

## SYLLABUS 2016/2017

Level of study	Master's course		
Course title in Ukraine	Фізичні принципи оптоінформатики		
Course title in English	Physical principles of optoinformatics		
Course code		ECTS credits	7
Lecturer(s)	Prof. Vasilij Moiseyenko Email address: <a href="mailto:vnmois@yandex.ru">vnmois@yandex.ru</a>		

Course objectives (learning outcomes)	<p>This course aims at providing an introduction to Optical Information Technologies and its applications in optical information processing.</p> <p>The students will be exposed to theory of information and information systems, optical technologies of superfast information transfer and information optical systems, which are based on new physical principles.</p> <p>The course also seeks to provide the background knowledge necessary to understand in reading of research articles.</p>
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### Prerequisites:

Knowledge	Knowledges of on the level of the highest school.
Skills	Physical skills at a rate of highest school.
Courses completed	No requirements.

### Learning effects:

	Learning effects of of the course	Relation of the learning effects to the specialization
Knowledge	<p><b>W01</b> A student has a basic knowledge about optical physics.</p> <p><b>W02</b> A student learns basics information about theory of information and information systems.</p> <p><b>W03</b> A student knows Fiber-optic communication systems.</p> <p><b>W04</b> A student acquires knowledge about information optical systems, which are based on new physical principles.</p>	W01 – W10

	Learning effects of the course	Relation of the learning effects to the specialization
Skills	<p><b>U01</b> A student understands Optical Transmission System Concepts.</p> <p><b>U02</b> A student can analyse features of Optical Fibre, Cables and Connectors, Optical Sources, Optical Detectors and Optical Devices.</p> <p><b>U03</b> A student can analyse Error probability in digital fiber optic communication systems.</p> <p><b>U04</b> A student understands New Physical Principles of Optical Information Processing.</p>	U01 – U07

	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.	K01 – K06

### Course organization:

Form of classes	Lecture (W)	Group-exercises						
		A (large group)	K (small group)	L (Lab)	S (Seminar)	P (Project)	E (Exam)	
Contact hours	34		26				1	
Semester	1							
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 developed through this process, with emphasis on how well students have understood the underlying mathematical and physical ideas.  
 The students will prepare one 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	Other
W01						x		x				x	
W02						x		x				x	
W03						x		x				x	
W04						x		x	x			x	
U01							x	x				x	
U02							x	x				x	
U03							x	x				x	
U04							x	x				x	

K01						X		X	X			X	
K02							X	X				X	
K03							X	X	X			X	
K04						X	X	X				X	
K05						X	X	X				X	
K06						X	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-K4. 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-K4, 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-K4, 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-K4 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-K4 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> Theory of information and information systems</p> <p><b>W2.</b> Light Propagation in Optical Fibre</p> <p><b>W3.</b> Optical Sources and Optical Detectors</p> <p><b>W4.</b> Error probability in digital fiber optic communication systems</p> <p><b>W5.</b> Local Fiber-optic Network</p> <p><b>W6.</b> Opened Optical information systems</p> <p><b>W7.</b> Optical Computers</p> <p><b>W8.</b> Nonlinear Optical systems of Information Processing</p> <p><b>W9.</b> Analog information processing by portioned system.</p> <p><b>W10.</b> Physical principles of Molecular electronics</p> <p><b>W11.</b> Squeezed states of light in optic communication systems</p> <p><b>W12.</b> Optical echo. Optical memory based on accumulated photon echoes. Optical computing</p> <p><b>W13.</b> Laser beams with phase singularities. Optical vortex and its applications in optic communication systems</p>
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**Literature:**

Compulsory reading	<ol style="list-style-type: none"> <li>1. Справочник. Волоконные оптические линии связи. Под ред. акад. АН УССР С.В.Свечникова и д-ра физ.-мат. Наук Л.М.Андрушко. Киев «Тэхника» 1998.</li> <li>2. Гауер Дж. Оптические системы связи. М.: «Радио и связь», 1989.</li> <li>3. Чео П.К. Волоконная оптика. Приборы и системы. М.: Энергоатомиздат, 1988.</li> <li>4. Казарян Р.А., Оганесян А.В., Погосян К.П., Милютин Е.Р. Оптические системы передачи информации по атмосферному каналу. М.: «Радио и связь», 1985.</li> <li>5. А.А.Акаев, С.А.Майоров. Оптические методы обработки информации. М.: Высшая школа, 1988. 237 с.</li> <li>6. Новые физические принципы оптической обработки информации. Под ред. С.А.Ахманова и М.А.Воронцова. М.: Наука, 1990. 400 с.</li> <li>7. Ю.Д.Думаревский, Н.Ф.Ковтонюк, А.И.Савин. Преобразование изображений в структурах полупроводник – диэлектрик. М.: Наука, 1987. 176 с.</li> </ol>
Recommended reading	<ol style="list-style-type: none"> <li>1. Govind P. Agrawal. Fiber-Optic Communication Systems. John Wiley &amp; Sons, 2012. Edition 4.</li> <li>2. Harry J. R. Dutton. Understanding Optical Communications. Copyright IBM Corp. 1998.</li> </ol>

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

Contact hours	Lectures	60
	Seminars	
	Other (consultation, meetings)	15
Students' work hours (without the lecturer)	Reading books and preparation for the lectures	40
	Preparation to the seminar	20
	Preparation of an individual presentation	20
	Preparation to the exam	20
Total works' hours		175
ECTS credits 1 ECTS = 25 h		7