

Silabus
educational component of the UA
(elective discipline)

Mechanized tool

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|---|---|
| Name of the discipline: | Mechanized tool |
| Level of higher education: | First (bachelor) |
| Course page in Moodle: | https://dl.khadi.kharkov.ua/course/view.php?id=711 |
| The volume of the educational component | 3 credits (90 hours) |
| Form of final control | Offset |
| Consultations: | on schedule |
| Name of the department: | Department of Construction and Road Machines |
| Language of instruction: | Ukrainian, English |
| Course leader: | Efymenko Oleksandr Volodymyrovych, PhD, Associate Professor |
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Summary of the educational component:

The aim is to train specialists for professional activities in the field of road construction, which are implemented on the basis of the wide use of natural samples of tools, personal professional computers.

Subject: theoretical and methodological foundations, methodological provisions of calculation and operation of manual machines at the present stage.

The main tasks of studying the discipline are:

- ability to solve complex problems in the production of mechanized tools, small mechanization technologies, which involves a deep rethinking of existing and creation of new holistic constructive solutions,
- mastering the methodology of creating the latest tool,
- conducting independent scientific research of samples, the results of which have scientific novelty, theoretical and practical significance

Prerequisites for studying the educational component:

Theoretical mechanics; Physics; Electrical engineering, electronics and microprocessor technology; Machine parts.

Competencies acquired by the applicant:

General competencies:

Ability to apply knowledge, demonstrating a professional approach in their activities, which allows solving problems in the field of lifting and transport, construction, road and land reclamation machines.

Ability to gather and interpret information and make judgments on relevant social, scientific or ethical issues.

Special (professional) competencies:

Ability to implement engineering developments in industrial engineering, taking into account technical, organizational, legal, economic and environmental aspects throughout the life cycle of the machine: from design, construction, operation, maintenance, diagnostics and disposal;

Ability to assess 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.

Learning outcomes in accordance with the educational program:

Knowledge and understanding of mechanics and lifting and transport, construction, road and land reclamation engineering and prospects for their development.

Analyze engineering objects, processes and methods.

Select and apply the necessary equipment, tools and methods.

Thematic plan

| no. of topics | Name of topics (LC, LR, PR, NW, SR) | Number of hours | |
|-----------------|--|-----------------|----------------|
| | | face-to-face | correspondence |
| 1 | LC General information about the mechanized tool | 2 | 1 |
| | PR (LR, NW) - | - | - |
| | SR Requirements for manual machines. Classification of machines. Marking and degrees of protection of machines. | 12 | 15 |
| 2 | LC Power sources of mechanized tools. | 2 | 1 |
| | PR (LR, NW) Pneumatic engines, classification. Pneumatic hand-held machines. | 4 | 1 |
| | SR Mobile electric power units. Electric motors, classification. | 12 | 15 |
| 3 | LC Machines for wood processing | 3 | 1 |
| | PR (LR, NW) - Machines for sawing wood. Circular saws. Definition of parameters. | 4 | 1 |
| | SR Mechanical hacksaws. Band saws. Chain saws. Jigsaw saws. | 12 | 15 |
| 4 | LC Rotating machines | 3 | 1 |
| | PR (LR, NW) Electric grinding machines. Purpose, scope, classification. Direct radial grinding machine. | 4 | 1 |
| | SR Impact wrench of impact-rotational action. Liquid impact wrenches. The device of the impact-rotating mechanism of the liquid impact wrench. | 8 | 15 |
| 5 | LC Machines with reciprocating movement of the working body. | 4 | - |
| | PR (LR, NW) - Electric perforators. Purpose, scope, classification. | 4 | 1 |
| | SR Electric hand hammers. Purpose, scope, classification. | 12 | 12 |
| 6 | LC Features of the use of mechanized tools | 2 | - |
| | PR (LR, NW) Manual pneumatic machines. | - | - |
| | SR Selection of manual machines by type of energy consumption and drive. | 2 | 10 |
| Together | LC | 16 | 4 |
| | PR (LR, NW) | 16 | 4 |
| | SR | 58 | 82 |

Individual educational and research task (if available):

Teaching methods:

MH1 - verbal method (lecture, explanation, story);
 MH2 - practical method (practical classes, exercises);
 MH3 - visual method (method of illustrations, method of demonstrations);
 MH4 - work with educational and methodical literature;
 MH5 - video method in combination with the latest information technologies and computer-based learning tools (distance, multimedia, web-based, etc.).

Forms and methods of evaluation

FMO2 - final control (credit)
 FMO3 - oral control (conversation)
 FMO5 - test control
 FMO7 - practical examination (defense of practical works)

Evaluation system and requirements:

Current academic performance

1 The current performance of applicants for the performance of educational activities in the classroom and for the performance of independent work is assessed using a four-point grading scale with the subsequent conversion to a 100-point scale. When assessing current progress, all types of work provided by the curriculum are taken into account.

1.1 Lecture classes are evaluated by determining the quality of specific tasks.

1.2 Practical classes are assessed by the quality of the control or individual task, performance and design of practical work.

1.3 Laboratory classes are evaluated by the quality of laboratory reports.

1.4 Seminar classes are evaluated by the quality of individual assignments / essays.

2 Evaluation of the current progress of higher education students is carried out at each practical lesson (laboratory or seminar) on a four-point scale ("5", "4", "C", "2") and recorded in the academic record book.

- "excellent": the applicant has flawlessly mastered the theoretical material, demonstrates deep knowledge of the relevant topic or discipline, the main provisions;

- "good": the applicant has mastered the theoretical material well, knows the main aspects of the primary sources and recommended literature, reasonably presents it; has practical skills, expresses his thoughts on certain problems, but makes certain inaccuracies and errors in the logic of the presentation of theoretical content or in the analysis of practical content;

- "satisfactory": the applicant has basically mastered the theoretical knowledge of the subject or discipline, is oriented in the primary sources and recommended literature, but unconvincingly answers, confuses concepts, hesitates to answer additional questions, does not have stable knowledge; answering questions of a practical nature, shows inaccuracy in knowledge, is unable to evaluate facts and phenomena, to relate them to the future profession;

- "unsatisfactory": the applicant has not mastered the educational material of the topic (discipline), does not know scientific facts, definitions, is almost not oriented in primary sources and recommended literature, there is no scientific thinking, practical skills are not formed.

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

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

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

$K1, K2, \dots, Kn$ - assessment of the success of the n current control measure;

n - number of current control measures.

Scores are converted into points according to the conversion scale (Table 1).

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

| 4-point scale | 100-point scale | 4-point scale | 100-point scale | 4-point scale | 100-point scale | 4-point scale | 100-point 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 | re-examination | |

Final evaluation

1 A higher education student receives a credit at the last class of the discipline based on the results of the current assessment. The average grade for the current activity is converted into points on a 100-point scale, according to the conversion table (Table 1). Higher education applicants who have a current average grade in the discipline below "3" (60 points) in the last class can increase their current score by taking tests in the discipline.

Assessment of knowledge of applicants by testing is carried out on a scale:

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

2 The condition for receiving credit is:

- working off all missed classes;
- the average current grade in the discipline is not lower than "3" (60 points).

3 Additional points are awarded for individual independent work and participation in scientific events.

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

3.2 The number of additional points awarded for different types of individual tasks depends on their volume and significance:

- prizes in the discipline at the international / all-Ukrainian competition of scientific student works - 20 points;
- prize places in the discipline at the national competitions - 20 points;
- participation in the international / all-Ukrainian competition of scientific student works - 15 points

- participation in international/national scientific conferences of students and young scientists - 12 points;
- participation in national competitions in the discipline - 10 points
- participation in Olympiads and scientific conferences of KhNADU in the discipline - 5 points;
- performance of individual research (educational and research) tasks of increased complexity - 5 points.

3.3 The number of additional points cannot exceed 20 points.

4 The learning outcome is evaluated (*select the required*):

- on a two-point scale (passed/not passed) according to Table 2;
- on a 100-point scale (knowledge assessment scale) according to Table 3.

The final score together with additional points cannot exceed 100 points.

Table 2 - Scale of points conversion to the national evaluation system

| On a 100-point scale | On a national scale |
|------------------------------|---------------------|
| from 60 points to 100 points | enrolled |
| less than 60 points | unaccounted for |

Table 3 - Scale for assessing the knowledge of students based on the results of the final control of the discipline

| Score in points | Assessment on the national scale | | Evaluation on the ECTS scale | |
|-----------------|----------------------------------|-----------------|------------------------------|--|
| | examination | offset | Evaluation | Criteria. |
| 90-100 | That's great. | Enrolled | A | The theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the mastered material are formed, all the training tasks provided by the training program are completed, the quality of their implementation is estimated by the number of points close to the maximum |
| 80-89 | | | B | The theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the mastered material are basically formed, all the training tasks provided by the training program are completed, the quality of most of them is estimated by the number of points close to the maximum |
| 75-79 | Okay. | Enrolled | C | The theoretical content of the course is fully mastered, without gaps, some practical skills of working with the mastered material are insufficiently formed, all the training tasks provided by the curriculum are completed, the quality of any of them is not assessed by the minimum number of points, some types of tasks are performed with errors |

| Score in points | Assessment on the national scale | | Evaluation on the ECTS scale | |
|-----------------|----------------------------------|---------------------|------------------------------|---|
| | examination | offset | Evaluation | Criteria. |
| | | | | |
| 67-74 | Satisfactory | | D | The theoretical content of the course is partially mastered, but the gaps are not significant, the necessary practical skills of working with the mastered material are basically formed, most of the training tasks provided by the curriculum are completed, some of the completed tasks may contain errors |
| 60-66 | | | E | The theoretical content of the course is partially mastered, some practical skills have not been formed, many of the training tasks provided by the curriculum have not been completed, or the quality of some of them is estimated by the number of points close to the minimum. |
| 35-59 | Unsatisfactory | Not enrolled | FX | The theoretical content of the course is partially mastered, the necessary practical skills have not been formed, most of the learning tasks provided by the curriculum have not been completed, or the quality of their implementation is estimated by the number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of learning tasks (with the possibility of repeating) |
| 0-34 | Unacceptable. | | F | The theoretical content of the course has not been mastered, the necessary practical skills have not been formed, all completed training tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of training tasks (with a mandatory repeated course) |

Policy of the course:

- the course involves teamwork, 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 discipline, which are submitted in accordance with the program for independent study, or were considered briefly;
- all tasks provided by the program must be completed in due time;
- if the applicant for higher education is absent from classes for a valid reason, he/she presents the completed tasks during independent preparation and consultation of the teacher;

- the term paper must be defended no later than one week before the start of the examination session (**indicated if available**);
- while studying the course, higher education students must adhere to the rules of academic integrity set out in the following documents: "Rules of academic integrity of participants of the educational process of KNADU" (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 KNADU" (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_MEK_1.pdf).
- in case of detection of the fact of plagiarism, the applicant receives 0 points for the task and must repeat the tasks provided in the silabus;
- cheating during tests and exams is prohibited (including using mobile devices). Mobile devices are allowed to be used only during online testing.

Recommended reading: (*literature not older than 10 years, except for 1 fundamental classic textbook or monograph*)

1. Efimenko A.V., Rukavishnikov Y.V., Shcherbak O.V. Mechanized tool.
 2. Tkachuk V.F. Mechanized tool - Rivne: NUVGP, 2015.
 3. File archive of the Department of DBM KhNADU (<http://files.khadi.kharkov.ua/mekhanichnij-fakultet/budivelnikh-i-dorozhnikh-mashin.html>)
- KhNADU training website <https://dl.khadi.kharkov.ua/course/view.php?id=711>

Additional sources:

1. Abramov, A.D. Vibro-impact technologies for road construction machines / Abramov, A.D., Tyunyukova, T.K., Izhibuldin, E.A. // Transport World. - M., 2016. - №4. C. 62-69.
2. Core losses and torque ripple in IPM Machines: dedicated modeling and design tradeoff / Pellegrino G., Guglielmi P., Vagati A., Villata F. // IEEE Transactions on Industry Applications, 2010, p. 2381-2391.
3. Numerical modeling of Electrical Machines: Requirements, State of the art, lacks / Mazauric V., Leconte V., Meunier G., Marechal Y. // Journal of Magnetism and Magnetic Materials. - 2002. - P. 1198-1201.
4. Work modeling processes of the hand-held impact machines / Abramov, A., Abramov, D., Izhibuldin, E. // Journal of Physics: Conference Series, 1050 (1). - 2018. - P. 012001. - doi: 10.1088/1742-6596/1050/1/012001.

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