# Syllabus educational component of VC

(conditional designation OK in the educational program (ONP))

Subjects:	Calculation methods of welding			
Level of higher education:	the second (master's)			
Course page in Moodle:	https://dl2022.khadi-			
	kh.com/course/index.php?categoryid=391			
The scope of the educational	3 credits (90 hours)			
component				
Final control form	Test			
Consultations:	Not provided by the curriculum			
Name of the department:	Department of Metal Technology and Materials			
	Science			
Teaching language:	Ukrainian, English			
Course leader:	Valery Anatolviyovych Bagrov , candidate of			
	technical sciences, associate professor			
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## Calculation methods of welding

## Brief content of the educational component:

**The goal is** to provide students with advanced knowledge about the methodology of designing technological processes for various methods of welding and brazing, the laws of formation of structural and phase composition, the stress-strain state of welded and brazed joints from materials that have unsatisfactory technological ability for fusion welding, the features of technologies with connection depending on the properties of materials, functional purpose and operational requirements for products, as well as acquiring skills in the practical use of the acquired knowledge.

**Subject** : calculation methods for determining the spring state of welded assemblies and structures.

## The main tasks of studying an academic discipline are:

the study of innovative technologies in the design of material joining processes, as a set of the latest approaches, methods and methods, which provide the opportunity, based on the analysis of the phase composition, structural and stress-strain state, using modern software complexes, in a controlled manner, to create new manufacturing technologies of welded and soldered connections, obtaining products with high quality characteristics, taking into account operational requirements.

## Prerequisites for studying the educational component:

the discipline is studied after

study of the disciplines "Resistance of materials", "Metallurgy of integral joints and their diagnostics", "Strength of construction and methods of its increase", "Computer graphics", "Automation of technological processes in materials science and welding".

## Competencies acquired by the acquirer:

## General competences :

Ability and readiness to implement modern technological processes of obtaining and processing materials and technologies for improving properties and restoring products in order to meet their production requirements.

The ability to analyze violations of the established technological process and the reasons for failure of parts and structures.

## Special (professional) competences:

Ability to use computer skills and knowledge and skills in the field of modern information technologies to solve experimental and practical tasks.

The ability to apply mathematical knowledge to master the theoretical foundations and practical application of methods of analysis, design of technological parameters and properties of materials.

The ability to perform scientific research, analyze and process the results of natural or model experiments, using regulatory documents, new hypotheses in the field of materials science, information technology, software.

#### Learning outcomes according to the educational program:

Know the basics of elements of theoretical and experimental research in professional activity. To be able to use the achievements of modern information technologies, to compile programs.

To understand the principles of system analysis, cause-and-effect relationships between significant factors and scientific and technical decisions made when solving complex material science problems. Apply knowledge and understanding of experimental design methods, perform experimental studies and process their results.

Use new methods and methods of researching materials and their processing processes based on knowledge of the methodology of scientific research and the specifics of the problem to be solved, correctly interpret the results of research and draw conclusions.

# Thematic plan

Topic No	Name of topics (LK, LR, PR, SZ, SR)				
-		ocular			
1	2	3			
	LC Introduction. The composition, features of the structural structure and the ability to weld materials	2			
1	PR (LR, SZ) Peculiarities of obtaining compounds from heterogeneous, composite and intermetallic materials and metals with non-metals.	2			
	SR Development of information support for each module (topic)	6			
	LK Application of special methods of welding and soldering for joining difficult to weld materials . Peculiarities and influence of the conditions of formation of connections.	2			
Z	PR (LR, SZ) Influence of process parameters, rate of deformation and intensity of force action during welding in the solid phase.	2			
	SR Development of information support for each module (topic)	6			
3	LK Intrinsic stresses and deformations, features and influence of the conditions of formation of connections on them kinetics.	2			
	PR (LR, SZ) Engineering methods of calculating welding deformations.	2			
	SR Development of information support for each module (topic)	6			
4	LK Determination of stress and strain components using engineering calculation methods.	2			
	PR (LR, SZ.) Specific types of welding deformations.	2			
	SR Development of information support for each module (topic)	8			
5	LK Software complexes for modeling the stress-strain state. Basic principles and dependencies, selection of typical nodes and	2			

	models, type of finite elements.				
	PR (LR, SZ) KOMETA-2 software was used for the calculation				
	and design of steel structure nodes				
	SR Development of information support for each module (topic)	8			
	LK Results of computer simulation of the stress-strain state.	2			
6	PR (LR, SZ) Crystal software was used to calculate elements of	2			
0	steel structures	L			
	SR Development of information support for each module (topic)	8			
	LC Methods of regulating the stress-strain state of joints.	2			
7	PR (LR, SZ) Use of the SCAD computing complex to analyze the				
1	strength of structures using the finite element method				
	SR Development of information support for each module (topic)?	8			
	LK Innovative technologies of welding and related processes.	2			
Q	PR (LR, SZ) Use of the SCAD computer complex to analyze the				
0	strength of structures using the finite element method				
	SR Preparation for the final inspection	8			
Together	LK	16			
	PR (LR, SZ)	16			
	SR	58			

Individual educational and research task (if available): absent

## Teaching methods:

1) verbal: 1.1 traditional: lectures, explanations, stories, etc.;

1.2 non-traditional: electronic version, remote.

2) visual: method of illustrations, method of demonstrations

3) practical: 3.1 traditional practical classes

3.2 non-traditional stations

# **Evaluation system 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", "Z", "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:

$$K^{nomov} = \frac{K1 + K2 + \dots + Kn}{n}$$

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

 $K1, K2, \dots, Kn$  – 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
						reasser	nbly
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;
- "Verv 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	ore Evaluation on a n national scale ints		Evaluation according to the ECTS scale		
in points			Rating	Criteria	
	examina tion	test			
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	

Score	Evaluati	on on a	Evaluation according to the ECTS scale		
IN points	nationa	al scale	Rating Criteria		
points	examina tion	test			
80–89	ž	rolled	В	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	
75-79	Oka		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	ctorily		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	Satisfa		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)	

Score	Evaluation on a national scale		Evaluation according to the ECTS scale		
in points			Rating	Criteria	
	examina tion	test			
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 comply with the rules of academic integrity set forth in the following documents: "Rules of academic integrity of participants in the educational process of the Khnadu" (https://www.khadi.kharkov.ua/fileadmin/P\_Standart/pologeniya/stvnz 67 01 dobroch 1.p df), "Academic integrity. Checking the text of academic, scientific and qualification papers for

(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 the 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. G.V. Yermolaev, V.V. Kvasnytskyi , V.F. Kvasnytskyi , S.V. Maksimova, V.F. Khorunov , V.V. Chigarev Brazing of materials: a textbook / G.V. Yermolaev, V.V. Kvasnytskyi , V.F. Kvasnytskyi , S.V. Maksy, V.F. Khorunov , V.V. Chigarev ; edited by V.F. Khorunov and V.F. Kvasnytskyi .- Mykolaiv: NUK, 2015. - 340 p. ISBN 978-966-321-307-1.

2. L. M. Lobanov , G. V. Yermolaev, V. V. Kvasnytskyi , O. V. Makhnenko , and others. Stresses and deformations during welding and brazing: textbook H 27 / L. M. Lobanov , G. V. Yermolaev, V. V. Kvasnytskyi , O. V. Makhnenko , G. V. Yegorov, A. V. Labartkava ; in general \_ ed. L. M. Lobanova. - Mykolaiv: NUK, 2016. - 246 p. ISBN 978–966–321–310–1.

3. I.V. Krivtsun, V.V. Kvasnytskyi Special methods of welding [Text]: textbook / I. V. Krivtsun, V. V. Kvasnytskyi [etc.]; ed. B. E. Paton. - Mykolaiv: NUK, 2017. - 348 p. - ISBN 978-966-321-321-7.

### 2. Additional literature

4. Matvienko, M.V. Structure and mechanical properties of joints of 10895 and 12X18N10T steels during diffusion welding in vacuum [Text] / M.V. Matvienko // Coll . of science works of the National Academy of Sciences. – 2009. – No. 6. – P. 83 - 91.

5. Phase-structural stability of a heat-resistant corrosion-resistant alloy for cast working blades of GTU / A. M. Verkhovlyuk , I. I. Maksyuta , Y. G. Kvasnytska , G. P. Myalnitsa , O. V. Mykhnyan // Metal science and metal processing . - 2016. - No. 3. - P. 3-9.

Developer(s) syllabus of the educational discipline

signature

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