



Syllabus of the educational component

Program of educational discipline

Modeling and design of processes, products, equipment

Specialty

131 – Applied mechanics

Educational program

Applied mechanics.

Level of education

Master's degree

Institute

NNI of Mechanical Engineering and Transport

Department

Foundry production (142)

Course type

Special (professional) training

Semester

1

Language of instruction

Ukrainian, English

Lecturers and course developers

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Senior lecturer of the foundry department of NTU "KhPI"

Work experience - 3 years. Author and co-author of 9 scientific publications.
Courses: "Modeling and design of processes, products, equipment."

[Learn more about the teacher on the department's website](#)

General information

Summary

This discipline is aimed at familiarizing students with the formation and development of design, methods of artistic construction, the basics of form formation, the theory of color harmony and the stages of design activity. Students will study the history of design, learn construction techniques, learn the basics of creating forms, and study the interrelationship of colors to achieve aesthetic and functional goals. In addition, they will be introduced to the stages of the design process, including sketching and modeling to fully understand this creative process.

Course objectives and goals

The main goal is to acquaint students with the history of design, the methodology of artistic design, the basics of form formation and the theory of color harmony, as well as the stages of design activity.

Format of classes

Lectures and laboratory works, independent work, consultations. Individual task. Final control - Exam.

Competencies

GC3. Ability to use information and communication technologies

GC 4. The ability to generate new ideas (creativity)

GC 7. Ability to communicate in a foreign language.

FC3. Application of appropriate methods and resources of modern engineering based on information technologies to solve a wide range of engineering problems using the latest approaches, forecasting methods with awareness of the invariance of solutions.

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

FC7. Ability to describe, classify and model a wide range of technical objects and processes, based on deep knowledge and understanding of mechanical theories and practices, as well as basic knowledge of related sciences.

Learning outcomes

LR3. Apply automation systems for research, design and construction work, technological preparation and engineering analysis in mechanical engineering.

LR 4. Use modern methods of optimizing the parameters of technical systems by means of system analysis, mathematical and computer modeling, in particular under the conditions of incomplete and contradictory information.

LR 5. Independently set and solve problems of an innovative nature, argue and defend the obtained results and decisions.

LR 6. Develop, implement and evaluate innovative projects taking into account engineering, legal, environmental, economic and social aspects.

LR 8. To master modern knowledge, technologies, tools and methods, in particular through independent study of specialized literature, participation in scientific, technical and educational events.

LR 9. Organize the work of the group when completing tasks, complex projects, scientific research, understand the work of others, give clear instructions.

LR 14. Demonstrate knowledge of the basics of organization and personnel management.

LR 15. Demonstrate knowledge of the structure, functioning, technical and software support of information and measurement computerized systems in engineering production.

LR 17. Demonstrate knowledge of the organization, functioning, technical and software support of information and measurement computerized systems in scientific research of mechanical systems and processes.

Student workload

The total volume of the discipline is 120 hours. (4 ECTS credits): lectures – 32 hours, practical classes – 32 hours, independent work – 56 hours.

Course prerequisites

For successful completion of the course, it is necessary have basic knowledge that may be important for this discipline, a bachelor's degree.

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

Lectures are conducted interactively using multimedia technologies. On practical ones classes use a project approach to learning, gamification, focus on application of information technologies.

Program of the course

Topics of lectures

Topic 1. Design as a type of activity.

Topic 2. Design methodology.

Topic 3. Compositional formation in design.

Topic 4. Stages of design of objects.

Topics of the workshops

Practical classes within the discipline are not provided.

Topics of the laboratory classes

Topic 1. Performing a concise artistic design analysis of the product, developing its more perfect form.

Topic 2. Composition as a tool of harmonization. Basic principles, means and methods of composition. Basics of coloristics. Color and its role in composition.

Topic 3. Creation of compositions for working out the main means of harmonization. Practical use of the principles of color harmony. Compilation of a color composition in warm and cold tones.

Topic 4. Sketch design. Layout Computer modeling in design. 2d and 3d modeling capabilities.

Topic 5. Creation of a spatial model of an object using computer simulation.

Self-study

For self-education in the discipline, it is recommended to study theoretical material, use interactive resources and online courses, visit exhibitions and master classes, as well as actively participate in communities and forums to share experiences and receive feedback from specialists in the field. Ensuring systematicity and self-discipline is important for the successful development and improvement of creative, and later, practical skills.

Course materials and recommended reading

Basic literature

1. Drobyazko, V. M., Yamshinskyi, M. M., Kocheshkov, A. S., Mogylatenko, V. G., Ponomarenko, O.

1. Theoretical foundations of foundry production.: education guide Kyiv: Center for Educational Literature, 2007

2. Shumega S.S. Design: education manual / S.S. Shumega. - K.: Education Center. of literature, 2004. - 300 p.

3. Mykhaylenko V.E. Fundamentals of composition: geometric aspects of artistic formation K.: Karavela, 2004.

4. Yaremkiw, M. Composition: creative foundations of image / M. Yaremkiw. – Ternopil, 2007.

Additional literature

1. L.K. Glinenko. O.H. Sukhonosov Basics of modeling technical systems: training. guide Lviv: Beskyd Bit, 2003

2. Itten J. Fundamentals of color. - "Art", 2019.

3. Shekhovtsov A.V., Poletayeva G.N., Kryuchkovskiy D.O., Baranenko R.V. Computer technologies for designers. – 2019. – 318 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 credit (40%) and current assessment (60%).

Test: written task (2 questions from theories) and an oral report.

Current assessment: 2 modular control and calculation task (20% each).

Grading 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 (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

Approved by

22.08.2023

Date, signature

Head of the department
Oleg AKIMOV

22.08.2023

Date, signature

Guarantor of the educational program
Oleksandr SHELKOVY