

## SYLLABUS 2019/2020

Level of study	Master's Course		
Course title in Ukraine	Фізика інформаційно-телекомунікаційних систем		
Course title in English	Physics of information and telecommunication systems		
Course code		ECTS credits	6
Lecturer(s)	Prof. Oleg Drobakhin Email address: drobakhino@gmail.com;		

Course objectives (learning outcomes)	Course aims at providing representation about means of creation and use of information and telecommunication systems based on radio and optic equipment for information transmitting; their specific properties; application areas and limits of application; directions of development of methods and means of information transmission; realization of interdisciplinary connections and providing skills in finding solution of problems that arise in practice in different economic sectors.
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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>W01</b> A student knows the basic definitions in information and telecommunication systems theory <b>W02</b> A student knows the general and specific structures of information and telecommunication systems <b>W03</b> A student knows the modern methods of coding and modulation <b>W04</b> A student knows the principles of electromagnetic waves propagation	K_W01 – K_W04

	Learning effects of the course	Relation of the learning effects to the specialization
Skills	<b>U01</b> A student can calculate the energy budget of communication lines <b>U02</b> A student understands the physical principles of message source coding <b>U03</b> A student is able to analyze signals, processes of their transformation in information and telecommunication systems <b>U04</b> A student is able to carry out comparative analysis of systems and signals for their adequate application	K_U01 – K_U04

	Learning effects of the course	Relation of the learning effects to the specialization
	<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	28				28				1
Semester	2								
Language	English, Ukrainian, Russian								

### 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:

	E – learning	Didactic games	Classes in schools	Field classes	Laboratory tasks	Individual project	Group project	Discussion participation	Student's presentation	written assignment (essay)	Oral exam	Written exam	Test
W01								x				X	x
W02						x		x	x			X	x
W03						x		x				X	x
W04						x		x	x			X	x
U01						x	x	x				X	x
U02						x	x	x				X	x
U03						x	x	x				X	x
U04						x	x	x				X	x

K01						x		x	x			X	x
K02						x	x	x	x			X	x
K03						x	x	x	x			X	x
K04						x	x	x	x			X	x
K05						x	x					X	x
K06							x					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.x</p> <p><b>B.</b> A student knows all terms and concepts mentioxned in W1-W4, U1- U4 and K1-K6, yet needs a little help when decision of specific xproblem.</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> Information, message, signal. The volume of the signal.</p> <p><b>W2.</b> Generalized scheme of communication systems, types of communication systems.</p> <p><b>W3.</b> The communication channel, channel capacity, estimation of quality parameters for communication channels.</p> <p><b>W4.</b> Methods of multiplexing: FDMA, TDMA, CDMA, SDMA.</p> <p><b>W5.</b> Capacity of continuous and discrete communication channels. Shannon formula.</p> <p><b>W6.</b> Propagation models.</p> <p><b>W7.</b> Analysis of the energy budget communication channel.</p> <p><b>W8.</b> Encoding of the source of the message. Scrambling.</p> <p><b>W9.</b> Sampling. Quantization. Noise immunity.</p> <p><b>W10.</b> Types of modulation. ASK. PSK. MSK. QAM.</p>
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**Literature:**

Compulsory reading	Bernard Sklar "Digital communication. Fundamentals and Application" Prentice Hall
Recommended reading	John G. Proakis "Digital Communications" / Fourth Edition (textbook), McGraw Hill

**Estimation of the total working time of students:**

Contact hours	Lectures	56
	Seminars	
	Other (consultation, meetings)	10
Students' work hours (without the lecturer)	Reading books and preparation for the lectures	20
	Preparation to the lab	20
	Preparation of an individual presentation	20
	Preparation to the exam	24
Total works' hours		150
ECTS credits 1ECTS=25h		6