Syllabus
Course Program

Finishing operation in the production of castings

Specialty
131 – Applied mechanics

Institute
NNI of Mechanical Engineering and Transport

Educational program
Applied mechanics. Computerized foundry production. Artistic and jewelry Lithuania

Department
Foundry production (142)

Educational level
Master's degree

Course type
Special (professional), Elective

Semester
2

Language of instruction
Ukrainian, English

Lecturers and course developers

Tatiana Viktorivna Berlizieva

Tatiana . Berlizieva @khpi.edu.ua
Candidate of Technical Sciences, Associate Professor of the Department of Foundry Production of NTU "KhPI"

Work experience - 10 years. Author and co-author of more than 60 scientific and methodical publications. Courses: "Design of foundry workshops and sites", "Finishing operations in the production of castings", "Alloys for artistic and jewelry casting", "Finishing of cast artistic products", "Furnaces of foundry workshops".
Learn more about the teacher on the department's website

General information

Summary

The course "Finishing operations in the manufacture of castings" develops knowledge in the selection and calculation of the number of equipment for finishing operations depending on the serial production, the name of the metal, the overall dimensions of the olive and the productivity of the workshop. Able to build a technological line for cleaning castings for a specific production, starting with the operation of knocking them out of the furnaces before transferring them to decoration.

Course objectives and goals

Reporting data on modern designs and methods of calculation of the main methods of cleaning castings, studying the modern level of development of designs of methods of finishing operations for the purpose of their rational selection for operation in workshops, as well as learning the prospects for further development of the main types of finishing operations and their calculations.

Format of classes

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

Competencies

GC1. Ability to identify, pose and solve engineering and technical and scientific and applied problems
GC2. Ability to make informed decisions.
GC3. Ability to use information and communication technologies.
GC4. Ability to generate new ideas (creativity).
GC7. Ability to communicate in a foreign language.
GC8. Ability to learn and master modern knowledge.
FC5. The ability to set a problem and determine ways to solve a problem by means of applied mechanics and related subject areas, knowledge of methods of finding the optimal solution under conditions of incomplete information and conflicting requirements..
FC7. The ability to describe, classify and model a wide range of technical objects and processes, which is based on a deep knowledge and understanding of mechanical theories and practices, as well as basic knowledge of related sciences.
FC8. The ability to generate new ideas and the ability to substantiate new innovative projects and promote them on the market.
FC10.The ability to clearly and unambiguously convey one's own conclusions, knowledge and explanations to specialists and non-specialists, in particular, in the process of teaching. Ability to understand the work of others, give and receive clear instructions.

Learning outcomes

LR1 Apply specialized conceptual knowledge of the latest methods and techniques of design, analysis and research of structures, machines and/or processes in the field of mechanical engineering and related fields of knowledge.
LR8 Master modern knowledge, technologies, tools and methods, in particular through independent study of specialized literature, participation in scientific, technical and educational events.
LR10 Search for necessary information in scientific and technical literature, electronic databases and other sources, assimilate, evaluate and analyze this information
LR16 Demonstrate knowledge and understanding of the basics of production process organization..

Student workload

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

Course prerequisites

To successfully complete the course, you must have knowledge and practical skills in the following disciplines: " Equipment of foundry production ", "Furnaces of foundry shops ", " Forming materials and mixtures " .

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

Lectures are conducted interactively using multimedia technologies. In the laboratory
works and practical classes use a project approach to learning, game methods, attention is focused on the application of information technologies in finishing operations. Study materials are available to students through OneNote Class Notebook. .

Program of the course

Topics of the lectures

Topic 1. Introduction
Tasks, scope and content of the discipline finishing operations in the production of castings
Topic 2. Classification of finishing operations and selection of means for cleaning castings.
Basic concepts, definitions and terms on which finishing operations are based
Topic 3. Knocking out castings from molds and removing rods from castings.
The choice of the type of punching equipment depends on the serial production, the size of the logs and the method of their steaming.

Topic 4. Manual method of cleaning spills. Felling with sledgehammers, hammers, chisels.
Hand mechanized tool. Purpose, advantages and disadvantages of the tool. Workplace of the feller. Principles of separation of pouring systems from castings.
Topic 5. Cleaning castings with circles. Cleaning of castings with abrasive wheels. Cleaning of castings on scraping and grinding machines.
Disadvantages of this equipment, ways to eliminate shortcomings. Selection of the material of the grinding tool for cleaning castings.
Topic 6. A mechanized tool for cleaning castings.
Pneumatic tools, tools with an electric drive and with a flexible shaft, stationary scraping and grinding machines. Automatic equipment for abrasive cleaning of castings.
Topic 7. Hydraulic means of punching and cleaning.
Water jet and water sand jet punching of rods. Basic parameters of water jet installations. Equipment and operation of a modern water jet installation and its elements.
Topic 8. Shot blast cleaning
Cleaning materials used. Selection of materials and shot size for cleaning parts of various purposes.
Topic 9. Cleaning of castings in mill drums.
Designation and equipment of winding drums. Advantages and disadvantages of this cleaning agent. Types of winding drums.
Topic 10. Fiery cleaning of castings. Oxygen gas sharp. The main stages of the process and conditions necessary for gas-oxygen cutting.
Classification of cutters for oxygen cutting. Cutter equipment. The main indicators of the oxygen cutting mode
Topic 11. Oxygen flux cleaning and cutting.
Appointment. Fluxes. Installations for oxygen flux cutting.
Topic 12. Gas-electric purification.
Types of gas-electric purification. Arc sharp. The essence of the method. Design of the cutter.
Topic 13. Vibro-abrasive cleaning of castings..
Purpose and essence of the method. Rectilinear, planar and three- ′dimensional vibration. Choice of filler. Vibro-abrasive cleaning installation. Vibro-hydroabrasive cleaning.
Topic 14. Cleaning of castings by electrical methods.
Electrical contact means of processing. Schematic diagram of the installation for electrical contact cleaning. Classification, variety for electrical contact cleaning.
Topic 15. Electrochemical cleaning...
Means of electrochemical cleaning and their meaning. Digestion in acid and alkali solutions. The essence of the methods. Sequence of operation. Advantages and disadvantages of means..

Topics of the workshops

Practical classes within the discipline are not provided

Topics of the laboratory classes

Topic 1. Knocking out spills from molds. Calculation of eccentric knockout grids. Calculation of inertial knockout grids.
Topic 2. Cleaning of castings with metal circles. Calculation of processing modes with metal circles. Cleaning with abrasive wheels. Calculation of casting processing time and casting cleaning plant productivity. Calculation of modes of abrasive processing .
Topic 3. Water jet punching of rods. Selection of parameters of water jet installations. Calculation of parameters of monitors of water jet installations.
Topic 4. Equipment for receiving and processing pulp. Hydroelevator calculation.
Topic 5. Shotgun installations. Calculation of fraction circulation system elements. Calculation of the velocity of the shot from the head of the shot-blasting device and calculation of its elements.
Topic 6. Turning drums. Calculation of the main parameters of the drum.

Topic 7. Calculation of the main parameters of vibration installations. Installations with planar vibration. Installations with volume vibration.
Topic 8. Electrocontact cleaning. Calculation of installation parameters for electrical contact processing.

Self-study

The course involves the implementation of an individual calculation task on the calculation of various types of casting cleaning. The result of calculations is drawn up in a written report.
Students are also recommended additional materials for independent study and analysis .

Course materials and recommended reading

Basic literature

1. Nemyrivsky V.G. Automatic lines of foundry production/V.G. Nemyrivskyi. - Kyiv: Higher School, 1981. - 278p.
2. Methodical instructions for laboratory work "Computer calculation of mechanical (inertial and eccentric) knock-out gratings" - Kharkiv: NTU "KhPI". - 1992. - 20 p.
3. Methodical instructions for laboratory work "Calculation of the parameters of a water-jet installation for knocking out rods and cleaning the surface of castings using a computer" - Kharkiv: NTU "KhPI" - 1992. - 13 p.

Additional literature

1. Chen, JC, Savage, M.: A Fuzzy-Net-Based Multilevel In-process Surface Roughness Recognition System in Milling Operations. (2001), The International Journal of Advanced Manufacturing Technology. vol. 17, pp. 670-676. 9
2. Quintana, G. Garcia-Romeu, ML, Ciurana, J.: Surface roughness monitoring application based on artificial neural networks for ball-end milling operations. (2009), Journal of Intelligent Manufacturing, vol. 22, pp. 607–617.
3. Sivarao, Castillo, Taufik,: Machining Quality Predictions: Comparative Analysis of Neural Network and Fuzzy Logic. (2000), International Journal of Electrical & Computer Sciences IJECS. vol. 9, pp. 451-456.
4. Hadi, Yasir, Ahmed, Salah Gasim,: Assessment of Surface Roughness Model for Turning Process. (2006), Knowledge Enterprise: Intelligent Strategies In Product Design, Manufacturing, and Management, in International Federation for Information Processing (IFIP). vol. 207, pp. 152-158.
5. Igusa T , Xu K (1994) Vibration control using multiple tuned Mass dampers . J Sound Vibration 175(4):491–503

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%).

Assessment : written assignment (2 questions from theories) and an oral report.
Current evaluation : 2 modular control and 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": 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 Head of Department
Oleg AKIMOV

22.08.2023 Guarantor of the educational program

Olexander SHELKOVIY