

## SYLLABUS 2017/2018

Level of study	Master Course
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Course title in Ukraine	Функціональні та інтелектуальні матеріали		
Course title in English	Functional and smart materials		
Course code		ECTS credits	5
Lecturer(s)	Dr.Sci., prof. Panchenko Tatyana Email address: <a href="mailto:pancht@mail.ru">pancht@mail.ru</a>		

Course objectives (learning outcomes)	<p>This course is aimed to get acquainted with materials physics applied to functional electronics.</p> <p>Students should acquire knowledge about physical properties and types of functional and smart materials.</p> <p>This course provides background knowledge necessary to understand textbooks and scientific publications in this field.</p>
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### Prerequisites:

Knowledge	Knowledge of optic, solid state physics and semiconductor physics on the level of bachelor of physics or applied physics.
Skills	Physics analysis skills on the level of bachelor of physics or applied physics.
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	<p><b>W01</b> A student knows special physical properties of functional and smart materials.</p> <p><b>W02</b> A student learns basic theoretical information about the nature of physical phenomena in functional and smart materials.</p> <p><b>W03</b> A student knows principles of operation of basic devices in various field of functional electronics (opto-, acousto-, magneto-, dielectronics and others).</p> <p><b>W04</b> A student knows the methods and technology of obtaining functional and smart materials.</p>	W01 – W10

	Learning effects of the course	Relation of the learning effects to the specialization
Skills	<p><b>U01</b> A student is able to classify functional and smart materials by different criteria.</p> <p><b>U02</b> A student is able to describe the schematics for different basic functional electronic devices.</p> <p><b>U03</b> A student has practical skills to estimate important parameters of functional and smart materials.</p> <p><b>U04</b> A student is able to use main technological methods of synthesis and parameters modification of functional and smart materials.</p>	U01 – U07

Social skills	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)	Exam
Contact hours	34		36						1
Semester	1								
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 developed through this process, with emphasis on how well students have understood the underlying technical 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	Test
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
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-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> Basic principles of functional electronics;</p> <p><b>W2.</b> Classification of functional and smart materials;</p> <p><b>W3.</b> Characteristics of different fields of functional electronics;</p> <p><b>W4.</b> Functionally active dielectrics;</p> <p><b>W5.</b> Semiconductors as materials of functional electronics;</p> <p><b>W6.</b> Functional and smart magnetic materials;</p> <p><b>W7.</b> Functional and smart materials to optoelectronic principal schematics;</p> <p><b>W8.</b> Functional and smart materials to acoustoelectronic principal schematics;</p> <p><b>W9.</b> Functional and smart materials to magnetoelectronic principal schematics;</p> <p><b>W10.</b> Functional and smart materials to dielectronic principal schematics;</p> <p><b>W11.</b> Solid state structures as an element base of functional electronics;</p> <p><b>W12.</b> Technology of synthesis of semiconductor and dielectric crystals;</p> <p><b>W13.</b> Methods to obtain films and heterostructures;</p> <p><b>W14.</b> Solid-phase synthesis of functionally active ceramics;</p> <p><b>W15.</b> Space technology for production of functional and smart materials.</p>
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**Literature:**

Compulsory reading	1. Височанський Ю.М., Горват А. А., Грабар О.О. Твердотільна електроніка/ Ужгород, ІВА, 2001, 388 с. 2. Гусев М.Б., Дубинина Е.М. Физические основы твердотельной электроники. М., МГУ, 1986, 311 с. 3. К. Уорден. Новые интеллектуальные материалы и конструкции. М.: Техносфера, 2006. 4. K.-Th. Wilke Kristallzuchtung. Berlin 1973, 560p.
Recommended reading	1. Різак В.М., Різак І.М., Семак Д.Г. Функціональні халькогенідні напівпровідники. Ужгород, ІВА, 2001, 149 с. 2. Lecture notes will be also provided.

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

Contact hours	Lectures	70
	Seminars	
	Other (consultation, meetings)	10
Students' work hours (without the lecturer)	Reading books and preparation for the lectures	10
	Preparation for quizzes and exercises	10
	Preparation of an individual presentation	10
	Preparation to the test	15
Total works' hours		125
ECTS credits 1 ECTS = 25 h		5