**Syllabus**
Course Program

# Operational processes analyses of motor car systems

Specialty
274 – Automobile transport

Institute
Institute of Education and Science in Mechanical Engineering and Transport

Educational program
Cars and automotive industry

Department
Car and tractor industry (152)

Level of education
Master's level

Course type
Special (professional), Mandatory

Semester
2

Language of instruction
English, Ukrainian

## Lecturers and course developers

**Ostroverkh Oleksandr Olehovych**
Oleksandr.Ostroverkh@khpi.edu.ua
Candidate of technical sciences, associate professor, associate professor of the Car and Tractor industry, department of National Technical University «KhPI»

Work experience - 13 years. Author and co-author of more than 45 scientific and methodical publications.
The courses: «Controllability and stability of the movement of cars and tractors», «Motor Cars Technical Operation, Autotecnical Assessment and Resource Saving», «Technology of constructions of self-propelled machines».
More about the lecturer on the department's website

## General information

### Summary

The courses «Operational processes analyses of motor car systems», is one of the main disciplines necessary for the training of qualified engineering personnel in the direction of training 274 «Automotive transport».

### Course objectives and goals

The combination of a high level of professional training with the formation of a student's scientific worldview and the provision of a broad outlook in the social, humanitarian, fundamental and professional spheres. Achieving the specified goal is based on the principles of continuity and individualization of education, fundamentality and integrity of knowledge provision, practical orientation and awareness of the place of acquired competences, symbiosis of scientific and systemic approaches, etc..

### Format of classes

Lectures, practical work, calculation work, independent work, consultations. The final control is an exam..

### Competencies

FC 2 Ability to analyze car designs, operational qualities, work processes of car systems and calculate its mechanisms and systems.

### Learning outcomes

PRN 2 Know the design of components and mechanisms of cars, their influence on operational qualities and work processes in car systems. Be able to perform design and verification calculation of nodes and aggregates.

### Student workload

The total volume of the discipline is 120 hours. (4 ECTS credits): lectures – 16 hours, practical work – 32 hours, independent work – 72 hours.

### Course prerequisites)

To successfully complete the course, you must have knowledge and practical skills in the following disciplines: "Theoretical mechanics", "Theory of mechanisms and machines", "Car design", "Car theory", "Resistance of materials", "Hydraulics and hydropneumatic drive".

### Features of the course, teaching and learning methods, and technologies

Pupils receive knowledge at lectures, from educational or methodical literature, through an on-screen guide in a "ready-made" form. Perceiving and comprehending facts, assessments, conclusions, students remain within the framework of reproductive (reproductive) thinking. In the university, this method is widely used for the transmission of a large array of information. Lectures are conducted interactively using multimedia technologies. Practical classes use a project approach to learning, game methods, and focus on the application of information technologies.

## Program of the course

### Topics of the lectures

Topic 1. Requirements, classification, applicability of clutches.
Topic 2. Working process of instantaneous engagement of the clutch when the car moves.
Topic 3. Shifting gears.
Topic 4. Gearbox (CP). Classification, requirements.
Topic 5. Switching gears
Topic 6. Peculiarities of working processes of the planetary KP
Topic 7. Capacity calculations
Topic 8. Stepless and combined transmissions.
Topic 9. Cardan transmission.
Topic 10. The main transmission.
Topic 11. Differential.
Topic 12. Bridges.
Topic 13. Car suspension.
Topic 14. Elastic and damping elements of suspensions and their characteristics
Topic 15. Controlled suspensions.
Topic 16. Sources of vibrations and noise.
Topic 17. Steering.
Topic 18. Working processes in the steering system.
Topic 19. Hydraulic steering.
Topic 20. Working processes of a hydraulic amplifier.
Topic 21. Braking systems.
Topic 22. Disc brake mechanisms.
Topic 23. Calculation of braking mechanisms for heating.
Topic 24. Regulators of braking forces of cars.

### Topics of the workshops

Topic 1 Selection of the main parameters of the car's engine and transmission
Topic 2. Analysis of the structures of the given transmission mechanism
Topic 3. Coupling calculation
Topic 4. Calculation of the gearbox
Topic 5. Calculation of cardan transmission
Topic 6. Calculation of the main transmission
Topic 7. Calculation of semi-axes.

### Topics of the laboratory classes

Laboratory work within the discipline is not provided

### Self-study

Estimated work from the course "Analysis of work processes of car systems" is provided by the curriculum for specialty 274 "Automotive transport". The goal of the project is to consolidate the knowledge necessary for the analysis of the structures of cars, their units and systems, as well as the ability to perform elementary calculations related to the assessment of the performance of the specified objects based on design calculations.

## Course materials and recommended reading

**Basic literature**

1 1 Kosharny M. F. Fundamentals of car mechanics and energy / Kosharny M. F. – K.: Vyshcha shkola, 1992. – 200 p.
2 Osnovenko M.Yu. Car transmission: Education. manual. [Text] / M.Yu. Osnovenko, G.A. Filipova. - K.: UTU, 1998. - 156 p..
3 Technological design of road transport enterprises: training. manual / I.P. Kurnikov, M.K. Korolev, V.M. Tokarenko. - K.: Vyshcha Shk., 1993. - 191 p.
4 Osnovenko H.E. Running system of the car. Study manual for students' specialization "Automobiles and automobile economy" [Text] / H.E. Osnovenko - K.: UMK VO, 1991. - 92 p.
5 5 Shchurikhin V. K. Examples of structural calculations of connections of parts and assemblies used in cars / V. K. Shchurikhin, A. V. Shchurikhin, O. V. Biloshitskyi. - Kyiv: MCPTO JSC and BM, 2004. - 39 p.

**Additional literature**

1 Redchyts V.V., Rudasyov V.B., Golovina O.V., Korobochka O.M. Design of steering controls of wheeled vehicles. Monograph - Dniprodzerzhinsk: DDTU, 2014 - 404 p.
2 Rudasyov V.B., Redchyts V.V., Korobochka O.M. Car. The theory of operational properties. – a study guide for students of universities specializing in "Automobiles and automotive industry". - Dnipropetrovsk: "System Technologies", 2000. -287p.
3 Brake systems of motor vehicles / N.E. Osnovenko - K.: KADI, 1986. - 62 p.
4 Vehicles. Steering / N.E. Osnovenko - K.: KADI, 1984. -47 p.
5 Cars. Transmission / H.E. Osnovenko - K.: UMK VO: 1989. -139 p.

## Assessment and grading

### Criteria for assessment of student performance, and the final score structure

100% of the final grade consists of assessment results in the form of an exam (40%) and current assessment (60%).

Exam: written assignment (2 questions from theories + problem solving) and an oral presentation. Current assessment: 2 online tests (20% each).

### Grading scale

| Total points | National | ECTS |
|---|---|---|
| 90–100 | Excellent | A |
| 82–89 | Good | B |
| 75–81 | Good | C |
| 64–74 | Satisfactory | D |
| 60–63 | Satisfactory | E |
| 35–59 | Unsatisfactory (requires additional learning) | FX |
| 1–34 | Unsatisfactory (requires repetition of the course) | F |

## Norms of academic integrity and course policy

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": show discipline, education, benevolence, honesty, responsibility. Conflict situations should be openly discussed in study groups with the teacher, and if it is impossible to resolve the conflict, it should be brought to the attention of the employees of the institute's directorate. Regulatory and legal support for the implementation of the principles of academic integrity of NTU "KhPI" is posted on the website: http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/

## Approval

| | | | |
|---|---|---|---|
| Syllabus agreed | 30.08.2023 | _____ | Head of the department<br>Oleksiy REBROV |
| | 30.08.2023 | _____ | Guarantor of the educational program<br>Mykola MITTSEL |