Syllabus of the elective component

Analytics of Transport Processes

| Discipline | Analytics of Transport Processes |
|------------------------------|---|
| Higher education level | third (educational-scientific degree) |
| Moodle course web-page | https://dl2022.khadi.kharkov.ua/course/view.php?id=2475 |
| Educational component volume | 4 credits (120 hours) |
| Final control form | test |
| Consultations | according to the schedule |
| Department | Transport Systems and Logistics Department |
| Language of teaching | English |
| Course leader | Horbachov Petro, DSc, Professor |
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Educational Component Summary:

The purpose is to train highly qualified scientific and pedagogical specialists, or specialists for enterprises in the field of transport technologies, capable of dynamically combining conceptual scientific and practical knowledge, in-depth cognitive and practical skills, mastery and innovation, while solving problems in the field of professional and research and innovation activities on transport systems and technologies, which involve a deep rethinking of the existing integral knowledge and the creation of new one or professional practice.

The subject is analytical foundations of transport processes in the systems of local, regional and state levels; mathematical bases of evaluating indicators of the quality of functioning of transport systems.

The main tasks of studying the academic discipline are to develop the ability to solve complex problems in the field of professional and research-innovative activities in the field of transport systems and logistics, which involves a deep rethinking of existing knowledge or professional practice and the creation of new holistic ones..

Prerequisites for studying the educational component:

Fundamental and applied mathematical training; Methods of scientific research; Modeling of traffic flows; Higher mathematics; Probability theory.

Competencies acquired by the applicant:

General competencies:

To know the methodology of the own scientific research, the results of which have scientific novelty, theoretical and practical significance;

To have ability to use mathematical methods, computer and communication technologies in road transport research;

To have the skills necessary to conduct an experiment in scientific research using modeling and devices in practical and analytical work;

To have the skills to interpret the obtained data as a result of the experiment, the simulation and relate them to the relevant theory;

To master the methods of data processing, evaluation, determination of regularities and their interpretation.

Special (professional) competencies:

Ability to perform and present original research, to achieve scientific results that create new knowledge in the field of transport technologies and related interdisciplinary areas, the

results of which can be published in leading scientific publications on transport technologies and related fields;

Ability to apply appropriate mathematical methods, models, computer technologies, as well as the principles of a systems approach to solving complex problems in the field of transport systems and technologies.

Training results:

1

To form and test hypotheses; use appropriate evidence, in particular, the results of theoretical analysis, experimental research (surveys, observations, ...) and mathematical modeling, available literature data in order to substantiate conclusions;

To develop and research conceptual, mathematical and computer models of processes and systems, effectively use them to obtain new knowledge and/or create innovative products in the field of transport and technology and related interdisciplinary areas.

| Theme | | | Hours | |
|---|--|-----------|-----------|--|
| No | Theme (L, LW, PW, SEW) | full-time | full-time | |
| IN≌ | | training | training | |
| | L. Existing methods of analytical modeling of transport processes | 2 | 2 | |
| 1 | PW. Calculation of the average waiting time by passengers at the bus stop | 2 | 2 | |
| | SEW. Analytical bases of modeling transport processes | 12 | 12 | |
| L. Concepts and methods of representation of processes in the the | | 2 | 2 | |
| | SEW. Basic characteristics and known regularities of random processes | 12 | 12 | |
| | L. Application of the queuing theory in the study of transport processes | 2 | 2 | |
| 3 | PW. Calculation of the waiting time of vehicles at a controlled intersection | 2 | 2 | |
| | SEW. Options for meeting requirements in various mass service systems | 12 | 12 | |
| 4 | L. Analytical evaluation of the reliability of elements of transport systems | 2 | 2 | |
| 4 | ⁴ SEW. Existing methods for assessing the reliability of elements of transport systems | | 12 | |
| | L. Analytical models of location of places of attraction in cities | 2 | 2 | |
| 5 | PW. Determination of the parameters of the settlement function in the city | 2 | 2 | |
| | SEW. Existing regularities in the location of places of attraction in cities | 12 | 12 | |
| 6 | L. Human behavior modeling when choosing a way of travel | 2 | 2 | |
| 6 | SEW. Varieties of multinomial models of a discrete choice | 12 | 12 | |
| _ | L. Analytical bases of modeling the transport market customers' needs for traveling | 2 | 2 | |
| / | SEW. Existing models of demand for traveling in passenger and cargo transport systems | 12 | 12 | |
| | L. Analytical process modeling of functioning of traffic participants' flow intersections | 2 | 2 | |
| 8 | PW. Calculation of the average waiting time of pedestrians at regulated and non-regulated crossings | 2 | 2 | |
| | SEW. Existing models for estimating the delay time of traffic participants at intersections and pedestrian crossings | 12 | 12 | |
| | | 16 | 16 | |
| Sum | PW | 8 | 8 | |
| | SEW | 96 | 96 | |
| Total | | 120 | 120 | |

Thematic plan

Т

Individual educational and research task: not provided.

Teaching methods:

1) verbal:

- 1.1 traditional: lectures, explanations, talks, etc.;
- 1.2 interactive: discussions
- 2) visual: illustration method, demonstration method

3) practical: 3.1 traditional: practical classes

Evaluation system and requirements:

Ongoing achievements

1 The applicants' ongoing achievement in the performance of the both educational activities and self-education work while training is evaluated using a four-point scale with the further conversion into the 100-point scale. While evaluating all kinds of works provided by the educational program are taken into account.

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

1.2 Practical classes are evaluated by the quality of performance of the tests or individual tasks, execution and design of the report on practical works.

2 The final evaluation of the discipline is determined as a sum of points on:

- passed standard tests, verbal questioning, attendance and communication activity level;

- in-class practical tasks execution and theoretical preparation.

Applicants' evaluation score scale according to the ongoing control is given in table1.

Table 1 – Points distribution under the themes defining a final test score according to the discipline ongoing assessment

| Ongoing assessment | | | | | Discipline total score | | | | |
|--------------------|---------|---------|---------|---------|---------------------------|---------|---------|-----|--|
| Theme 1 | Theme 2 | Theme 3 | Theme 4 | Theme 5 | Theme 6 | Theme 7 | Theme 8 | 100 | |
| 13 | 12 | 13 | 12 | 13 | 12 | 12 | 13 | 100 | |

Final estimation

1 The final test score is got by the applicant at the last double-lesson according to the discipline ongoing assessment. The condition to pass the test is not less than 60 points score.

2 Higher education applicants who have an ongoing assessment score less than 60 points can increase it at the last class by taking a combination of written and oral tests that comprise both answering 2 professionally-oriented question and a problem solution with further commenting the work done or standard tests. The applicants who made the tasks previewed by the practical classes are allowed to pass the final test.

3 Extra-points are awarded to the applicants for participation in scientific events.

3.1 Extra-points are added to the achieved sum of points by the higher education applicant for the current educational activity.

3.2 The number of extra-points awarded for different types of individual tasks depends on their volume and importance:

 discipline prize-winning places on the at the international / all-ukrainian competition of scientific students' works – 20 points;

- discipline prize-winning places at all-Ukrainian olympiads - 20 points;

participation in the international / all-Ukrainian competition of scientific students' works – 15 points

- participation in international / all-Ukrainian scientific conferences of students and

young scientists - 12 points;

- participation in all-Ukrainian discipline competitions - 10 points

 participation in KhNAHU discipline competitions and scientific conferences – 5 points;

– implementation of individual scientific and research (educational and research) tasks of increased complexity – 5 points.

3.3 The number of extra points might not exceed 20 points.

4 The result of the study is evaluated on a two-point scale (passed/failed) according to table 2. The total score comprising the extra-points might not exceed 100 points.

| Table 2 - Conversion of the score into na | ational evaluation system |
|---|---------------------------|
|---|---------------------------|

| According to 100-point scale | According to the national scale |
|----------------------------------|---------------------------------|
| between 60 scores and 100 scores | Passed |
| less than 60 scores | Failed |

Course policy:

- the course involves working in the team, the environment in the audience is friendly, creative, open to constructive criticism;

-the discipline requires mandatory attendance of lectures and practical classes, as well as self-education work;

- self-education work involves studying certain discipline themes, which are submitted in accordance with the program for self-education work, or have been considered briefly;

 – all the tasks provided by the program must be completed within the prescribed timeframe;

- if the higher education applicant is absent for valid reasons, he/she passes the completed tasks during the self-education work and consultations provided by the teacher;

while studying the course, higher education applicants should follow the rules of academic integrity set out in such documents: «Rules of academic integrity of participants of the KhNAHU Education process» (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_dobroch_1.p df), «Academic integrity. The text check of academic, scientific and qualification works for the plagiarism»

(https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_85_1_01.pdf), «Moral and ethical code of participants of the KhNAHU educational process» (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_MEK_1.pdf).

 in case of detecting the plagiarism, the applicant receives 0 points for the task and must retake the tasks provided in the syllabus;

 cheating during control works and examinations is prohibited (including mobile devices). Mobile devices are only allowed to be used during online testing.

Recommended literature:

1. Основи теорії транспортних систем / Монографія. П.Ф. Горбачов. І.А. Дмитрієв. – Харків. Вид-во ХНАДУ, 2020. – 232 с.

2. Горбачов П. Ф. Концепція формування систем маршрутного пасажирського транспорту в містах. Дисертація на здобуття наукового ступеня доктора технічних наук. – Х., 2009. – 370 с.

3. Системологія на транспорті. Книга 3. Дослідження операцій у транспортних системах : підручник / Е. В. Гаврилов, М. Ф. Дмитриченко, В. К. Доля, О. Т. Лановий та ін. ; За заг. ред. М. Ф. Дмитриченко. – К., Знання України, 2015. – 375 с.

4. Mathematical Methods of Reliability Theory / B. V. Gnedenko, Yu. K. Belyayev, A. D. Solovyev, V. A. Kashtanov. — Academic Press, 2019. — 506 c.

5. Ross Sh. A First Course In Probability / Eighth Edition. — Pearson Education, 2013 – 545 c.

6. Литвинов А. Л. Теорія систем масового обслуговування. Навчальний посібник. Х.: ХНУМГ ім. О. М. Бекетова, 2018. – 141 с.

7. Richter K.J. Verkehrsökonometrie.2341 - Drezden : Gruyter, Walter de GmbH, 2019. - 322 c.

8. Управління дорожнім рухом на регульованих перехрестях у містах : монографія / Є. Ю. Форнальчик, І. А. Могила, В. Е. Трушевський, В. В. Гілевич ; за заг. ред Є. Ю. Форнальчика. – Львів : Видавництво Львів-ської політехніки, 2018. – 236 с.

Additional sources:

1 Handbook of transportation science. Second edition / Edited by Randolf W Hall. University of Southern California. Kluwer academic publishers. 2013 – 741 P.

2 Форнальчик Є. Ю., Гілевич В. В., Могила І. А. Львів Моделювання транспортних потоків. Навчальний посібник : Видавництво Львівської політехніки, 2020. 216 с

3 Планування міст і транспорт : навч. посібник / О. С. Безлюбченко, С. М. Гордієнко, О. В. Завальний; Харків. нац. ун-т міськ. госп-ва ім. О. М. Бекетова. – Харків : ХНУМГ ім. О. М. Бекетова, 2021. – 271 с.

4 Andrew E. G. Jonas Urban Geography: A Critical Introduction / Andrew E. G. Jonas, Eugene McCann, Mary Thomas. Oxford : Wiley-Blackwell, 2015. – 378 p.

5 http://files.khadi.kharkov.ua

6 http://bigcities.org/?p=11226

7 http://www.newurbanism.org/

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