Educational component syllabus
Academic discipline program

Electrical and electronic equipment of vehicles and basics of diagnostics

Code and name of specialty
274 – Road transport

Institute
National Research Institute of Mechanical Engineering and Transport

Educational program
Cars and automotive industry

Chair
Automotive and tractor manufacturing (152)

Education level
Bachelor

Type of discipline
Profile, Selective

Semester
4

Language of instruction
Ukrainian, English

Lecturers and course developers

Ostroverkh Oleksandr Olehovych
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Candidate of technical sciences, associate professor, associate professor of the Car and Tractor industry, department of National Technical University «KhPI»

Work experience - 14 years. Author and co-author of more than 50 scientific and methodical publications.
The courses: «Controllability and stability of the movement of cars and tractors», «Electrical and electronic equipment of vehicles and basics of diagnostics».
More about the lecturer on the department's website

General information

Annotation

The discipline belongs to the educational and professional bachelor's program.The discipline is aimed at in-depth study of the structure of electrical and electronic equipment of automobiles and the basics of their diagnostics.

Purpose and objectives of the discipline

Familiarization and formation of students' knowledge about the principles of design, construction, functioning and basics of diagnostics of devices and systems during the operation of electrical and electronic equipment of automobiles.

Class format

Lectures, laboratory work, calculation work, independent work, consultations. Final control - test.

Competencies

FC 10. Ability to perform technical diagnostics of road transport objects, their systems and elements. FC 11. Ability to use specialized software to solve complex specialized problems of road transport. FC 13.

Ability to analyze technical and operational indicators of road vehicles, their systems and elements in order to identify and eliminate negative factors and increase the efficiency of their use.

Learning outcomes

RN 1. Have conceptual scientific and practical knowledge necessary for solving specialized complex problems of road transport, critically understand the relevant theories, principles, methods and concepts. RN 2. Communicate fluently in the state and foreign languages orally and in writing when discussing professional issues. RN 3. Apply specialized software, information and information and communication technologies to study models of objects and processes of road transport, operational properties of road vehicles, perform engineering and technical and economic calculations, create design documentation and solve other problems of road transport. RN 6. Make effective decisions, analyze and compare alternative options taking into account goals and limitations, quality assurance issues, as well as technical, economic, legislative and other aspects. RN 7. Analyze the information obtained from research, summarize, systematize and use it in professional activities. RN 8. Understand and apply in professional activities the regulatory and legislative acts of Ukraine, international regulatory documents, Rules for the technical operation of road transport of Ukraine, instructions and recommendations for the operation, repair and maintenance of road transport vehicles, their systems and elements. RN 9. Analyze and evaluate road transport objects, their systems and elements. RN 10. Plan and carry out measurement experiments using appropriate equipment, analyze their results. RN 11. Develop and implement technological processes, technological equipment and technological equipment, means of automation and mechanization in the process of operation, repair and maintenance of road transport objects, their systems and elements. RN 14. Analyze technological processes of operation, maintenance and repair of road transport objects. RN 15. Participate in the development and implementation of engineering and/or production projects in the field of road transport, determine the duration and sequence of work, resource needs, and predict the consequences of project implementation. RN 18. Develop technologies for production processes at all stages of the life cycle of motor transport facilities. RN 19. Carry out technical diagnostics of motor vehicles, their systems and elements using appropriate methods and tools, as well as technical regulations, standards and other regulatory documents. RN 20. Collect and analyze diagnostic information on the technical condition of motor vehicles.
PH 23. Analyze technical, operational and technical and economic indicators of motor vehicles, their systems and elements. PH 25. Present the results of research and professional activities to specialists and non-specialists, argue their position.

Scope of the discipline

The total amount of the discipline is 120 hours (4 ECTS credits): lectures – 6 hours, laboratory work – 6 hours, calculation task, independent work – 108 hours.

Prerequisites for studying the discipline (prerequisites)

To successfully complete the course, you must have knowledge and practical skills in the following: disciplines: "Higher Mathematics", "Physics", "Chemistry", "History of Science and Technology", "Fundamentals of Computer Science", "Ecology", "Car Designs and Their Analysis".

Discipline features, teaching methods and technologies

Lectures are conducted interactively using multimedia technologies. In the laboratory
The classes use a project-based approach to learning, with emphasis on the application of information technologies to study systems, circuits, devices, the order of their functioning, determining their characteristics and comparing them.

Academic discipline program

Lecture topics

Topic 1. Introduction. Sources of electric energy for a car.
Introduction. Electrical and electronic equipment of automobiles and the basics of diagnostics - as a professional discipline and its role in the training of highly qualified bachelors in the field of transport.

Energy storage devices. Starter and traction batteries. Automobile generators. Voltage regulators of the on-board network of the automobile. Electronic voltage regulators.
Topic 2. Internal combustion engine ignition systems.
Spark ignition of the mixture and classification of ignition systems. Magneto. Thyristor ignition systems. Electronic and microprocessor ignition systems.
Topic 3. Engine starting system.
Electric engine starting system. Starter selection.
Topic 4. Lighting, signaling and control systems.
Car lighting systems and their electronic devices. Car signaling, control and diagnostic devices.
Topic 6. Electronic control systems and drives.
Engine control systems. General provisions. Vehicle control systems. Electric drives in vehicle equipment.

Laboratory topics

Topic 1. Study of Rechargeable Batteries.
Topic 2. Study of the Automobile Alternator.
Topic 3. Study of the Voltage Regulator of a Generator Set.
Topic 4. Study of the Automotive Ignition System.
Topic 5. Study of the Engine Starting System (ICE).
Topic 6. Selection of a Starter for an Internal Combustion Engine.
Topic 7. Study of the Automotive Lighting System.
Topic 8. Study of Automotive Control System Sensors.
Topic 9. Study of the Internal Combustion Engine (ICE) Management System.

Topics of practical work

Practical work is not provided within the discipline.

Calculation task

Determination of parameters and characteristics of devices (systems) of electronic and electrical equipment of a car.

Independent work

Students are also recommended additional materials (videos, articles, textbooks) for independent study and analysis.

Literature and educational materials

Basic literature
1.Sklyarov V.M., Volkov V.P., Sergienko M.E. Automobile. Design features. – Kharkiv: 2013. – 927p.
2. Sazhko V.A. Electrical and electronic equipment of a car. – Kyiv: Higher School, 1999. – 412 p.
3. Bronstein M.I. Electronic control of the engine, transmission and chassis of the car. Educational manual. - Kharkiv: Khgadtu, 2001. - 150 p.
4. General principles of diagnosing electronic vehicle control systems: manual/ O.F. Dashchenko, V.G. Maksimov, etc.; edited by M.B. Kopytchuk. O.: Nauka i tekhnika, 2012. – 392 p.
5. Mygal V, D. Mechatronic and telematic systems of a car: a manual. – Kh.: Maidan, 2017. – 314 p.
6.Mazepa S. S., Kutsyk A. S. Vehicle electrical equipment: a textbook. – Lviv: Lviv Polytechnic, 2004. – 168 p.
7.Przysucha A.M., Przysucha O.A. Car battery.–Publishing house “Kharkiv”, 1999.–192 p.
8. Bronshtein M.I. Electrical and electronic equipment of cars: Textbook – K.: ISDO, 1993.
Additional literature
1.Automobiles: a textbook on the English language / N. I. Marchenko, N. O. Kurnosova, O. V. Zabashta and others. – Zhytomyr: ZhDTU, 2005. – 256 p.
2. Vydmysh A. A. Electrical and electronic equipment of automobiles / A. A. Vydmysh, V. V. Bogachuk — Vinnytsia: VDTU, 2002. Part 1: Electrical equipment of automobiles. — Vinnytsia: VDTU, 2002 — 106 p.

Evaluation system

Criteria for evaluating student performance and distribution of points

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

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

Rating scale

Total points	National assessment	ECTS
90–100	Perfectly	A
82–89	Good	B
75–81	Good	C
64–74	Satisfactorily	D
60–63	Satisfactorily	E
35–59	Unsatisfactory (additional study required)	FX
1–34	Unsatisfactory (required) re-study)	F

Academic Ethics Standards and Course Policies

The student must adhere to the "Code of Ethics for Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, politeness, friendliness, honesty, responsibility. Conflict situations should be openly discussed in study groups with the teacher, and if the conflict cannot be resolved, they should be brought to the attention of the institute's management staff.
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/

Coordination

Syllabus agreed	08/30/2025 _____	Head of the Department Alexey REBROV
	08/30/2025 _____	Guarantor OP Andriy KOZHUSHKO