Національний технічний університет України
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ
імені ІГОРЯ СІКОРСЬКОГО»

Department of dynamics
and strength of machines and
resistance of materials

TECHNICAL MECHANICS

Working program of the academic discipline (Syllabus)

Details of the academic discipline	
Level of higher education	***First (undergraduate)***
Field of	*14 Electrical engineering*
knowledge	*141 Power engineering, electrical engineering and electromechanics*
Specialty	*"Management, protection and automation of energy systems"*
Educational program	*Normative*
Status of the	*full-time (full-*
discipline Form of study	*time) 1st year, fall semester*
Year of training,	*3 credits (90 hours)*
semester Volume of the discipline Semester control/ control measures	*test*
Class schedule	*36 hours - lectures, 6 p.m. – practical classes, 36 hours. - independent work*
Language of	*Ukrainian*
instruction Information about the course leader / teachers	Lecturer: *Khoroshev Kostyantyn Hryhorovych, Ph.D.-M.Sc., associate professor, khoroshev.kostiantyn@lll.kpi.ua* Practical: *Ph.D., associate professor, Khoroshev Kostiantyn Hryhorovych, khoroshev.kostiantyn@lll.kpi.ua;*
Placement of the course	*Training is through Google Classroom is given in the first lecture session* https://classroom.google.com/c/NTI3NzA0NDI5NTMz?cjc=w4fccup

Program of educational discipline

1. Description of the educational discipline, its purpose, subject of study and learning outcomes

"Technical mechanics" refers to general engineering academic disciplines. Technical content mechanics consists of the basic provisions of courses in the direction of mechanical engineering: theoretical mechanics, resistance of materials, theory of mechanisms and machines, parts of machines, basics of interchangeability, of standardization and technical measurements, materials science.

The purpose of the academic discipline "Technical Mechanics" is to form students of modern engineering thinking and systems of knowledge in the field of mechanical engineering, development of skills and abilities from the calculation of engineering structures and structures, parts and assemblies of machines, synthesis and analysis structural and kinematic diagrams of machines and machine units.

The object of the educational discipline is engineering structures common in engineering practice, mechanisms, machines and their interaction with the environment.

The subject of study of the academic discipline is the general patterns of mechanical interaction between components of engineering structures, mechanisms and machines and the environment.

The main task of "Technical Mechanics" is the assimilation of educational material by students, having mastered which students should demonstrate the following learning outcomes:

- understanding of mechanical processes taking place in individual nodes and parts of machines, as well as in machines as a whole, as a result of their operation;
- application of standardized engineering methods for calculating details of machines, their components and aggregates;

- analysis of factors that significantly affect the cost, reliability, durability of machines and their economic efficiency;
- synthesis of machines and their aggregates according to specified operational indicators;
- evaluation of the expediency of using machine parts, their units and aggregates according to criteria reliability, durability and their economic efficiency.

As a result of studying the academic discipline "Technical mechanics" the student will have formed the following competencies:

- the ability to analyze the structures of machines and the principles of their creation;
- the ability to read, draw up structural and kinematic diagrams of the most common mechanisms and machines;
- the ability to carry out standardized engineering calculations of machine parts, their components and aggregates;
- the ability to orientate in factors that significantly affect the cost price and their economic efficiency of machines and their components and parts;
- the ability to rationally synthesize machine parts and components.

Program competencies and results according to the educational program.

Program competencies (K) and results (PR)	
K	K02. Ability to apply knowledge in practical situations. K06. Ability to identify, pose and solve problems. K12. The ability to solve practical problems involving the methods of mathematics, physics and electrical engineering. K20. Awareness of the need to constantly expand one's own knowledge of new technologies in electric power, electrical engineering and electromechanics. K21. The ability to promptly take effective measures in emergency (emergency) situations in electric power and electromechanical systems.
PR	PR05. Know the basics of electromagnetic field theory, methods of calculating electric circuits and be able to use them to solve practical problems in professional activities. PR07. To carry out the analysis of processes in electric power, electrotechnical and electromechanical equipment, relevant complexes and systems PR19. Apply appropriate empirical and theoretical methods to reduce losses of electrical energy during its production, transportation, distribution and use.

2. Pre-requisites and post-requisites of the discipline (place in the structural and logical scheme of training according to corresponding educational program)

The academic discipline "Technical Mechanics" is based on the knowledge and skills that students have received as a result of studying school courses in mathematics and physics. On knowledge and skills, which students receive as a result of studying this discipline, academic disciplines are based of electromechanical direction, such as "Electric machines", "Electric drive".

3. Content of the academic discipline

Chapter 1. Theoretical foundations of calculations to ensure the functional ability of elements of technical objects.

Topic 1. Fundamentals of solid state statics.

1.1. Basic concepts and definitions of statics.
1.2. System of convergent forces.
1.3. Moment of force relative to a point and relative to an axis. 1.4. Parallel forces and pair of forces. Force pair system.
1.5. A system of forces located arbitrarily in one plane. 1.6. A system of forces arbitrarily located in space. 1.7. Examples of solving problems of statics.

Topic 2. Geometric characteristics of plane sections.

2.1. Static moments and center of gravity of sections.
2.2. Moments of inertia of plane sections and radius of inertia. 2.3. Main axes and main moments of inertia. 2.4. Moments of inertia of simple and complex forms of sections.
2.5. Examples of calculations.

Topic 3. General provisions on strength and stiffness calculations.

3.1. The main tasks of strength and stiffness calculations. 3.2. Structural elements of technical objects. 3.3. External forces and their classification. 3.4. Basic hypotheses and principles of the science of resistance of materials. 3.5. Internal efforts and the method of their determination. Types of simple deformations. 3.6. The concept of tension. Correlation between internal efforts and stresses. 3.7. Elastic deformations and their relationship with stresses. 3.8. Basics of stress theory. 3.9. General principles of strength calculations.

Topic 4. Experimental tests of structural materials under static load.

4.1 Tensile testing of materials. 4.2 Compression testing of materials 4.3 Permissible stresses in strength calculations.

Topic 5. Construction of charts of internal efforts.

5.1 General remarks on the construction of charts. 5.2. Plots of longitudinal forces in rods. 5.3. Epics of torque. 5 4. Plots of transverse forces and bending moments. 5.5. Characteristic features of constructing diagrams of transverse forces and bending moments. 5.6. Examples of building charts of internal efforts.

Topic 6. Central tension (compression) of a straight rod.

6.1. Stress in the cross sections of the rod during tension (compression). Strength conditions.
6.2. Deformations of the rod during tension and compression. Hooke's law. 6.3. Statically indeterminate problems for tension (compression) and methods of their solution.
6.4. Examples of calculations.

Topic 7. Shear deformation and torsion of rods.

7.1. Stresses and deformations during shear. Strength condition.

7.2. Torsional stress in the cross sections of a round rod. Torsional strength condition. 7.3. Hooke's law during torsion and
the stiffness condition. 7.4 Examples of shear and torsion
calculations.

Topic 8. Flat transverse bending of beams.

8.1. Normal bending stresses. 8.2. Tangential
stresses during bending. 8.3. Calculations
of beams for bending strength. 8.4. Examples of
calculations.

Topic 9. Basics of calculations of flexible threads.

9.1. Basic calculation dependencies for a suspended heavy thread. 9.2. Peculiarities
of calculations of wires of power transmission lines. 9.3. An example of the
calculation of a suspended power line.

Topic 10. Basic concepts of the theory of machines and mechanisms.

10.1. General definitions, structure and classification of mechanisms. 10.2.
Some common types of mechanisms. 10.3.
Problems of synthesis and analysis of mechanisms and machines.

Section 2. Designs and calculations of general purpose elements in technical facilities.

Topic 11. General information about the design of technical objects.

11.1. Basic provisions on design and construction. 11.2. Structural materials and
their mechanical characteristics.
11.3. The concept of reliability and durability of machines.
11.4 Technology and economy of machines and their parts. 11.5. Accuracy
of manufacturing machine parts.

Topic 12. Calculation and construction of connections of elements of machines and structures.

12.1. General information and designs of threaded connections. 12.2.
Calculations of threaded connections for strength. 12.3.
Keyed connections.
12.4 Welded joints.
12.5. Examples of connection calculations.

Topic 13. Mechanical transmissions of rotary motion.

13.1. Purpose, classification and kinematic schemes of mechanical transmissions. 13.2.
Kinematic and power relations for mechanical transmissions. 13.3. Example of
calculation of kinematic and power parameters of gears.

Topic 14. Belt drives.

14.1. General information and classification of belt drives. 14.2. Elements
of belt drives.
14.3. Elastic belt sliding and belt transmission kinematics. 14.4 Forces and
stresses in belt transmission circuits. 14.5. Selection and
calculation of belt transmission parameters. 14.6. Calculation of belt
gears for traction capacity and durability. 14.7. Features of the calculation of flat belt
gears. 14.8. Features of the calculation of V-belt gears. 14.9. Gear
and belt transmissions.

14.10. Example of calculation of belt transmission.

Topic 15. Chain transmissions.

15.1. General information and classification of chain transmissions.
15.2. Details of chain gears.
15.3. Basic calculation parameters of chain gears. 15.4
Performance criteria and calculation of chain gears. 15.5. An example
of chain transmission calculation.

Topic 16. General information about gears.

16.1. Application of gears and their classification. 16.2. Basics
of gearing theory. 16.3. Designs of gear
wheels and their accuracy. 16.4. Materials for the
manufacture and heat treatment of gears.
16.5. Types of tooth destruction and criteria for calculating the strength of gear
transmissions. 16.6. Permissible stresses in gear calculations.

Topic 17. Cylindrical gears.

17.1. Dimensional parameters of spur and helical gears. 17.2. Design
loads of teeth of cylindrical gears. 17.3. Calculation of active tooth surfaces for
contact endurance and strength. 17.4 Calculation of teeth for endurance and bending
strength. 17.5. Project calculation of cylindrical gears and
features of calculation of open gears. 17.6. An example of calculating a cylindrical gear.

Topic 18. Bevel gears.

18.1. Features of bevel gears. 18.2. The main
parameters of bevel spur gear. 18.3. Load on the tooth of
the bevel gear. 18.4 Calculations on the strength of bevel
spur gears. 18.5. An example of calculating a bevel gear.

Topic 19. Worm transmissions.

19.1. General information and features of worm gears. 19.2.
Dimensional parameters of worm transmission.
19.3. Kinematics and accuracy of manufacturing worm gears. 19.4
Materials and designs of worm gear parts. Workability and calculation criteria. 19.5.
Permissible
stresses in worm gear calculations. 19.6. Load on the teeth of the
worm wheel and transmission efficiency. 19.7. Calculations on the
strength of worm gear elements. 19.8. An example of calculating
a worm gear.

Topic 20. Axles and shafts.

20.1. General information. Designs and materials of axles and shafts.
20.2. Calculation schemes of shafts and axes. Calculation criteria.
20.3. Calculation of axles and shafts for static strength.
20.4 Calculation of axles and shafts for durability.
20.5. Project calculation of shafts and their construction. 20.6.
An example of calculating and designing a shaft.

Topic 21. Supports of shafts and axles.

21.1. Sliding bearings - general information, designs and materials of their elements. 21.2. Types
of destruction and calculations of sliding bearings. 21.3. Rolling
bearings: general information, classification and designs.

21.4 Designs of shaft supports with rolling bearings and their requirements. 21.5. Selection of rolling bearings according to static and dynamic load. 21.6. Calculated equivalent load on rolling bearings. 21.7. Examples of calculations of the service life of rolling bearings.

Topic 22. Elements of mechanical drives of machines.

22.1. General characteristics of machine drives 22.2. Engines in machine drives. 22.3. Drive clutches.

25.4. Reducers and motor-reducers in machine drives 25.5. An example of selecting a conveyor drive motor and gearbox.

4. Educational materials and resources

Basic:

1. Pavlishche V.T., Kharchenko E.V., Barvinskyi A.F., Harshnev Y.G. Applied mechanics. Study guide / Ed. V.T. Pavlishche - Lviv: "Intellect-West", 2004 - 368 p.

2. Pavlishche V.T. Fundamentals of design and calculation of machine parts: Tutorial. - 2nd edition. processing - Lviv: Afisha, 2003 - 560 p

3. Gulida E.M., Dzyuba L.F., Olkhovy I.M. Applied mechanics: Textbook / Ed. E.M. Gulids - Lviv: Svit, 2007 - 384 p.

Auxiliary:

1. Malashchenko V.O. Pavlishche V.T. Machine details. A collection of tasks and examples of calculations. - Lviv: "New World -2000", 2011 - 214 p.

2. Olkhovy I.M., Dzyuba L.F., Gulida E.M. Calculation and design of mechanical transmissions of the technological machine drive. - Lviv: LSU BZD, 2013 - 156 p.

3. Dmytrychenko M.F., Gonchar M.O., Nikolayenko V.A. Technical mechanics: tutorial. for students higher education closing - K.: NTU, 2018 - 364 p.

Educational content

5. Methods of mastering an educational discipline (educational component)

Lectures.

No	The name of the topic to which the lecture relates and a list of main questions, literature, independent student work (SRS)	Number hours aud./SRS
Chapter 1. Theoretical foundations of calculations to ensure the functional ability of elements technical objects.		
1	*Topic 1. Fundamentals of statics of solid bodies.* Basic concepts and definitions of statics. System of convergent forces. Literature: [1, p. 8-17] SRS. Get acquainted with the main types of elms and directions of their reactions. 2	2/0.5
	Topic 1. Fundamentals of solid state statics. Moment of force relative to a point and relative to an axis. Parallel forces and pair of forces. Force pair system. A system of forces located arbitrarily in one plane. A system of forces arbitrarily located in space. Literature: [1, p. 17-36] SRS. Familiarize yourself with examples of solving statics problems.	2/0.5

3	*Topic 3. General provisions on strength and stiffness calculations.* The main tasks of strength and stiffness calculations. Structural elements of technical objects. External forces and their classification. Basic hypotheses and principles of the science of resistance of materials. Internal efforts and the method of their determination. Types of simple deformations. Literature: [1, p. 42-49] SRS. Familiarize yourself with the types of simple deformations.	2/0.5
4	*Topic 3. General provisions on strength and stiffness calculations.* The concept of tension. Correlation between internal efforts and stresses. Elastic deformations and their relationship with stresses. Basics of stress theory. General principles of strength calculations. Literature: [1, p. 49-58] SRS. Familiarize yourself with the general principles of strength calculations.	2/0.5
5	*Topic 4. Static experimental tests of structural materials* *load* Tensile testing of materials. Compression testing of materials. Permissible stresses in strength calculations. Literature: [1, p. 58-64] SRS. Familiarize yourself with compression testing of materials.	2/0.5
6	*Topic 6. Central tension (compression) of a straight rod.* Stress in the cross sections of the rod during tension (compression). Strength conditions. Deformations of the rod during tension and compression. Hooke's law. Statically indeterminate problems for tension (compression) and methods of their solution. Examples of calculations. Literature: [1, p. 76-82] SRS. Familiarize yourself with examples of calculations.	2/0.5
7	*Topic 7. Shear deformation and torsion of rods.* Stresses and deformations during shear. Strength condition. Torsional stress in the cross sections of a round rod. Torsional strength condition. Hooke's law during torsion and the stiffness condition. Examples of shear and torsion calculations. Literature: [1, p. 83-87] SRS. Familiarize yourself with examples of calculations.	2/0.5
8	*Topic 8. Flat transverse bending of beams.* Normal bending stresses. Tangential stresses during bending. Calculations of beams for bending strength. Examples of calculations. Literature: [1, p. 83-87] SRS. Familiarize yourself with examples of calculations.	2/0.5
9	*Topic 10. Basic concepts of the theory of machines and mechanisms.* General definitions, structure and classification of mechanisms. Some common types of mechanisms. Problems of synthesis and analysis of mechanisms and machines. Literature: [1, p. 140-151] SRS. Familiarize yourself with some common types of mechanisms.	2/0.5
	Total for section 1: 18/4.5	
	Section 2. Designs and calculations of general purpose elements in technical facilities.	
10	*Topic 11. General information about the design of technical objects.* Basic provisions on design and construction. Construction materials and their mechanical characteristics. The concept of reliability and durability of machines. Technology and economy of machines and their parts. Literature: [1, p. 162-180] SRS. Technology and economy of machines and their parts.	2/0.5
11	*Topic 13. Mechanical transmissions of rotary motion.* 16.1. Purpose, classification and kinematic schemes of mechanical transmissions. 16.2. Kinematic and power relations for mechanical transmissions.	2/0.5

	16.3. Example of calculation of kinematic and power parameters of gears. Literature: [1, p. 216-221] SRS. Familiarize yourself with an example of calculating the kinematic and power parameters of gears.	
12	*Topic 16. General information about gears.* Application of gears and their classification. Basics of gearing theory. Designs of gear wheels and their accuracy. Literature: [1, p. 253-261] SRS. Familiarize yourself with the construction of gear wheels	2/0.5
13	*Topic 16. General information about gears.* Materials for the manufacture and heat treatment of gears. Types of tooth destruction and criteria for calculating the strength of gear transmissions. Permissible stresses in gear calculations. Literature: [1, p. 261-270] SRS. Familiarize yourself with the types of teeth destruction.	2/0.5
14	*Topic 17. Cylindrical gears.* Dimensional parameters of spur and helical gears. Design loads of teeth of cylindrical gears. Calculation of active tooth surfaces for contact endurance and strength. Calculation of teeth for endurance and bending strength. Project calculation of cylindrical gears and features of calculation of open gears. An example of calculating a cylindrical gear. Literature: [1, p. 270-283] SRS. An example of calculating a cylindrical gear.	4/1
15	*Topic 20. Axles and shafts.* General information. Designs and materials of axles and shafts. Calculation schemes of shafts and axes Calculation criteria. Calculation of axles and shafts for static strength. Calculation of axles and shafts for durability. Project calculation of shafts and their construction. An example of calculating and designing a shaft. Literature: [1, p. 311-326] SRS. An example of calculating and designing a shaft.	2/0.5
16	*Topic 21. Supports of shafts and axles.* Sliding bearings: general information, designs and materials of their elements. Types of destruction and calculations of sliding bearings. Rolling bearings: general information, classification and designs. Designs of shaft supports with rolling bearings and requirements for them. Selection of static rolling bearings and dynamic load. Calculated equivalent load on rolling bearings. Examples of calculations of the service life of rolling bearings. Literature: [1, p. 327-344] SRS. Examples of calculations of the service life of rolling bearings.	2/0.5
17	*Topic 22. Elements of mechanical drives of machines.* General characteristics of machine drives. Engines in machine drives. Drive clutches. Reducers and motor-reducers in machine drives. An example of selecting a conveyor drive motor and gearbox. Literature: [1, p. 345-365] SRS. Examples of calculations of the service life of rolling bearings.	2/0.5
	Total for section 2: 18/4.5	

Practical classes.

No	The name of the topic to which the practical lesson, literature, independent work of the student (SRS) refers	Number hours, aud./SRS
Chapter 1. Theoretical foundations of calculations to ensure the functional ability of elements technical objects.		
1	*Topic 1. Fundamentals of statics of solid bodies.* Equilibrium of the system of convergent forces. Literature: [1, p. 31-33] SRS. Solving practical problems. 2 *Topic 1.*	2/0.5
	Fundamentals of solid state statics. Equilibrium of an arbitrary planar system of forces. Literature: [1, p. 35] SRS. Solving practical problems.	2/0.5
3	*Topic 6. Central tension (compression) of a straight rod.* Examples of calculations. Literature: [1, p. 80-82] SRS. Solving practical problems.	2/0.5
4	*Modular control work, part I (according to practical lessons 1-3)* 5 *Topic 11. Basic concepts of the theory*	2/3
	of machines and mechanisms. General definitions, structure and classification of mechanisms. Literature: [1, p. 140-151] SRS. Solving practical problems.	2/0.5
	Total for section 1: Section	10/5
2. Designs and calculations of general purpose elements in technical facilities.		
6	*Topic 13. Mechanical transmissions of rotary motion.* 2/0.5 Calculation of kinematic and power parameters of gears. Literature: [1, p. 220-221] SRS. Solving practical problems.	
7	*Topic 16. General information about gears.* Calculation of transmission ratios of serial and planetary gear mechanisms. SRS. Solving practical problems.	2/0.5
8	*Modular control work, part II (for practical lessons 5-6-7) Total for chapter 2:*	2/3
		6/4
9	*Credit*	2/6

6. Independent work of the student

This section contains topics that are exclusively for the student's independent study.

The part of independent work related to the student's classroom work is specified in section 5.

No.	The name of the topic to which the student's independent work refers, literature	Number hours
Chapter 1. Theoretical foundations of calculations to ensure the functional ability of elements technical objects.		
1	*Topic 2. Geometric characteristics of plane sections.* Static moments and center of gravity of sections. Moments of inertia of plane sections and radius of inertia. Main axes and main moments of inertia. Moments of inertia of simple and complex forms of sections. Examples of calculations. Literature: [1, p. 36-43]	2
2	*Topic 5. Construction of charts of internal efforts.* General remarks on the construction of charts. Plots of longitudinal forces in rods. Epics of torque. Plots of transverse forces and bending moments.	2

	Characteristic features of constructing diagrams of transverse forces and bending moments. Examples of building charts of internal efforts. Literature: [1, p. 65-76]	
3	*Topic 9. Basics of calculations of flexible threads.* Basic calculation dependencies for a suspended heavy thread. Peculiarities of calculations of wires of power transmission lines. An example of a suspended calculation power line Literature: [1, p. 128-134]	2
	Total for section 1: 6	
	Section 2. Designs and calculations of general purpose elements in technical facilities.	
4	*Topic 12. Calculation and construction of connections of elements of machines and structures.* 2 General information and designs of threaded connections. Calculations of threaded connections for strength. Keyed connections. Welded joints. Examples of connection calculations. Literature: [1, p. 192-216]	
5	*Topic 14. Belt drives.* General information and classification of belt drives. Elements of belt drives. Elastic belt sliding and belt transmission kinematics. Forces and stresses in belt transmission circuits. Selection and calculation of belt transmission parameters. Calculation of belt gears for traction capacity and durability. Features of the calculation of flat belt gears. Features of the calculation of V-belt gears. Gear and belt transmissions. Example of calculation of belt transmission. Literature: [1, p. 230-252]	1
6	*Topic 15. Chain transmissions.* General information and classification of chain transmissions. Details of chain gears. Basic calculation parameters of chain gears. Workability criteria and calculation of chain gears. An example of chain transmission calculation. Literature: [2, p. 377-394]	1
7	*Topic 18. Bevel gears.* Features of bevel gears. The main parameters of bevel spur gear. Load on the tooth of the bevel gear. Calculations on the strength of bevel spur gears. An example of calculating a bevel gear. Literature: [1, p. 283-293]	1
8	*Topic 19. Worm transmissions.* General information and features of worm gears. Dimensional parameters of worm transmission. Kinematics and accuracy of manufacturing worm gears. Materials and designs of worm gear parts. Workability and calculation criteria. Permissible stresses in the calculations of worm gears. Load on the teeth of the worm wheel and transmission efficiency. Calculations on the strength of worm gear elements. An example of calculating a worm gear. Literature: [1, p. 293-311]	1
	Total for chapter 2:	6

Policy and control

7. Policy of academic discipline (educational component)

Rules for attending classes

Attendance at lectures and practical classes, as well as absence from them, is not evaluated. However, according to *the Rules of Internal Procedure of the National Technical University of Ukraine "Ihor Sikorsky Kyiv Polytechnic Institute" (https:// kpi.ua/ admin-rule)*

students are required to attend classes.

Rules of conduct in classes and control events

In classroom classes (lectures or practical classes), active participation of students is welcomed and it is required to turn off electronic devices, if this is not provided for in the plan
conducting classes.

At any control event, it is allowed to use literary sources in paper form from the list specified in section 4. It is forbidden to use electronic devices, unless it is provided for in the plan of the control event.

Standards of ethical behavior of students and employees are defined in Chapter 2 of the Code of Honor of the National Technical University of Ukraine "Ihor Sikorskyi Kyiv Polytechnic Institute". More details: https://kpi.ua/code.

Rules for assigning penalty and incentive points

The evaluation system is focused on encouraging students to timely perform control measures (express surveys and modular control works). Penalty points
is charged exclusively for untimely performance of the control measure, namely:

1) express survey - 1 point

2) modular control work (part I) - 5 points

3) modular control work (part II) - 5 points

The total number of penalty points cannot exceed 10 points.

Incentive points in the amount of up to 10 points can be received by a student for performing additional abstract and calculation work, which is agreed with the lecturer.

Missed control measures, rules of deadlines and rescheduling

All control measures are conducted in classes, so their timely performance is mandatory. If the student was absent without a good reason, which is documented, in the lesson in which the test is scheduled, or did not complete it, then he/she has the opportunity to take the test in another time agreed with the teacher responsible for this event. At the same time, penalty points are accrued for late execution in accordance with *the Rules for assigning penalty and incentive points* of this section.

If a student accumulates the maximum possible number of penalty points (10 points), he/she loses the opportunity to perform untimely control measures.

Control measures must be passed before crediting.

It is allowed to redo the control measure only if it is evaluated at 0 points. The score of a rescheduled test cannot exceed 60% of the maximum possible score for this test.

Academic integrity

The policy and principles of academic integrity are defined in Chapter 3 of the Code of Honor of the National Technical University of Ukraine "Ihor Sikorsky Kyiv Polytechnic Institute". More details: https://kpi.ua/code.

Studying in a foreign language

The academic discipline "Technical Mechanics" does not provide for its study in English.

Inclusive education

The academic discipline "Technical Mechanics" can be taught to most students with special educational needs, except for persons with severe visual impairments that do not allow

perform tasks using personal computers, laptops and/or other technical devices means

8. Types of control and rating system for evaluating learning outcomes (RSO)

Types of control

Current control. In order to diagnose the residual knowledge and skills of students individually topics and sections are express survey (ES) and two parts of a modular test (ICR).

Express surveys are aimed at checking the availability of knowledge of the lecture material acquired in learning process after key topics and cover their basic concepts.

Express surveys are conducted in the form of online tests in lecture classes and are provided service https://quizizz.com. If the lecture takes place in the classroom, then for conducting express survey, the student(s) must have a smartphone with an Internet connection. If the student does not have a smartphone with an Internet connection, he/she will be provided with one paper version of the express survey. A paper version of the express survey is possible only with the classroom form of education.

The announcement about the express control and the topics of its questions takes place a week before carrying out. Each online EO consists of 12 test questions that require a quick summary answers Each paper EO consists of 3 questions to which comprehensive answers must be given. The duration of one EO is 9 minutes.

The main task of the MKR is the diagnosis of practical abilities and skills. Each part of the MKR consists of 2 practical tasks, examples of which are discussed in previous practical classes. They are held at 7-9 and 15-16 weeks. The duration of one part of the MKR is 2 academic hours (one practical lesson).

Semester control - credit. The control task of this work consists of two theoretical tasks questions from the list provided in section 9 and one practical question, an example of which was considered in a practical lesson. The form of conduct is oral. It is held on the last one practical training. Duration – 2 academic hours (one practical session).

Calendar control: carried out twice a semester as a monitoring of the current state of implementation syllabus requirements.

A rating system for evaluating learning outcomes

The rating of a student in an academic discipline consists of the points he receives for:

a) performance of 10 EOs at lectures;

b) performance of MKR (part I) and MKR (part II) in practical classes on the 7th-9th and 15th-16th academic week.

Criteria for awarding points for execution of EO.

1. In the case of performing the EO online, each test question to which the correct answer is given is valued at 0.5 points. At the same time, the overall evaluation of the EO is formed according to the following criteria:

"perfectly":	11-12 correct answers	5.5-6 points;
"good":	9-10 correct answers	4.5-5 points;
"satisfactorily":	7-8 correct answers	3.5-4 points;
"unsatisfactory":	less than 7 correct answers	0 points.

2. If the EO is made in paper form, it is evaluated at a maximum of 6 points per criteria:

"excellent" - a complete answer, at least 90% of the required information - 5.5-6 points;

"good" - sufficiently complete answer, at least 75% of the required information or there are minor inaccuracies - 4.5-5 points;

"satisfactory" - an incomplete answer, at least 60% of the required information, contains some errors - 3.5-4 points;

"unsatisfactory" - the answer does not meet the conditions for "satisfactory" - 0 points.

Each part of the MKR of 20 points is evaluated according to the criteria

"excellent" - complete answer, at least 90% of the required information, (complete, error-free solution of tasks) - 19-20 points;

"good" - sufficiently complete answer, at least 75% of the required information or there are minor inaccuracies (complete solution of tasks with minor inaccuracies) - 15-18 points;

"satisfactory" - an incomplete answer, at least 60% of the required information (the task was completed with certain significant shortcomings) - 12-14 points;

"unsatisfactory" - the answer does not meet the conditions for "satisfactory" - 0 points.

Semester rating (sum of rating points received by the student during the semester) is transferred to the final assessment according to the table

Points	**Rating**
100...95	Perfectly
94...85	Very good
84...75	Good
74...65	Satisfactorily
64...60	Enough
Less than 60	Unsatisfactorily
Not performed conditions of admission	Not allowed

If the semester rating is less than 60, the student completes a credit test. IN in this case, the semester rating is the sum of points for the completion of both parts of the MKR and the assessment control work. It is transferred to the final assessment according to the given table.

The final test is worth 60 points, with each question worth 20 points according to the following criteria:

"excellent" - a complete answer (at least 90% of the required information), relevant justifications and a personal opinion are provided - 19-20 points;

"good" - sufficiently complete answer (at least 75% of the required information, minor inaccuracies) - 15-18 points;

"satisfactory" - incomplete answer (at least 60% of the required information, contains some errors) - 12-14 points;

"unsatisfactory" - unsatisfactory answer - 0 points.

A student who received more than 60 points in the semester, but wishes to improve his result, can take part in the credit control work. In this case, the semester rating consists of points obtained on the final test and points from both parts of the MKR.

The condition for a positive first certification is to obtain at least 20 points, for the second certification - to obtain at least 40 points. The condition for admission to credit is a semester rating of at least 35 points.

9. Additional information on the discipline (educational component)

The list of questions submitted for semester control coincides with the list of subtopics of the content of the academic discipline specified in section 3.

Working program of the academic discipline (syllabus):

Compiled by an associate professor of the Department of Dynamics and Strength of Machines and Resistance of Materials,
Khoroshev Kostyantyn Hryhorovych, Ph.D.-M.Sc., associate professor

Approved by the department of the department of dynamics and strength of machines and resistance of materials

(protocol No. 10 dated 31.05.2023)

Approved by the Methodical Commission of the Faculty of Electrical Engineering and Automation

(protocol No. 10 dated June 22, 2023)