**Syllabus**

**of the educational component EC 8**

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

**Computer modelling**

|  |  |
| --- | --- |
| Subject | **Computer modelling** |
| 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-kh.com/course/view.php?id=3431>*  |
| Year of study: | **1** |
| Semester: | **2 (spring)** |
| Volume of the educational component | **4,0 credits (120 hours)** |
| Final control form | **Credit** |
| Consultations: | **on schedule** |
| Name of the department: | **Department of Highway Building and Maintenance** |
| Teaching language: | **Ukrainian** |
| Head of the course: | **Kostyn Dmytro, c.tech.sc., associate professor** |
| Contact phone number: | *+380661111522* |
| E-mail:  | *kostin\_d@khadi.kharkov.ua*  |

**Brief content of the educational component:**

 **The goal** is to prepare specialists in the road construction industry to independent performance of the professional tasks in their specialty with the help of computer modelling of processes.

**Subject:** management of highway repair and reconstruction planning processes.

**The main tasks of the academic discipline studying are** students' assimilation of the latest theories, methods and technologies for planning road repairs and reconstruction, building of the degradation models of the highways operational state, substantiating of a set of measures aimed to ensuring of the reliable functioning of highways in conditions of limited funding.

**Prerequisites for studying the educational component:**

"Bachelor" education level of the related specialty

 **Competencies acquired by the acquirer:**

***Integral competence:*** The ability to solve problems of an innovative and research nature in the field of construction and civil engineering, related to the technological aspects of road building materials manufacturing with an extended term of their durability in engineering structures.

***General competences:***

GC01. Ability to abstract thinking, analysis and synthesis.

GC02. Ability to conduct research at an appropriate level.

GC04. Ability to make reasoned decisions.

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

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

SC06. The ability to use existing computer programs when solving complex engineering problems in the field of construction and operation of highways and airfields.

SC08. Ability to integrate knowledge from other fields to solve complex problems in broad or multidisciplinary contexts.

SK09. 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.

**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.

LR06. Apply modern mathematical methods to analyze statistical data, calculate and optimize parameters of technological processes of highway construction and maintenance.

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.

**Thematic plan**

|  |  |  |
| --- | --- | --- |
| № topic | Topic names (LC, LW, PW, IT, IW) | Hours |
| full-time | correspondence |
| 1 | LC. Methods of traffic intensity forecasting in the design, reconstruction and maintenance of highways tasks | 4 | 2 |
| LW. Traffic intensity forecasting by the method of least squares | 4 | 4 |
| IW. Examples of traffic intensity forecastingin the tasks of designing and maintenance of highways | 10 | 20 |
| 2 | LC. Planning of limited financial resources distribution for repairs and reconstruction of highways | 4 | - |
| LW. Planning of limited financial resources for roads repairs and reconstruction | 4 | - |
| IW. Quantitative and qualitative structure of state and local roads. | 20 | 22 |
| 3 | LC Modeling of the effect of road roughness on the car's vibration system | 8 | 2 |
| LW. Modeling of road roughness effect on the car's vibration system in the Road Ruf and Proval programs | 8 | 4 |
| IW. The necessity to assess the roughness level of the roadway for planning the terms and volumes of current repairs with restoration of the road's operational properties. | 20 | 30 |
| 4 | LC. Automated design of the mineral part granulometric composition of road construction materials. | 8 | - |
| LW. Automated design of the asphalt concrete mixture in the MIX-XADI program | 4 | - |
| IW. The main problems of the asphalt concrete mixture composition technological design. Preparation for the test. | 20 | 36 |
| Total | LC | 16 | 4 |
| LW  | 24 | 8 |
| CGW | 10 | - |
| IW | 70 | 108 |
|  | Total | 120 | 120 |

**Individual educational and research task:** calculation and graphic work.

**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:**

**Basic**

1. Filipov V., Zhdanyuk V., Smirnova N. Automated design of capital repair of highways // training. manual, Kh.: KhNAHU, 2014. - 276 p.

2. Filipov V., Smirnova N. Modeling of traffic flows on roads of II - IV categories: monograph - Kh.: KhNAHU, 2014. - 200 p.

3. Smirnova N. Computer modeling: Synopsis of lectures. Educational website of the KhNAHU, 2020.

4. Filipov V., Smirnova N. Computer modeling: Synopsis of lectures. File archive of the KhNAHU, 2014. <http://files.khadi.kharkov.ua>

5. Filipov V., Smirnova N. Computer modeling: Methodical materials for laboratory classes. File archive of the KhNAHU, 2014.<http://files.khadi.kharkov.ua>

**Additional literature**

1. Smirnova N., Determination of prospective traffic intensity and estimated load in the tasks of justifying major repairs // Automobile roads and road construction. - 2017. - № 100. - P. 21-27.

2. DBN B.2.3-4-2015. Automobile roads. - K.: Ministry of Regional Construction of Ukraine, 2015. – 91 p.

3. DSTU 8747:2017 Roads. Types and lists of repair and maintenance works.

4. GBN V.2.3-37641918-559:2019 Motor roads. Flexible road pavements. Designing.

5. Filipov V., N. Smirnova, V. Zhdanyuk, E. Prusenko Forecasting of the highway network development at different levels of funding // KhNAHU Vestnik: Collectin of scientific papers - Kharkiv - 2008 - № 26. - P.61-63.

6. File archive of the KhNAHU <http://files.khadi.kharkov.ua>

7. Filipov V., Smirnova N. Computer modeling: Synopsis of lectures. File archive of the KhNAHU, 2011.<http://files.khadi.kharkov.ua>

8. Filipov V., Smirnova N. Computer modeling: Methodical materials for laboratory classes. File archive of the KhNAHU, 2011.<http://files.khadi.kharkov.ua>

**Information resources**

1. distance course: *<https://dl2022.khadi-kh.com/course/view.php?id=3431>*
2. <http://files.khadi.kharkov.ua>
3. <http://www.nbwv.gov.ua>
4. <http://korolenko.kharkov.com>
5. <http://library.univer.kharkov.ua>



Developer(s)

of the academic discipline syllabus \_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ Dmytro Kostin



Guarantor of educational

and professional

programs \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Roman Smolyanuik



Head of the HBM department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Roman Smolyanuik