**Syllabus**

**of the educational component EC11**

(conditional designation EC in the educational program (EP))

**State attestation**

|  |  |
| --- | --- |
| Subject | **State attestation** |
| Level of higher education: | **Second (master’s degree)** |
| Field of knowledge: | **19«Architecture and construction»** |
| Specialty:  | **192 «Construction and civil engineering»** |
| Educational and professional (Educational and scientific) program: | **Highways and airfields** |
|  Page on the Moodle:  | [*https://dl2022.khadi.kharkov.ua/course/view.php?id=3060*](https://dl2022.khadi.kharkov.ua/course/view.php?id=3060) |
| Year of study: | **2** |
| Semester: | **3 (autumn)** |
| Volume of the educational component | **30 credits** |
| Final control form | **Public defense of qualification work** |
| Consultations: | **on schedule** |
| Name of the department: | Department of Highway Building and Maintenance |
| Teaching language: | Ukrainian, English  |
| Head of the course: | **Gryshchenko Tamara, senior lecturer** |
| Contact phone number: | *+38 (057) 707-37-80* |
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**Brief content of the educational component:**

**The goal is** the formation of deep theoretical knowledge and practical skills in the field of construction and civil engineering, which allow to make effective decisions, including in interdisciplinary contexts, to choose and implement innovative technologies for the construction, reconstruction, repair and operation of highways in practical production activities.

**Subject:**theoretical and methodological foundations, methodological provisions of the scientific directions of construction, reconstruction, repair and operation of highways at the present stage.

**The main tasks of the academic discipline studying are:**

- systematization, consolidation and expansion of theoretical knowledge obtained in the process of studying under the educational program, and their practical use in solving specific engineering, scientific and industrial issues in the field of professional activity;

- formation of the ability to carry out innovative activities regarding the design, construction and operation of highways;

- formation of skills in the organization of independent research work and presentation of the results of scientific research.

**Prerequisites for the educational component studying:**

EC 1 Foreign Language; EC 2 Civil Protection; EC 3 Undergraduate practice; EC 4 Innovative technologies of highway construction; EC 5 Innovative directions of highways maintenance; EC 6 Progressive methods of organization, planning and management in road construction; EC 8 Computer modelling; EC 9 Metrology, standardization, certification, attestation and quality control in the construction industry; EC 10 Labor protection in the construction industry.

**Competences accuired by the accuirer:**

***Integral competence:*** The ability to solve problems of a research and/or innovative nature in the field of construction and civil engineering**.**

***General competences:***

GC02. Ability to conduct research at an appropriate level.

GC03. Ability to adapt and act in a new situation.

GC04. Ability to make reasoned decisions.

***Special (professional) competences:***

SC01. The ability to integrate specialized conceptual knowledge in the field of construction and maintenance of highways, combined with compliance with valid regulatory and legal documents in the field of architecture and construction, to solve complex engineering problems in accordance with the specialization.

SC02. Ability to develop and implement projects in the field of construction and maintenance of highways and airfields.

SC05. Ability to build and investigate models of situations, objects and processes of construction and maintenance of highways and airfields.

 SC07. The ability to clearly and unambiguously convey one's own knowledge, conclusions and arguments to specialists and non-specialists in the road construction industry.

SC09. The ability to formulate new hypotheses and scientific problems in the field of construction and maintenance of highways and airfields, to choose appropriate directions and appropriate methods for their solution, taking into account the available resources.

SC10. The ability to present the results of research activities, prepare scientific publications, participate in scientific discussions at scientific conferences, symposia, and carry out pedagogical activities in educational institutions.

***Learning results according to the educational program:***

LR01. To design production processes, including the use of computer modeling software systems, with the aim of ensuring the reliability and durability of highways and airfields, making rational design and technical decisions, technical and economic justification, taking into account the features of the object, determination the optimal mode of its functioning and implementation of resource and energy saving measures.

LR02. To apply specialized conceptual knowledge, including modern scientific achievements, as well as critical understanding of modern problems in the field of construction and maintenance of highways and airfields to solve complex problems of professional activity.

LR04. To evaluate consumer properties of roads and road safety.

LR05. To communicate in a national and foreign languages fluently ​​verbally and in writing to discuss professional problems and results of activities in the field of architecture and construction.

LR09. To select modern materials, technologies and methods of construction production, taking into account the architectural and planning and constructive part of the project and the base of the construction organization.

LR14. To plan and carry out scientific and applied research in the field of highway and airfield construction, choose effective research methods, argue conclusions, present research results.

LR15. To be able to identify the scientific essence of problems in the professional sphere, to find the ways to solve them.

**Topics and content of qualification papers:**

The topics of qualification works are developed by the department taking into account the specifics of training specialists, the requirements of higher education standards for the corresponding educational level; own experience of managing diploma design; scientific research and professional interests of the department, orders and recommendations of production enterprises and research institutes.

**Indicative list of qualification works topics:**

1. Peculiarities of construction of the subgrade embankments under conditions of permanent flooding.

2. Research of the physical and mechanical properties of soils, stone materials and industrial waste products with the development of proposals for their use in the construction of pavements.

3. Technological aspects and construction organization of pavement layers made of soils, stone materials, strengthened by organic and inorganic binders.

4. Technological aspects and organization of asphalt-concrete and cement-concrete mixtures construction.

5. The use of geosynthetic reinforcing materials in the construction, repair and reconstruction of highways.

6. The assessment of the operational condition of highways and city streets and development of recommendations for their repair.

7. Monitoring, forecasting and development of recommendations for the prevention of deformations and destruction of road surfaces at the stage of highway maintenance.

8. Technologies of cold recycling of old constructions of road pavement.

9. Development of resource-saving technologies for road pavement repairs in adverse weather conditions.

10. Technologies for the rutting resistance increasing of the asphalt concrete layers of road pavements.

11. The cracks sealing technology in road pavement surface layers.

12. The development of recommendations for thermal regeneration of road surface layers based on organic binder materials.

13. The effective measures development for highways snow protection.

15. The development of recommendations for the aggressive effect of anti-icing chloride materials reducing on the road surfaces.

16. The development of recommendations for improving road traffic safety by means of the road maintenance service.

17. The development of recommendations for the transport and operational condition improvement of the road network of the region, district or city.

18. The development of methods of the availability and condition of traffic management equipment determination on public roads.

19. The investigations of psychophysiological perception by drivers of informational support equipment.

20. The system of consumer properties improvement by increasing the aesthetic attractiveness of the road.

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

**Teaching methods:**

1) verbal: 1.1 traditional: lectures, explanations, stories, conversations, discussions, work with books, etc.; 2) visual: method of illustration and demonstration,

3) practical: 3.1 traditional: practical classes;

3.2 interactive (non-traditional): business and role-playing games, trainings, case method.

**Evaluation system and requirements**

**Current performance**

1 The current success rate 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 by the educational program are taken into account.

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

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

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 applicant 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, possesses 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 control works according to the formula:



where *Kcurrent* – the final assessment of success based on the results of current control;

 – evaluation of the success of the current control measure;

 – the number of measures of current control.

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

Table 1 – Recalculation of the average grade for the current activity into a multi-point scale

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 4-pointscale | 100-pointscale | 4-pointscale | 100-pointscale | 4-pointscale | 100-pointscale | 4-pointscale | 100-pointscale |
| 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 |
| retaking |
| 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 calculation table (table 1).

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

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": 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 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 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 significance:

– 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 KHNAHU 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 is required):

– on a two-point scale (passed/failed) according to table 2;

– on a 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 | Is credited |
| less than 60 points | Is not credited |

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

| Evaluation in points | Evaluation on a national scale | Evaluation according to the ECTS scale |
| --- | --- | --- |
| Mark | Criteria |
| examination | credit |
| **90-100** | **excellent** | **credited** | **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** | **good** | **credited** | **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 |
| **75-79** | **С** | 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 evaluated with a minimum number of points, some types of tasks have been completed with errors |
| **67-74** | **satisfactory** | **D** | The theoretical content of the course is partially mastered, but the gaps are not significant, 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** | **unsatisfactory** | **Not credited** | **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 established term;

- 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;

- while studying the course, students of higher education must adhere to the rules of academic integrity given in the following documents: "Rules of academic integrity of participants in the educational process of the KHNAHU" (<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 works 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 the KHNAHU” (<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 literature:**

1. 1. SHEI 6.1-02:2017 Diploma design. Organization and conduct.
2. SHEI 57.1-02:2017 Certification of applicants for higher education. Master's thesis. Structure, content, requirements, protection procedure
3. 3. DBN V.2.3-4-20015. Transport facilities. Automobile roads. "P.I. Design, P.II Construction. - K.: Ministry of Regional Construction of Ukraine - 2015. -92 p.
4. Industry calculations of resource costs for operational maintenance works on public highways. [Valid from 2022-11-18]. Officially published Kyiv: State Agency of Highways of Ukraine (Ukravtodor), 2022. 222 p. (Information and documentation).
5. Industry calculations of resource costs for repair and construction works on public roads [Valid from 2022-11-18]. Officially published Kyiv: State Agency of Highways of Ukraine (Ukravtodor), 2022. 285 p. (Information and documentation).
6. DSTU B V.2.7–127:2015. Asphalt-concrete mixtures and stone mastic asphalt concrete.
7. DSTU 4044:2019 Viscous petroleum road bitumens. Specifications
8. DSTU 9116:2021 Road bitumens modified with polymers. Specifications.
9. DSTU 9133:2021 Bitumen and bituminous binders. Road bitumens modified by additive complexes. Specifications
10. DSTU B V.2.7-129:2013 Building materials. Bituminous road emulsions. Specifications.
11. DSTU B V.2.7-136:2016 Materials for seams and cracks sealing in highway pavements. General technical requirements
12. DSTU B V.2.7-319:2016 Asphalt-concrete mixtures road and airfield asphalt concrete. Test methods
13. DSTU B V.2.7-89-99 (GOST 12801-98) "Materials based on organic binders for road and airfield construction. Test methods"
14. DSTU 8607:2015 Geosynthetic road materials. Test methods
15. MR B.2.7-218-24729256-758:2009 Synthetic materials for asphalt concrete reinforcement. Test methods.
16. DSTU 8853:2019 Anti-icing materials for highways. Specifications
17. DSTU 2587:2021 Road traffic safety. Road markings. General technical requirements. Control methods. Application rules
18. DSTU 8745:2017 Roads. Methods of roughness measuring of the base and covering road pavement layers.
19. DSTU B V.2.3-42:2016 Motor roads. Methods of the deformation characteristics determination of the subgrade and road pavement.
20. DSTU-N B V.2.3-32:2016 Guideline on the arrangement of road surface
21. DSTU 8977:2020 Road materials produced by cold recycling technology. Test methods
22. DSTU B V.2.7-71-98 (GOST 8269.0-97) Building materials. Crushed stone and gravel from dense rocks and industrial waste for construction work. Methods of physical and mechanical tests
23. DSTU B V.2.7-309:2016 Soils reinforced with a binder. Test methods
24. Solodkiy S. Road pavements: training. manual Lviv Polytechnic Publishing House, 2020. – 218 p.
25. Methodological instructions for the completion of master's theses in the department of highway construction and maintenance named after OK. Birulya for students in the field of training 192 "Construction and civil engineering". Compilers: V. Zhdanyuk, I. Kiyashko, R. Smolyanyuk, D. Kostin. – Kharkiv 2022

Methodical guidelines for the main machines selection for the construction and reconstruction of highways in course and diploma papers. Compilers: I.V. Kiyashko, V.K. Zhdanyuk, O.O. Guessed, O.O. Fomenko. – Kharkiv 2015**Додаткові джерела:**

1. distance course:

<https://dl2022.khadi.kharkov.ua/course/view.php?id=3060>

2. Library named after Korolenko URL: <http://korolenko.kharkov.com/>

3. Electronic library. URL: <http://lib.meta.ua/>



Developer(s)

of the academic discipline syllabus \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_ Gryshchenko Т.\_\_\_\_\_\_\_\_\_

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