Syllabus
Course Program

Introduction to the speciality. Introductory practice

Specialty
131 –
Applied Mechanics

Institute
Institute of Education and Science in Mechanical Engineering and Transport

Educational program
Applied Mechanics

Department
Department of Mechanical Engineering Technology and Metal-Cutting Machines (146)

Level of education
Bachelor's level

Course type
Free choice (professional), Selective

Semester
1

Language of instruction
English, Ukrainian

Lecturers and course developers

Maryna Ivanova

maryna.ivanova@khpi.edu.ua
Candidate of Technical Sciences. Associate Professor. Associate Professor of the Department of Mechanical Engineering Technology and Metal-Cutting Machines

Work experience - 12 years. Co-author of more than 50 scientific works, 1 monograph, and 2 training manuals. Leading lecturer in courses: Introduction to Speciality. Introductory Practice; Mechanization and automation of technological processes; Equipment and Transportation of Machining Shops, Technological Fundamentals of Machinebuilding
More about the lecturer on the department's website

General information

Summary

Academic course "Introduction to the speciality. Introductory Practice" is a mandatory component of educational and professional programs in the cycle of professional training of specialists in the speciality 131 Applied Mechanics. Students study the structure of a machine-building plant, get acquainted with the functions of the enterprise's departments, and learn about the basic technologies used in mechanical engineering.

Course objectives and goals

The purpose of the course "Introduction to the speciality. Introductory Practice" is to theoretically acquaint students with the future speciality, its place in production and the means of mastering it, to develop skills of academic culture and academic integrity, and to form a student's idea of the perspectives of the future profession..

Format of classes

Lectures, self-study, consultations. The final control is an credit.

Competencies

GC01 Ability to think abstractly, analyze and synthesize
GC02 Knowledge and understanding of the subject subject area and understanding of professional activity
GC03 Ability to identify, formulate and solve problems
GC04 Ability to apply knowledge in in practical situations
GC05 Ability to work in a team
GC06 Determination and perseverance in tasks and responsibilities
GC07 Ability to learn and master modern knowledge
GC09 Skills in the use of information and communication technologies
GC10 Skills to carry out safe activities
GC11 Ability to act socially responsibly and consciously
GC12 Ability to search, process and analysis of information from various sources
PC01 Ability to analyze materials, structures and processes on the basis of laws, theories and methods of mathematics, natural sciences and applied mechanics.
PC02 Ability to evaluate the performance parameters of materials, structures and machines in operating conditions and find appropriate solutions to ensure a given level of reliability of structures and processes, including in the presence of some uncertainty
PC06 Ability to perform technical measurements, obtain, analyze and critically evaluate measurement results.
PC07 Ability to apply computer-aided design (CAD), manufacturing (CAM) systems
(CAD), manufacturing (CAM), engineering research (CAE) and specialized application software to solve engineering problems in applied mechanics
PC10 Ability to describe and classify a wide range of technical objects and processes, based on a thorough knowledge and understanding of basic mechanical theories and practices, as well as basic knowledge of related sciences

Learning outcomes

PLO09 Know and understand related fields (mechanics of liquids and gases, heat engineering, electrical engineering, electronics) and be able to identify interdisciplinary connections of applied mechanics at the level necessary to fulfil other requirements of the educational program
PLO3.06 Know the technological equipment of mechanical engineering industries.

Student workload

The total volume of the course is 90 hours (3 ECTS credits): lectures - 32 hours, self-study - 58 hours.

Course prerequisites

To successfully pass the course, it's required to have knowledge and practical skills in the following courses: "Higher Mathematics", "Physics", "Chemistry", "Descriptive Geometry, Engineering and Computer Graphics"

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

Lectures are held in an interactive form using multimedia technologies. Familiarization with the structure and production features of the actual industrial enterprises. Study materials are available to students through the teacher's corporate disk.

Program of the course

Topics of the lectures

Topic 1. Introduction.
Introductory lecture - familiarisation with the history and structure of the university, the Department of Mechanical Engineering Technology and Machine Tools. Familiarisation with the curriculum of the speciality 131 Applied Mechanics, peculiarities of the educational process organisation. Basic concepts of

mechanical engineering technology. Careers in Machining Technology: Semiskilled Workers, Skilled Workers, Technicians, Professional.

Topic 2. Industry and engineering in Ukraine and the World. The historical path of development.

The Evolution of Machine Tools. Development of Power Sources. Basic Machine Tool Operation. Nontraditional Machining Processes. Automating the Machining Process. The Development of Numerical Control. Computer Numerical Control. Industry 4.0.

Topic 3. Shop Safety

General Safety in the Shop. Protective Clothing and Equipment. Usage of Common Sense. Usage of Safety Aids. General Machine Safety. General Tool Safety. Fire Safety.

Topic 4 Introduction to the work of the Design Department

Types of Drawings Used in the Shop. Conventional and Metric Dimensioning. Dual Dimensioning. Coordinate Dimensioning. Information Included on Drawings: Materials, Surface Finishes, Tolerances. Work as CAD Technician.

Topic 5. Introduction to the Work of the Technical Control Department

Measurement tools and gages: Rules, The Micrometer Caliper, Vernier Measuring Tools, Gages, Dial Indicators, Helper Measuring Tools. Work as Quality Control Inspector.

Topic 6. Introduction to the auxiliary workshops. Tooling Workshops. Hand Tools

Clamping Devices. Pliers. Wrenches. Screwdrivers. Striking Tools. Chisels. Hacksaw. Files. Hand Reamers. Hand Threading. Hand Polishing.

Topic 7. Introduction to the auxiliary workshops. Tooling Workshops. Jig and Fixture

Jigs. Fixtures. Jig and Fixture Construction. Types of Jigs and Fixtures. Custom Jigs and Fixtures.

Topic 8. Introduction to the main workshops. Blanking shops

Layout Tools and Works. Casting shop. Forging shop. Work as Industrial Machinery Mechanic.

Topic 9. Introduction to the main workshops. Machining shops

Sawing and Cutoff Machines. Drilling and Drilling Machines. Offhand Grinding. Turning and Lathes. Milling and Milling Machines. Precision Grinding and Grinders. Band Machining and Broaching. CNC Machine tools. Work as CNC Programmer.

Topic 10. Introduction to the main workshops. Heat Treatment shops

Heat Treatment of Steel and other materials. Equipment for Heat Treatment. Hardness Testing. Work as Metallurgist.

Topic 11. Introduction to the main workshops. Assembly shops

Threaded Fasteners: Machine Screws, Machine Bolts, Cap Screws, Setscrews, Stud Bolts, Eye Bolts, Removing Broken or Sheared Bolts, Nuts, Inserts, Washers, Lock Washers, Liquid Thread Lock, Thread-Forming and Thread-Cutting Screws, Drive Screws. Nonthreaded Fastening Devices: Dowel Pins, Cotter Pins, Retaining Rings, Rivets, Keys. Adhesives: Types and Using.

Topics of the workshops

Topics of the laboratory classes

Self-study

Students' self-study is based on the educational literature, which allows them to work on theoretical and practical issues of the course. The course involves individual homework. Students are offered a list of topics in accordance with the subject matter of the course to prepare illustrative reports. A 5-10 minute presentation is intended to create the preconditions for a discussion in the student group. Consultations on issues related to this assignment or on theoretical issues of the discipline are held individually or for a group of students. Students are also recommended additional materials (videos, web-resources) for independent study and analysis

Course materials and recommended reading

Main references

1. John R. Walker, Bob Dixon. MachinLng fw1damentals. lOth edition. 2019
2. John R Walker. Machining Fundamentals: from Basic to Advanced Techniques. 2000.

Additional references
1. Jonathan Wickert and Kemper E. Lewis. An Introduction to Mechanical Engineering, Third Edition. 2013

Assessment and grading

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

Description of the final score structure, course requirements, and necessary steps to earn points, especially paying attention to self-study and individual assignments.

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-dobrochesnist/

Approval

Approved by	Date, signature	Head of the department Oleksandr PERMYAKOV
	Date, signature	Guarantor of the educational program Mykola PROKOPENKO