СИЛАБУС ДИСЦИПЛІНИ
«Materials Science»

Ступінь вищої освіти - Bachelor
Спеціальність 133-«Sectoral mechanical engineering»
Освітня програма - «Bachelor»
Рік навчання – 2, semester – 3, 4
Форма навчання - daily learning
Кількість кредитів ЄКТС - 5
Мова викладання – english

Лектор курсу	**Aftandiliants I.**
Контактна інформація лектора (e-mail)	**aftyev@yahoo.com**
Сторінка курсу в eLearn	**-**

ОПИС ДИСЦИПЛІНИ

(до 1000 друкованих знаків)

Purpose is skills of Materials Science and laying the basis for the study subjects: "Machine parts", "Hoisting machinery", "Tractors and cars", "Agricultural and meliorative machines", "The safety and repair of machines."

Objectives:

- Study methods of obtaining metals and alloys;
- Study of the structure, properties and destination of metals and alloys;
- Studying the basic theory of heat treatment of carbon and alloy steels, their technology heat and chemical-heat treatment, as well as specific details and working of agricultural machines;
- The study of the structure, properties and appointment of non-metallic construction materials.

Competencies of educational program:

1) *Integral competence:* The ability to solve complex specialized tasks and solve practical problems in the field of mechanical engineering using the theories and methods of modern science based on a systems approach and taking into account the complexity and uncertainty of the operating conditions of technological systems.

2) *General competencies:*

GC2. Ability to apply knowledge in practical situations.

GC5. Ability to generate new ideas (creativity).

GC8. The ability to act socially responsibly and consciously.

GC13. The ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technologies, to use various types and forms of motor activity for active recreation and leading a healthy lifestyle.

3) *Special (professional) competences of the specialty (SC)*:

PC6. The ability to evaluate the technical and economic efficiency of typical systems and their components based on the application of analytical methods, analysis of analogues and the use of available data.

PC9. The ability to carry out commercial and economic activities in the field of mechanical engineering.

Programmatic learning results

LR04. Carry out engineering calculations to solve complex problems and practical problems in industrial mechanical engineering.

LR06. Search for the necessary scientific and technical information in available sources, in particular, in a foreign language, analyze and evaluate it.

LR09. Choose and apply the necessary equipment, tools and methods.

LR12. Apply means of technical control to evaluate the parameters of objects and processes in industrial mechanical engineering.

THE STRUCTURE OF DISCIPLINE

<table>
<tr><th>Title of thematic modules and themes</th><th>Hours (Lectures / Laboratory lessons/ Independent study)</th><th>Training facts</th><th>Tasks</th><th>Estimation, units</th></tr>
<tr><td colspan="5">3 semester</td></tr>
<tr><td colspan="4">The thematic module 1. Metal science</td><td>25</td></tr>
<tr><td>Theme 1. The theory of alloys</td><td>4/4/4</td><td rowspan="2">Student should be know: the main connections between the composition, structure and properties of steels and cast irons and changes in these properties under thermal, chemical or mechanical stress.
Student should be able to based on knowledge of the working conditions to work of the machine parts to select of the steels and cast irons for their production.</td><td rowspan="2">Delivery of laboratory works. Execution of independent works.</td><td>10</td></tr>
<tr><td>Theme 2. Carbon steels and cast irons</td><td>6/6/6</td><td>15</td></tr>
<tr><td colspan="4">The thematic module 2. Bases of heat treatment of metals and alloys</td><td>25</td></tr>
<tr><td>Theme 3. The theory of heat treatment</td><td>6/6/6</td><td rowspan="2">Student should be know: the main connections between the composition, structure and properties of steels and cast irons and changes in these properties under thermal, chemical or mechanical stress.
Student should be able to based on knowledge of the working conditions to work of the machine parts to select of the steels and cast irons for their production.</td><td rowspan="2">Delivery of laboratory works. Execution of independent works.</td><td>12</td></tr>
<tr><td>Theme 4. Technology of heat treatment</td><td>6/6/6</td><td>13</td></tr>
<tr><td colspan="4">The thematic module 3. Alloyed steels and alloys</td><td>20</td></tr>
<tr><td>Theme 5. The alloying theory</td><td>4/4/4</td><td>Student should be know: the main connections</td><td>Delivery of laboratory</td><td>10</td></tr>
</table>

Theme 6. Classification of alloy steels, marking and their use in agriculture	4/4/4	between the composition, structure and properties of alloy steels and changes in these properties under thermal, chemical or mechanical stress. Student should *be able to* based on knowledge of the working conditions to work of the machine parts to select of the steels and cast irons for their production.	works. Execution of independent works.	**10**
Total for 3 semester	**30/30/30**	**-**	**-**	**70**
Test				**30**
Total for 3 semester				**100**
4 semester				
The thematic module 4. Steels and alloys with special properties				**25**
Theme 1. Corrosion and heat resistant steels and magnetic alloys.	2/2/4	Student should be *know*: the main connections between the composition, structure and properties of corrosion and heat resistant steels and magnetic alloys and changes in these properties under thermal, chemical or mechanical stress. Student should *be able to* based on knowledge of the working conditions to work of the machine parts to select of the corrosion and heat resistant steels and magnetic alloys for their production.	Delivery of laboratory works. Execution of independent works.	**10**
Theme 2. Amorphous, bimetallic and composite materials and materials with shape memory	2/2/6			**15**
The thematic module 5. Non-ferrous metals and alloys				**25**
Theme 3. Copper, aluminum, titanium, magnesium and their alloys	4/4/6	Student should be *know*: the main connections between the composition, structure and properties of copper, aluminum, titanium, magnesium and their alloys and changes in these properties under thermal, chemical or mechanical stress. Student should *be able to* based on knowledge of the working conditions to work of the machine parts to select of the copper, aluminum, titanium, magnesium and their alloys for their production.	Delivery of laboratory works. Execution of independent works.	**15**
Theme 4. Zinc, lead. Solders. Antifriction alloys	3/3/6			**10**

The thematic module 6. Nonmetallic construction materials				**20**
Theme 5. Polymers and plastics. Rubber. Glue materials. Inorganic glass.	2/2/6	Student should be *know*: the main connections between the composition, structure and properties of polymers and plastics, rubber, glue materials, inorganic glass and changes in these properties under thermal, chemical or mechanical stress. Student should *be able to* based on knowledge of the working conditions to work of the machine parts to select of the polymers and plastics, rubber, glue materials. inorganic glass for their production.	Delivery of laboratory works. Execution of independent works.	**10**
Theme 6. Paints and insulating materials. Wood.	2/2/2			**10**
Total for 4 semester	**15/15/30**	**-**	**-**	**70**
Exam				**30**
Total for course				**100**

EVALUATION POLICY

Deadline and retake policy:	The student must submit the work within the time specified by the teacher. Works that are submitted in violation of deadlines without good reason are evaluated at a lower grade. Rearrangement of modules takes place with the permission of the lecturer if there are good reasons (for example, hospital).
Academic Integrity Policy:	Write-offs during tests and exams are prohibited (including the use of mobile devices). Course papers, abstracts must have correct text references to the literature used
Visiting policy:	The student is obliged to attend classes of all kinds every day in accordance with the established schedule, not to be late, to have the appropriate appearance. For objective reasons (for example, illness, international internship) training can take place individually (in online form in consultation with the dean of the faculty)

STUDENT EVALUATION SCALE

Student rating, points	**Evaluation results on national exam tests**	
	Exams	**Tests**
90-100	Excellent	Accepted
74-89	Good	
60-73	Satisfactory	
0-59	Unsatisfactorily	Not accepted

PRINT AND ONLINE SOURCES

The main ones:

1. Афтанділянц Є.Г., Зазимко О.В., Лопатько К.Г. Матеріалознавство: Підручник (Гриф надано Міністерством освіти і науки, молоді та спорту України, лист №1/11-18055 від 20 листопада 2012 р.). Херсон, Видавець Грінь Д.С., 2013.- с 612.

2. Практикум з матеріалознавства. Навчальний посібник. (гриф МОН (лист № 1/11-4472 від 27.02.2013 р.))/ Котречко О. О. Зазимко, К.Г. Лопатько, Є.Г. Афтанділянц, Гнилоскуренко В. В.// Херсон: Олді Плюс, 2013.-с. 500.
3. Опальчук А.С., Афтанділянц Є.Г., Роговський Л.Л., Семеновський О.Є., Клендій М.Б., Біловод О.І., Дудніков І.А., Матеріалознавство і технологія конструкційних матеріалів: підручник для вищих навчальних закладів III-IV ступенів акредитації; за ред. А.С. Опальчука і О.Є. Семеновського. – Ніжин: Видавець ПП. Лисенко М.М., 2013. – 752 с.
4. Попович В., Голубець В., Технологія конструкційних матеріалів і матеріалознавство: Навчальний посібник для вищих навчальних закладів: У 2-х кн. Книга II. – Суми: ВТД «Університетська книга», 2002. – 260 с.

Auxiliary:

1. Афтанділянц Є.Г., Зазимко О. В., Лопатько К.Г., Технологія конструкційних матеріалів і матеріалознавство. Курс лекцій. Частина 1. Металургія. Київ, НАУ, 2005.- с.115.
2. Хільчевський В.В. та ін., Матеріалознавство і технологія конструкційних матеріалів, К: Либідь, 2002, 326с.
3. Бялік О.М., Металознавство, К: Політехніка, 2002, 383с.

Internet sources:

1. Матеріалознавство і технологія металів. http://univer.nuczu.edu.ua/tmp_metod/924/MZTM_KONSP_LEK.pdf
2. Особливості хіміко-термічної обробки металів і сплавів. https://fizmat.7mile.net/materialoznavstvo/3_4_2-himiko-termichna-obrobka.html
3. Класифікація та обладнання нагрівальних печей. https://fizmat.7mile.net/materialoznavstvo/3_3_5-nagrivalni-pechi.html
4. Термічна обробка виробів із сталі. https://www.youtube.com/watch?v=8UvkV92z2fI
5. Термічна обробка і структури. https://www.youtube.com/watch?v=7mpAt7h317c