Syllabus
selective component SC

Pressure treatment of metals (PTM)

Name of discipline:	**Pressure treatment of metals**
Level of higher education:	**the first (bachelor's)**
Course page in Moodle:	https://dl2022.khadi-kh.com/course/view.php?id=1969
Scope of the educational component	**4 credits (120 hours)**
Final control form	**test**
Consultations:	**on schedule**
Name of the department:	**department of metal technology and materials science**
Language of teaching:	**ukrainian, english (if available)**
Head of the course:	**Lalazarova Nataliia, PhD, Associate Professor**
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Brief content of the educational component:
The purpose of the discipline is the formation of basic knowledge about the basics of technological processes of metal pressure processing, which are used for the manufacture of products from ferrous and non-ferrous metals and alloys.

Subject: theoretical and methodological foundations of metal pressure processing.

The main tasks of studying an academic discipline are:
- study of the features of modern technological processes of processing materials by pressure, their influence on the structure and properties;
- knowledge of the physical foundations of OMT;
- study of technologies for improving properties in the process of obtaining products in order to meet their production requirements;
- formation of knowledge and skills in the selection of materials subjected to OMT, technologies, equipment, methods of product quality control in order to ensure the necessary operational properties.

Prerequisites for studying the educational component:
Physics.
Construction materials technology and materials science.
Materials science.

Competencies acquired by the acquirer:
General competences:
the ability and readiness to implement modern technological processes of processing materials by pressure, technologies for improving properties in the process of obtaining products in order to meet their production requirements.

Special (professional) competences:
knowledge of the main methods of obtaining products by pressure treatment; knowledge of the physical foundations of PTM, the ability to choose materials that are subjected to OMT, technologies, equipment, methods of quality control of products in order to ensure the necessary operational properties.

Learning outcomes according to the educational program:
To know the types of pressure metal processing (PTM), the fields of their use, equipment and tools. Use the knowledge of the physical foundations of metal pressure treatment when choosing the metal heating temperature before pressure treatment, to calculate the deformation characteristics. To understand the peculiarities of the technological processes of obtaining products by various methods of PTM, their influence on the structure and properties. Know the types of defects in PTM and ways to eliminate them. Apply highly effective methods of PTM.

Thematic plan

№ topic	Name of topics (lectures - Lec, laboratory works - LW, practical works - PW, individual work - IW)	Number of hours
		intramural
1	2	3
1	Lec1 "Fundamentals of pressure metal processing (PTM)". Types of PTM, physical bases, deformation characteristics	2
	LW1 "Investigation of chemical heterogeneity of steel ingots and rolled products"	2
	IW "Areas of use of PTM. Examples of car parts received by OMT"	11
	Lec2 «Basic laws of plastic deformation. Heating of metal before pressure treatment».	2
	LW2 "Choosing the temperature mode of heating the workpieces before pressure treatment"	2
	IW "Induction and electric contact heating of metal before OMT"	11
2	Lec3 "Types of rolling. Assortment of rolling"	2
	LW3 "Determination of mechanical properties cold-rolled bronze"	2
	IW "Prospects for the development of rolled production"	11
	Lec4 "Rolling equipment and technologies"	2
	LW4 "Determination of deformation characteristics in pressure treatment processes"	2
	IW "Modern technologies for obtaining pipes by rolling"	11
3	Lec5 "Free forging. Influence on the structure and properties of products"	2
	LW5 "Study of axial deformation of a cylindrical workpiece during settling"	2
	IW "Features of forging technology of shipbuilding, metallurgy, power engineering (examples)"	11
4	Lec6 "Hot volumetric stamping. Influence on the structure and properties of products"	2
	LW6 «Determination of deformation characteristics and parameters of the center of deformation during rolling»	2
	IW "Ways of increasing the productivity of hot volumetric stamping"	11
5	Lec7 "Pressing. Traction"	2
	LW7 "Study of the drawing process"	2
	IW "Study of ways to improve the productivity of the pressing process"	11
6	Lec8 "Sheet stamping. Modern methods of pressure treatment"	2
	LW8 "Study of defects of metal products during pressure	2

	treatment"	
	IW "Study of intense plastic deformation processes"	11
Together	Lec	16
	LW	16
	IW	88

Individual educational and research task (if available)**:**

Teaching methods:
1) verbal:
1.1) traditional: lectures, explanations, stories, etc.;
1.2) interactive (non-traditional): problem lectures, discussions, etc.;
2) visual: method of illustrations, method of demonstrations
3) practical:
3.1) traditional: practical classes, seminars;
3.2) interactive (non-traditional): business and role-playing games, trainings, seminars-discussions, "round table", brainstorming method.

System assessment and requirements:

Current performance
1 The current success of applicants for the performance of educational types of work in training sessions and for the performance of independent work tasks is evaluated using a four-point rating scale with subsequent transfer to a 100-point scale. During the evaluation of the current academic performance, all types of work provided for by the educational program are taken into account.
1.1 Lecture classes are evaluated by determining the quality of performance of specified tasks.
1.2 Practical classes are evaluated by the quality of performance of a control or individual task, performance and design of practical work.
1.3 Laboratory classes are evaluated by the quality of reports on the performance of laboratory work.
1.4 Seminar classes are evaluated by the quality of individual assignment/abstract.
2 The current performance of higher education applicants is assessed at each practical session (laboratory or seminar) on a four-point scale ("5", "4", "3", "2") and entered in the journal of academic performance.
– "excellent": the winner mastered the theoretical material flawlessly, demonstrates deep knowledge of the relevant topic or academic discipline, the main provisions;
– "good": the applicant has mastered the theoretical material well, has the main aspects from primary sources and recommended literature, presents it in an argumentative manner; has practical skills, expresses his thoughts on certain problems, but certain inaccuracies and errors are assumed in the logic of the presentation of theoretical content or in the analysis of practical ones;
– "satisfactory": the applicant has basically mastered the theoretical knowledge of the educational topic or discipline, orients himself in primary sources and recommended literature, but answers unconvincingly, confuses concepts, answers additional questions uncertainly, does not have stable knowledge; when answering questions of a practical nature, reveals inaccuracy in knowledge, does not know how to evaluate facts and phenomena, connect them with the future profession;
– "unsatisfactory": the applicant has not mastered the educational material of the topic (discipline), does not know scientific facts, definitions, hardly orients himself in primary sources and recommended literature, lacks scientific thinking, practical skills are not formed.

3 The final score for the current activity is recognized as the arithmetic mean sum of points for each lesson, for individual work, current test works according to the formula:

$$K^{помоч} = \frac{K1 + K2 + ... + Kn}{n},$$

where $K^{помоч}$ is the final assessment of success based on the results of current control;

$K1, K2, ..., Kn$ – evaluation of the success n of the current control measure;

n – number of ongoing control measures.

O prices are converted into points according to the calculation scale (table 1).

Table 1 – Conversion of the average score for the current activity into a multi-point scale

4-point scale	100 points scale	4-ball scale	100 points scale	4-ball scale	100 points scale	4-ball scale	100 points scale
5	100	4.45	89	3.90	78	3.35	67
4.95	99	4.4	88	3.85	77	3.3	66
4.9	98	4.35	87	3.80	76	3.25	65
4.85	97	4.3	86	3.75	75	3.2	64
4.8	96	4.25	85	3.7	74	3.15	63
4.75	95	4.20	84	3.65	73	3.1	62
4.7	94	4.15	83	3.60	72	3.05	61
4.65	93	4.10	82	3.55	71	3	60
4.6	92	4.05	81	3.5	70	from 1.78 to 2.99	from 35 to 59
						reassembly	
4.55	91	4.00	80	3.45	69	from 0 to 1.77	from 0 to 34
4.5	90	3.95	79	3,4	68	repeated study	

Final assessment

1 A student of higher education receives a credit in the last lesson in the discipline based on the results of the current assessment. The average score for the current activity is converted into points on a 100 -point scale, according to the conversion table (table 1).

Applicants for higher education who have a current grade point average in the discipline lower than "3" (60 points) can increase their current grade by taking tests in the discipline in the last session.

Assessment of the knowledge of applicants through testing is carried out according to the following scale:

– "Excellent": at least 90% of correct answers;
– "Very good": 82% to 89% correct answers;
– "Good": from 74% to 81% of correct answers;
– "Satisfactory": from 67% to 73% of correct answers;
– "Fair enough": 60% to 66% correct answers;
– "Unsatisfactory": less than 60% of correct answers.

2 The condition for obtaining credit is:

– making up for all missed classes;

– the average current grade in the discipline is not lower than "3" (60 points).

3 For performing individual independent work and participation in scientific events, additional points are awarded to the winners.

3.1 Additional points are added to the sum of points scored by the student of higher education for the current educational activity (for disciplines for which the final form of control is a test), or to the final grade in the discipline for which the final form of control is

an exam.
3.2 The number of additional points awarded for different types of individual tasks depends on their volume and importance:
– prizes in the discipline at the international / all-Ukrainian competition of scientific student works - 20 points;
– prize places in the discipline at the All-Ukrainian Olympiads - 20 points;
– participation in the international / all-Ukrainian competition of scientific student works - 15 points
– participation in international / all-Ukrainian scientific conferences of students and young scientists - 12 points;
– participation in all-Ukrainian Olympiads in the discipline - 10 points
– participation in olympiads and scientific conferences of the Khnadu in the discipline - 5 points;
– performance of individual scientific and research (educational and research) tasks of increased complexity - 5 points .
3.3 The number of additional points cannot exceed 20 points.
4 The learning result is evaluated *(select the required one)* :
– on a two- point scale (passed/failed) according to table 2;
– for 100 - point scale (for differentiated assessment) according to table 3.
The final grade together with additional points cannot exceed 100 points.

Table 2 – Scale for transferring points to the national evaluation system

On a 100-point scale	**On a national scale**
from 60 points to 100 points	counted
less than 60 points	not counted

Table 3 – The scale for evaluating the knowledge of the students based on the results of the final control of the academic discipline

Score in points	Evaluation on a national scale		Evaluation according to the ECTS scale	
	examination	test	Rating	Criteria
90-100	**Perfectly**	**Enrolled**	**A**	The theoretical content of the course has been mastered in its entirety, without gaps, the necessary practical skills for working with the mastered material have been formed, all educational tasks provided for in the training program have been completed, the quality of their performance has been assessed with a number of points close to the maximum
80–89	**Okay**	**Enrolled**	**B**	The theoretical content of the course has been mastered in its entirety, without gaps, the necessary practical skills for working with the mastered material have mainly been formed, all educational tasks provided for by the training program have been completed, the quality of most of them has been assessed with a number of points close to the maximum

Score in points	Evaluation on a national scale		Evaluation according to the ECTS scale	
	examination	test	Rating	Criteria
75-79			**C**	The theoretical content of the course has been mastered in its entirety, without gaps, some practical skills of working with the mastered material have not been formed enough, all educational tasks provided for by the training program have been completed, the quality of none of them has been assessed with a minimum number of points, some types of tasks have been completed with errors
67-74	**Satisfactorily**		**D**	The theoretical content of the course is partially mastered, but the gaps are not of a significant nature, the necessary practical skills for working with the mastered material are basically formed, most of the educational tasks provided by the training program have been completed, some of the completed tasks may contain errors
60–66			**E**	The theoretical content of the course has been partially mastered, some practical work skills have not been formed, many educational tasks provided by the training program have not been completed, or the quality of some of them has been assessed with a number of points close to the minimum.
35–59	**Unsatisfactorily**	**Not counted**	**FX**	The theoretical content of the course has been partially mastered, the necessary practical work skills have not been formed, most of the prescribed training programs of educational tasks have not been completed, or the quality of their implementation has been assessed with a number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of the performance of educational tasks (with the possibility of retaking)
0–34	**Unacceptable**		**F**	The theoretical content of the course has not been mastered, the necessary practical work skills have not been formed, all completed educational tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of the performance of educational tasks (with a mandatory repeat course)

Course policy:

– the course involves working in a team, the environment in the classroom is friendly, creative, open to constructive criticism;

– mastering the discipline involves mandatory attendance of lectures and practical classes, as well as independent work;
– independent work involves the study of individual topics of the academic discipline, which are presented in accordance with the program for independent study, or were considered briefly;
– all tasks provided by the program must be completed within the set time;
– if the student of higher education is absent from classes for a good reason, he presents the completed tasks during independent preparation and consultation of the teacher;
– the coursework must be protected no later than a week before the beginning of the examination session (indicated if available);
– while studying the course, students of higher education must adhere to the rules of academic integrity set forth in the following documents: "Rules of academic integrity of participants in the educational process of KhNADU" (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_dobroch_1.pdf), "Academic integrity. Checking the text of academic, scientific and qualification papers for plagiarism" (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_85_1_01.pdf), «Moral and ethical code of participants in the educational process of KhNADU» (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_MEK_1.pdf);
– in case of detection of plagiarism, the applicant receives 0 points for the task and must repeat the tasks provided for in the syllabus;
– writing off during tests and exams is prohibited (including using mobile devices). Mobile devices are allowed to be used only during online testing.

Recommended Books:

1. Basic literature

1.1. Tekhnolohiia konstruktsiinykh materialiv ta materialoznavstvo: navchalnyi posibnyk / I.P. Hladkyi, V.I. Moshchenok, V.P. Tarabanova, N.O. Lalazarova, D.B. Hlushkova. - Kharkiv: KhNADU, 2014. - 528 s.
1.2. Diachenko S.S. Materialoznavstvo : pidruchnyk / S. S. Diachenko, I. V. Doshchechkina, A. O. Movlian, E. I. Pleshakov. – Kharkiv : Vyd-vo KhNADU, 2007. – 440 s.
1.3. Teoriia ta praktyka obrobky metaliv tyskom. Monohrafiia / Pid red. Bohuslaieva V.O., Bobyria M.I., Titova V.A., Kachana O.Ya. – Zaporizhzhia, vyd., AT «Motor Sich», 2016, 522 s.
1.4. Pakharenko V.L. Materialoznavstvo ta tekhnolohiia konstruktsiinykh materialiv (obrobka metaliv rizanniam, tyskom ta zvariuvanniam). Laboratornyi praktykum. Navchalnyi posibnyk. / Pakharenko V.L., Marchuk M.M., Ivasiuk P.I. – Rivne: NUVHP, 2013. – 126 s.
1.5. Tekhnolohiia konstruktsiinykh materialiv i materialoznavstvo. Pidruchnyk / Opalchuk A.S., Aftandiliants Ye.H., Klendii M.B., Rohovskyi L.L., Semenovskyi O.Ye. // Nizhyn.: TOV "Vydavnytstvo "Aspekt-Polihraf"", 2011. – 792 s.

(**Explanation:** it is desirable to indicate the teacher's own achievements in the discipline)

2. Supporting literature

2.1. Sereda B.P. Obrobka metaliv tyskom : Navch. posib. dlia stud. VNZ / B.P. Sereda; Zaporizka derzh. inzhenerna akademiia. - Zaporizhzhia : [Vydavnytstvo Zaporizkoi derzh. inzh. akad.], 2009. - 342 s.

Developer(s) syllabus of the educational discipline	_____ signature	N.O. Lalazarova name
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