



Syllabus

Course Program



Modeling and design of processes, products, equipment

Specialty

131 – Applied mechanics

Institute

Educational-scientific Institute of Mechanical Engineering and Transport

Educational program

Applied mechanics

Department

Hydraulic Machines (150)

Level of education

Master's level

Course type

Optional

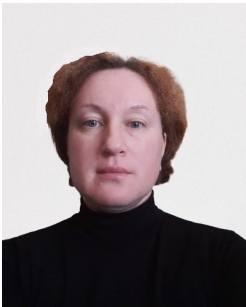
Semester

2

Language of instruction

English

Lecturers and course developers

**Nadiia Fatieieva**

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Candidate of Technical Sciences, Associate Professor, Associate Professor of the Department of Hydraulic Machines named after G.F. Proskura NTU "KhPI"

Author and co-author of more than 30 scientific and methodical publications. Courses: "Fundamentals of hydraulic drive theory", "Design of volumetric hydraulic machines and hydraulic drives of oil and gas industries", "Reliability, operation and maintenance of hydraulic machines", "Machines and equipment for drilling oil and gas wells", "Calculation and design of volumetric of hydropneumatic machines and hydropneumatic drives", "Modern scientific schools of the department".

**Yevhenii Krupa**

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Candidate of Technical Sciences, Associate Professor of the Department of Hydraulic Machines named after G.F. Proskura of NTU "KhPI"

The author of more than 50 scientific and educational works (articles, manuals, monographs, patents on a useful model). Courses: "Fundamentals of bladed hydraulic machines theory", "Hydraulic turbines and reversible hydraulic machines", "Fundamentals of CAD for bladed hydraulic machines", "Design of bladed hydraulic machines"

General information

Summary

The course "Certification and metrological quality assurance" allows you to gain knowledge in the field of quality assessment and management, determining the goals and methods of certification of machine-building products and services, the methodology of certification of products and services, which makes it possible to ensure the high qualification of future specialists in their multifaceted activities, formation students have a holistic system of knowledge in certification, use the knowledge gained in production when making independent decisions in order to obtain high final results

Course objectives and goals

The purpose of this course is to form students' knowledge about the scientific, technical, organizational and legal bases of certification, accreditation, metrological assurance and product quality management, study of modern methods of control in mechanical engineering, determination of goals and methods of certification of mechanical engineering products.

Format of classes

Lectures, practical classes, independent work, consultations. Individual task - calculation work. Final control - exam.

Competencies

ZK1. Ability to identify, pose and solve problems.

ZK2. Ability to make informed decisions.

ZK3. Skills in using information and communication technologies.

ZK8. Ability to learn and master modern knowledge.

FK1. Specialized conceptual knowledge of the latest methods and techniques of designing and researching structures, machines and/or processes in the field of mechanical engineering.

FC2. The ability to critically analyze and forecast performance parameters of new and existing mechanical structures, machines, materials and engineering production processes based on knowledge and use of modern analytical and/or computerized methods and techniques.

FC6. Ability to apply appropriate mathematical, scientific and technical methods, information technologies and applied computer software to solve engineering and scientific problems in applied mechanics.

Learning outcomes

PRN2. Demonstrate knowledge of the principles of construction and operation of automation systems for technological research, design and construction work, technological training and engineering analysis in mechanical engineering.

PRN3. Demonstrate the ability to perform modeling, static and dynamic analyzes of structures, mechanisms, materials and processes at the design stage using modern computer systems.

PRN5. Demonstrate the ability to independently solve tasks of an innovative nature, the ability to argue and defend the obtained results and decisions, in particular publicly.

Student workload

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

Course prerequisites

Having a bachelor's degree. To successfully complete the course, you must have knowledge and practical skills in the following disciplines: "Interchangeability, standardization and technical measurements", "Fundamentals of hydraulic drive theory", "Intellectual property".

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

Lectures provide an interactive form of conducting with the use of multimedia technologies, video materials. Practical work is carried out in a combined format of individual and team project work. Independent work involves the study of topics from the curriculum of the discipline in the process of working with information sources. Consolidation of knowledge, acquisition of competencies and program learning results occurs during the performance of practical and computational tasks. Control of educational work is carried out during the defense of practical works, writing modular control works, answers in classes and exams.

Program of the course

Topics of the lectures

Topic 1. Certification of quality systems.

General information about certification and confirmation of compliance in Ukraine. Legal basis of certification and confirmation of compliance in Ukraine

Topic 2. Basic concepts and categories of quality management.

The concept of "quality". Concepts of "quality assurance" and "quality management". The role of quality management in the system of modern management.

Topic 3. Quality objects and their management strategy.

Product and process quality indicators. The importance of quality improvement.

Topic 4. Standardization of product quality requirements in mechanical engineering.

General principles of optimization of quality requirements.

Topic 5. Problems and methods of standardizing the accuracy and quality parameters of the surface of hydraulic machines.

Standardization of the accuracy of the dimensions of hydraulic machine parts. Basic concepts of precision in mechanical engineering. Basic concepts about the accuracy of the shape and location of the surfaces of hydraulic machine parts and their role in ensuring the efficiency of hydraulic machines. Accuracy of the shape of the surfaces.

Topic 6. Recommendations for preliminary selection of accuracy requirements.

Forms and arrangement of surfaces of parts of hydraulic machines.

Topic 7. Normalization of the roughness and waviness of the surfaces of hydraulic machine parts.

Recommendations for the preliminary selection of requirements for surface roughness of hydraulic machine parts.

Topic 8. Normalization of the physical and mechanical properties of the surfaces of hydraulic machine parts.

Recommendations for the preliminary selection of requirements for the physical and mechanical properties of the surfaces of hydraulic machine parts.

Topics of the workshops

Topic 1. Tests of flow control hydraulic devices. Test indicators of hydraulic distributors with electromagnetic control.

Topic 2. Tests of flow control hydraulic devices. Indicators of tests of hydraulic check valves.

Topic 3. Tests of hydraulic pressure control devices. Indicators of tests of hydraulic valves of indirect action (safety valves).

Topic 4. Tests of flow control hydraulic devices. Indicators of tests of chokes.

Topic 5. Tests of flow control hydraulic devices. Test indicators of flow regulators.

Topic 6. Methods of testing hydraulic devices. Function check. Durability check.

Topic 7. Methods of testing hydraulic devices. Checking for external and internal tightness.

Topic 8. Methods of testing hydraulic devices. Methods of testing hydraulic devices. Dependence of the pressure drop on the flow rate $\Delta p = f(Q)$

Topics of the laboratory classes

Laboratory work within the discipline is not provided.

Self-study

The course involves the implementation of calculation work on the topics of the course. Students are also recommended additional materials (videos, literature, articles) for independent study and analysis.

Course materials and recommended reading

Basic literature

- 1 Kozakova N. V. Product quality management, certification and audit in mechanical engineering: training manual for students of the "Applied Mechanics" specialty of full-time, part-time and distance education / N.V. Kozakova, E.V. Ostroverkh, V.O. Fedorovych. - Kh.: NTU "KhPI", 2018. - 257 p.
- 2 Quality management and quality management systems, ISO 9000 standards: Outline of lectures/ Edited by: Trish R.M., Lukyanenko V.M. Kharkiv; FOP Ro-dak L.P., 2013. -78 p.
- 3 Basics of standardization, certification and metrology: Course of lectures / I.V. Kalynych, L.I. Pichkar. - Uzhgorod: PGFC DVNZ "UzhNU", 2022. - 75p.
- 4 DSTU ISO 9000-2001 Quality management systems. Basic provisions and dictionary.
- 5 DSTU ISO 10012:2005 Measurement management systems. Requirements for measurement processes and measuring equipment.
- 6 DSTU 3073-95 Volumetric hydraulic drives. Hydraulic devices. Acceptance rules and test methods.

Additional literature

- 1 DSTU 2192-93 Volumetric hydraulic drives. Volumetric pumps and hydraulic motors. General technical requirements.
- 2 Fedorovych V.O. abstract of lectures on the discipline "Metrological quality assurance", NTU "KhPI" http://web.kpi.kharkov.ua/cutting/wp-content/uploads/sites/143/2016/12/KL_F.pdf
- 3 Shapoval M. I. Quality management Textbook. - 3rd edition, corrected and supplemented. - Kyiv, T-vo "Knowledge", KOO, 2007. - 471 p

Assessment and grading

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

100% of the final grade consists of the results of the assessment in the form of an exam (40%) and the current assessment (60%). Exam: written assignment (2 theory questions + problem solving) and oral presentation. Current evaluation: modular control works (20%), performance and defense of practical works (20%), calculation task (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": to demonstrate discipline, good manners, kindness, honesty, and responsibility. Conflict situations should be openly discussed in academic groups with a lecturer, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management.

Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website: <http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrocheshnist/>

Approval

Approved by

Date of approval, signature

Head of the department
Andrii ROGOVYI

Date of approval, signature

Guarantor of the educational
program
Oleksandr SHELKOVIY

