SYLLABUS 2017/2018

Level of study	Master's course

Course title in Ukraine	Сучасне фізичне матеріалознавство		
Course title in English	Modern Physical Material Science		
Course code		ECTS credits	4
Lecturer(s)	Dr.Sci., prof. Bashev V.F. Email address: fttkaf@i.ua		

Course objectives (learning outcomes)	The aim of this course is studying of such basic concepts of physical material science as the types of heat treatment, thermomechanical processing of materials, solubility of elements, phase composition, classification of black and color alloys, stable and metastable state of alloys, physical and mechanical properties of materials. Task of the discipline - to master the basic concepts of the features and methods of obtaining and processing Alloys, to be able to apply them practically. As a result of studying the discipline, the student must have solid theoretical and practical knowledge, to know the relationship between the types of heat treatment and the properties of materials and be able to use them in solving specific problems of improving the performance characteristics of industrial alloys.

Prerequisites:

Knowledge	Knowledge of solid state 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	**W01** A student knows special physical properties of materials. **W02** A student learns basic theoretical information about the nature of physical phenomena in materials. **W03** A student knows the relationship between the types of heat treatment and how to use them in solving specific problems of improving the performance characteristics of industrial alloys. **W04** A student knows the methods and technology of obtaining functional and smart materials.	W01 – W10

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

	Learning effects of the course	Relation of the learning effects to the specialization
Social skills	**K01**. A student has the creativity and the ability to conceptual thinking. **K02** A student is able to present and justify the personal point of view. **K03** A student is able to use the information technologies for the communication with the scientific community. **K04** A student is aimed to expand personal knowledge and skills. **K05** A student has the legal erudition. **K06** 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)	T. (Test)
Contact hours	16		18				1
Semester	1						
Language	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 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	The grading scale will be as follows: 90 – 100 % - **A** including **A- excellent** (eq. in Ukraine:відмінно (very good)) 82–89 % : **B** including **B – very good** (eq. in Ukraine: добре (good)) 74–81 %: **C** including **C - good** (eq. in Ukraine: добре (good)) 64–73 %: **D** including **D – satisfactory** (eq. in Ukraine: задовільно (satisfactory)) 60–63 %: **E** including **E – acceptable** (eq. in Ukraine: задовільно (satisfactory)) < 59 %: **F failded** (eq. in Ukraine: незадовільно (unsatisfactory))
Criteria	**A.** 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. **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. **C.** 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. **D.** 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. **E.** A student knows only several terms and concepts mentioned in W1-W4, U1- U4 and K1-K4 and can solve only a simple problem. **F**. 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.

Course content (topic list):

Topics	1. General characteristics of discipline. Problems of scientific material science. 2. Prerequisites for heat treatment of industrial alloys. 3. Diagrams of the state 4. Cast iron, their classification. 5. Structural carbon steel. Qualitative steel. Instrumental steel. 6. Diffusion and disfuzial transformations in steels. 7. Features of hardening of steels. 8. Ways of tempering steels. 9. Doped steels and alloys.

Literature:

Compulsory reading	1. Спиридонова И.М. Упрочнение поверхности метал лов и сплавов.- Днепропетровск.- 1985.-84с. 1. А.П.Гуляев. Металловедение.- М.:Металлургия.-1977.-647с. 2. Л.Ван Флек. Теоретическое и прикладное материаловедение.-М.: Атомиздат.-1975.-472с. 3. Ю.М.Лахтин, В.П.Леонтьева. Материаловедение.-М.: Машиностроение.-1980.-493с. 4. Р.К.Мозберг. Материаловедение.-М.: Высшая школа.-1991.-448с. 5. Т.И. Анищенко, В.Ф.Башев, А.А.Анищенко. Курс лекцій з фізичного матеріалознавства.- РВВ ДНУ. Дніпропетровськ.-1999.-120с. 6. Крестовников А.Н., Вигдорович В.Н. Химическая термодинамика._ М.: Металургія.- 1973.-256с. 7. Флемингс М. Процессы затвердевания.-М.: Мир.1977.-423с. 8. Чалмерс Б. Физическое металловедение.-М.: Металлургия.- 1963.- 455с.
Recommended reading	1. Поверхностные явления фазовые превращения в конденсированных пленках. П/редГладкихН.Т.-Харьков.-ХНУ.-2004.-276с. 2. Крестовников А.Н., Вигдорович В.Н. Химическая термодинамика - М.:Металлургия.-1981.-224с.

Estimation of the total working time of students:

Contact hours	Lectures	34
	Seminars	
	Other (consultation, meetings)	16
Students' work hours (without the lecturer)	Reading books and preparation for the lectures	20
	Preparation for quizzes and exercises	
	Preparation of an individual presentation	20
	Preparation to the test	10
Total works' hours		100
ECTS credits 1 ECTS = 25 h		4