



## СИЛАБУС ДИСЦИПЛІНИ «Technology of construction materials»

Ступінь вищої освіти - Bachelor  
Спеціальність 133-«Sectoral mechanical engineering»  
Освітня програма - «Bachelor»  
Рік навчання – 1, 2, semester – 2, 3  
Форма навчання - daily learning  
Кількість кредитів ЄКТС - 4  
Мова викладання – english

Лектор курсу  
Контактна інформація  
лектора (e-mail)  
Сторінка курсу в eLearn

Aftandilants I.  
aftvev@yahoo.com  
https://elearn.nubip.edu.ua/course/view.php?id=1174

### ОПИС ДИСЦИПЛІНИ

(до 1000 друкованих знаків)

Purpose is skills of Technology of construction materials 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;

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.

**Program learning results:**

LR3. To know and understand the systems of automatic management of objects and processes of industrial engineering, to have skills in their practical use.

LR4. Carry out engineering calculations to solve complex problems and practical problems in industrial mechanical engineering.

LR8. Understand the relevant methods and have the skills to design typical assemblies and mechanisms in accordance with the task.

## THE STRUCTURE OF DISCIPLINE

Title of thematic modules and themes	Hours (Lectures / Laboratory lessons/ Independent study)	Training facts	Tasks	Estimation, units
<b>2 semester</b>				
<b>The thematic module 1. Metallurgy of ferrous metals</b>				<b>35</b>
Theme 1. Purpose and objectives of the course. The source materials in metallurgy and obtaining methods metals from ores.	2/1/2	<p style="text-align: center;">Student should:</p> <p><i>know:</i></p> <ul style="list-style-type: none"> <li>- the basis of technology of obtaining cast iron and steel.</li> <li>- the basic of recycling technological processes of cast iron and steel in billet.</li> <li>- the main connections between the composition, structure and properties of steel and cast iron</li> </ul> <p><i>be able to:</i></p> <p style="text-align: center;">based on knowledge of the working conditions to work of the machine parts to select of the manufacture technologies cast iron and steel.</p>	<p style="text-align: center;">Delivery of laboratory works. Execution of independent works. Performing laboratory and independent work in "Elearn"</p>	5
Theme 2. Metallurgy of the pig iron. Materials for the production of cast iron. Preparation ores. The structure and work of the blast furnace.	2/1/2			5
Theme 3. Blast furnace products and their using. Blast furnace cast iron classification. Blast furnace gas and slag and their using.	2/1/2			5
Theme 4. Steel metallurgy. The source materials for steel production, steel melting furnaces and steel melting technological processes.	2/1/2			5
Theme 5. The influence of method of production on steel quality. Processes of deoxidizing steel. Steel production in open hearth furnaces and oxygen converters.	2/1/2			5
Theme 6. Steel production in electric furnaces. Special methods of obtaining high-quality steels.	2/1/2			5
Theme 7. Pouring steel. Structure steel ingots. Prospects for the development of steel production.	2/1/2			5
<b>The thematic module 2. Technology of nonferrous metallurgy</b>				<b>20</b>
Theme 8. Nonferrous metallurgy. Copper. The essence of the process of	2/1/2	<p style="text-align: center;">Student should:</p> <p><i>know:</i></p>	<p style="text-align: center;">Delivery of laboratory works.</p>	5

obtaining copper from ore. Matte receiving.		- the basis of technology of obtaining copper, aluminium, titanium, magnesium and their alloys.	Execution of independent works. Performing laboratory and independent work in "Elearn"	
Theme 9. Obtaining and refining of blister copper. Marking and using copper in technics.	2/1/2	- the basis of recycling technological processes of copper, aluminium, titanium, magnesium and their alloys in billet.		5
Theme 10. Aluminium. Aluminum receiving of ores. Alumina electrolysis and aluminum refining.	2/1/2	- the main connections between the composition, structure and properties of copper, aluminium, titanium, magnesium and their alloys.		5
Theme 11. Titanium-magnesium metallurgy. Production of refractory metals and nickel.	2/1/2	<i>be able to:</i> based on knowledge of the working conditions to work of the machine parts to select of the manufacture technologies copper, aluminium, titanium, magnesium and their alloys.		5
<b>The thematic module 3. The powder metallurgy basics</b>				<b>15</b>
Theme 12. Introduction to powder metallurgy. Obtaining powders. Preparation of powders to the formation.	4/2/2	Student should:  <i>know:</i> - the basis of powder technology of obtaining iron, copper, aluminium, titanium, magnesium and their alloys powders.	Delivery of laboratory works. Execution of independent works. Performing laboratory and independent work in "Elearn"	5
Theme 13. Pressing, rolling, extrusion, slip casting. Sintering, additional and finishing treatment of powder products.	2/1/4	- the basis of recycling technological processes of iron, copper, aluminium, titanium, magnesium and their alloys in powders.		5
Theme 14. Classification, marking powders and their applications in engineering.	2/1/2	- the main connections between the composition, structure and properties of iron, copper, aluminium, titanium, magnesium and their alloys powders.		5

		<p><i>be able to:</i> based on knowledge of the working conditions to work of the machine parts to select of the manufacture powder technologies iron copper, aluminium, titanium, magnesium and their alloys.</p>		
<b>Total for 2 semester</b>	<b>30/15/30</b>	-	-	<b>70</b>
<b>Test</b>				<b>30</b>
<b>Total for 2 semester</b>				<b>100</b>
<b>3 semester</b>				
<b>The thematic module 4. Foundry</b>				<b>30</b>
Theme 1. Introduction. Technological scheme of casting manufacture. Methods of manufacturing castings and kinds of molds.	2/2/2	<p>Student should:</p> <p>know:</p> <ul style="list-style-type: none"> <li>- the basis of foundry technology of obtaining iron, copper, aluminium, titanium, magnesium and their alloys powders.</li> <li>- the basic of recycling technological processes of iron, copper, aluminium, titanium, magnesium and their alloys in castings.</li> <li>- the main connections between the composition, structure and properties of iron, copper, aluminium, titanium, magnesium and their alloys castings.</li> </ul>	<p>Delivery of laboratory works. Execution of independent works. Performing laboratory and independent work in "Elearn"</p>	<b>10</b>
Theme 2. Pouring, knocking out mould and cores, clearing and cutting of castings.	3/3/2			<b>10</b>
Theme 3. Special methods of manufacture castings. Technological features castings manufacture from various alloys (cast iron, steel, non-ferrous metals and alloys).	2/2/2	<p>be able to:</p> <p>based on knowledge of the working conditions to work of the machine parts to select of the foundry technologies iron copper, aluminium, titanium, magnesium and their alloys.</p>		<b>10</b>
<b>The thematic module 5. Treatment of metals and alloys by pressure</b>				<b>20</b>

<p>Theme 4. Physical and technological bases of metal deformation. Temperature interval of steel treatment by pressure. Methods of heating and heating furnaces</p>	<p>2/2/2</p>	<p>Student should:</p> <p>know:</p> <ul style="list-style-type: none"> <li>- the basis of technology of obtaining iron, copper, aluminium, titanium, magnesium and their alloys billets.</li> <li>- the basic of recycling technological processes of iron, copper, aluminium, titanium, magnesium and their alloys in billets.</li> <li>- the main connections between the composition, structure and properties of iron, copper, aluminium, titanium, magnesium and their alloys during pressure treatment.</li> </ul>		<p><b>10</b></p>
<p>Theme 5. Classification of treatment methods by pressure. The processes forging, drawing, pressing of steel billet. Hot and cold volumetric sheet stamping.</p>	<p>2/2/2</p>	<p>be able to:</p> <p>based on knowledge of the working conditions to work of the machine parts to select of the pressure treatment technologies of iron copper, aluminium, titanium, magnesium and their alloys.</p>	<p>Delivery of laboratory works. Execution of independent works. Performing laboratory and independent work in "Elearn"</p>	<p><b>10</b></p>
<p><b>The thematic module 6. The welding technology</b></p>				<p><b>20</b></p>
<p>Theme 6. Theoretical basis of welding. Metallurgical and chemical-physical phenomena in the welding zone and their influence on the structure of ambient zone. The welding classification.</p>	<p>2/2/2</p>	<p>Student should:</p> <p>know:</p> <ul style="list-style-type: none"> <li>- the basis of welding technology of obtaining iron, copper, aluminium, titanium, magnesium and their alloys welding connections.</li> <li>- the basic of welding classification.</li> <li>- the main connections between the composition, structure and properties of iron, copper, aluminium, titanium, magnesium and their alloys welding connections.</li> </ul>		<p><b>10</b></p>

		be able to: based on knowledge of the working conditions to work of the welding connections to select of the welding technologies of iron copper, aluminium, titanium, magnesium and their alloys welding.		
Theme 7. Electric arc and gas welding	2/2/3			<b>10</b>
<b>Total for 3 semester</b>	<b>15/15/15</b>	-	-	<b>70</b>
<b>Exam</b>				<b>30</b>
<b>Total for course</b>				<b>100</b>

### EVALUATION POLICY

<b><i>Deadline and retake policy:</i></b>	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).
<b><i>Academic Integrity Policy:</i></b>	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
<b><i>Visiting policy:</i></b>	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. 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.
2. Сологуб М.А., Рожнецький І.О., Некоз О.І., Горпенюк М.А., Прейс Г.О., Технологія конструкційних матеріалів; за ред. Сологуба М.А. – 2-ге вид., перероб. і допов. – К.:Вища шк., 2002. – 374 с.

3. 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.

4. Афтанділянц Є.Г., Зазимко О. В., Лопатько К.Г., Іванова О. В. Технологія конструкційних матеріалів. Навчальний посібник в 2-х книгах. Книга 1. – К.:НУБіП України, 2016. – 511 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. Виробництво чавуну - <https://www.youtube.com/watch?v=WCJSdp6lhZo>
2. Виробництво чавуну і сталі - <https://www.youtube.com/watch?v=uzwnfQ6krV8>
3. Виробництво сталі - <https://www.youtube.com/watch?v=tYTazquHXfY>
4. Порошкова металургія: <https://www.youtube.com/watch?v=LnALTU4BEgQ>
5. Виробництво міді: <https://www.youtube.com/watch?v=M2hvjv6FS67g>
6. Виробництво алюмінію: <https://www.youtube.com/watch?v=JBso28su0G4>