Silhouette of the educational component
Programme of the discipline

Volumetric hydraulic machines

Code and name of the speciality
131 - Applied mechanics

Institute
Educational and Research Institute of Mechanical Engineering and Transport (MIT)

Educational programme
Applied mechanics

Department
parts Machine hydraulic pneumatic systems (148)

Level of education
Bachelor's degree

Type of discipline
Special (professional)

Semester
3

Language of instruction
Ukrainian

Teachers, developers

Mariana Stryzhak

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Author of more than 60 scientific and educational publications. Leading lecturer in the courses: "Theory of Automatic Control and Dynamics of Mechatronic Systems", "Modern Element Base of Mechatronic Systems", "Volumetric Hydraulic Machines", "Fundamentals of Calculation and Design of Electro-Hydraulic and Electro-Pneumatic Transducers", "Fundamentals of Scientific Research".
More about the lecturer on the department's website

General information

Abstracts.

The academic discipline "Volumetric Hydraulic Machines" provides students with a set of professional knowledge in the design and calculation of volumetric hydraulic drives as systems that convert mechanical energy into potential energy of fluid compression and use it in technological operations. As well as methods of controlling actuators.

Purpose and objectives of the discipline

The purpose of the discipline is to provide future specialists with in-depth knowledge of the structure, theory of work processes and methods of calculation and design of volumetric hydraulic systems.

Class format

Lectures, practical classes, laboratory classes, course project. The final control is an exam.

Competences

GC2. Ability to apply knowledge in practical situations.
SC2. Ability to select optimal performance parameters of materials, structures, tools and machines under operating conditions and find appropriate solutions to ensure a given level of reliability of structures and processes.

SC3. Ability to make an optimal choice of technological equipment, tools, technical complexes, have a basic understanding of the rules of their operation.
SC4. Ability to use computer-aided design systems (CAD, CAM, CAE) and specialised application software to solve technological problems in applied mechanics.

Learning outcomes

PO5. To know the design, methods of selection and calculation, basics of maintenance and operation of drives of machine tools and robotic equipment;
PO15. Apply methods of technical calculations in the computer-aided design of technological processes for the manufacture, installation and repair of products in the field of applied mechanics.

Scope of the discipline

The general scope of the discipline
180 hours (6 ECTS credits): lectures - 48 hours, practical classes - 32 hours, laboratory classes - 16 hours, independent work - 84 hours.

Prerequisites for studying the discipline (prerequisites)

To successfully complete the course, you must have knowledge and practical skills in the following areas disciplines: "Higher Mathematics", "Physics", "Hydraulics".

Features of the discipline, teaching methods and technologies

Lectures and practical classes are conducted interactively with the use of multimedia technologies, laboratory work is carried out in the laboratory of the Department of Machine Parts and Hydropneumatic Systems. Teaching materials are available to students through Microsoft Teams.

Programme of the discipline

Topics of lecture classes

Topic 1. General concepts and definitions of hydraulic actuators.
Topic 2 . Hydraulic actuator working bodies Supporting components of the hydraulic actuator.
Topic 3: Positive displacement pumps and hydraulic motors.
Topic 4. Hydraulic motors.
Topic 5. Hydraulic equipment.
Topic 6: Volumetric hydraulic drives.
Topic 7. Hydraulic actuator control systems.
Topic 8: Drawing up schematic diagrams of hydraulic drives. Selection of working fluid.
Topic 9: Design and calculation of a volumetric hydraulic actuator.

Topics of practical classes

1. Calculate the main dimensions and select the design scheme of an axial piston pump with a fixed distributor disc.
2. Calculate the main design parameters of a single-row radial piston pump.
3. Calculate the basic dimensions of a single and double acting vane pump.
4. Design a volumetric actuator according to an individual design task.

Topics of laboratory work

1. Study of the general characteristics of positive displacement pumps and performance control mechanisms.
2. Study the design of the pump test bench and the test methodology.
3. Study the design of an axial piston pump.
4. Experimental determination of the dependence of the tap-changer flow rate on the pump outlet pressure.
5. Study of the design of a radial piston pump (RPD).
6. Experimental determination of the tap changer characteristics.
7. Setting up the capacity control mechanism of the radial piston pump.
8. Study of the mechanism for changing the flow rate of an axially piston pump with a pressure regulator. Design of the pump pressure regulator. Method of setting the pump pressure regulator.

Independent work

The discipline involves the implementation of a course project on the calculation and design of a volumetric hydraulic actuator according to an individual assignment. The design result is presented in a written report.

Literature and training materials

1. Burennikov Y. A. Hydraulics, hydraulic and pneumatic drives: a textbook / Y. A. Burennikov, I. A. Nemyrovsky, L. G. Kozlov - Vinnytsia: VNTU, 2013. 273 p.
2. Mandrus V. I. Machine-building hydraulics. Problems and examples of calculation. Textbook / V. I. Mandrus, N. P. Leshchiy, V. M. Zvyagin - Lviv: World, 1995. 264 p.
3. Fedorets O. M. Fedorets O. O. Yakhno O. M. et al. "Technical hydraulics and hydropneumatic drive": - Zhytomyr ZhITI, 1998 - 418 p.

Evaluation system

Criteria for assessing student performance and distribution of points

100% of the final grade consists of assessment results in the form of a test (40%) and ongoing assessment (60%).

Assessment: written assignment (2 questions from theory + problem solving) and an oral presentation.
Current assessment: calculation task (40% each).

Rating scale

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

Standards of academic ethics and course policy

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

Approval

Silabus has been approved

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Date of approval, signature

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