECTS=30h		3