



HISTORY OF SCIENCE AND TECHNOLOGY

Working program of the academic discipline (Syllabus)

Details of the academic discipline

Level of higher education <i>First (bachelor)</i> Field of knowledge	
<i>For all</i>	
Specialty <i>For all specialties</i>	
Educational program <i>For all educational and professional programs</i>	
Discipline status <i>Normative</i>	
Form of study <i>full-time (full-time)</i>	
Year of training, semester <i>1 course, autumn / spring semester</i>	
Scope of the discipline	<i>2 ECTS credits/ 60 hours (Lecture classes - 18 hours, seminar classes - 18 hours, Wednesday - 24 hours)</i>
Semester control/ control measures	<i>modular control work, credit</i>
Class schedule	<i>Lectures (once a fortnight starting from the 1st week), Seminar classes (once a fortnight preferably after the lecture)</i>
Language of instruction	<i>Ukrainian/ English</i>
Information about the course leader / teachers	<i>Responsible for the syllabus</i> <i>doctor of science, professor, faculty of history Tarnavskiy Ihor Stanislavovych,</i> Tarnavskiy.Ihor@ill.kpi.ua (head of the working group) <i>Lecturers, seminar: NPP of the Department of History, FSP</i> https://history.kpi.ua/department/academic-staff/
Placement of the course	<i>The courses are hosted on the remote platform "Sikorsky" using the platforms Moodle, Google classroom, etc. (separately for each faculty)</i>

Program of educational discipline

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

The educational discipline "History of Science and Technology" is developed on the basis of a combination humanitarian and natural knowledge, and therefore, unlike those worked out in the past and oriented mainly on the history of natural science and technology of "classic schemes", it is aimed at covering all forms of scientific knowledge - natural, technical and humanitarian. The study of this academic discipline is an important means of forming the scientific outlook of students, promoting the growth of their general erudition, and it is also an organic component of normative educational components of the cycle of general training studied at KPI named after Igor Sikorsky.

The syllabus of the study discipline "**History of Science and Technology**" is developed on the basis of the principle of constructive alignment (constructive alignment), which makes it possible to predict the necessary educational tasks and activities that students need to achieve the expected learning outcomes and to plan the educational process in such a way as to maximize the opportunities of students to achieve desired results.

The subject of study of the discipline "History of Science and Technology" is the genesis and regularities of the formation and development of world science and technology, the history of human activity in the scientific and technical sphere from the earliest times to the present in close relationship with global historical and cultural processes. "History of science and technology" is a science that develops dynamically and is constantly replenished with new knowledge, scientific concepts and facts.

The purpose of the discipline is to form students' ideas about the main stages, processes and events in the history of the development of science and technology from the earliest times to the present day and to form a holistic idea about the development of science and technology as a historical and cultural phenomenon; familiarization with history

the accumulation of scientific knowledge within the limits of certain branches of natural, social and humanitarian, technical sciences in accordance with specific historical stages of the development of mankind.

According to the educational and professional programs (OPP) of the first "bachelor's" level of higher education of education, after studying the discipline, students must acquire the following **competencies**:

- the ability to realize one's rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of a person and a citizen of Ukraine;
- the ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technology.

According to the decree of the rector of KPI named after Igor Sikorsky OPP of the first "bachelor's" level of higher education, as a result of mastering the academic discipline, students must demonstrate the results of their studies according to the matrix of ensuring **the programmatic results of the study** by the relevant components of the educational program.

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

In the structural and logical schemes of educational and professional training programs for specialists of the first (bachelor) level of higher education, the academic discipline "History of Science and Technology" is included in the list of normative disciplines aimed at the formation of general competencies
a specialist

Prerequisites – the academic discipline has an interdisciplinary nature and is taught in the 1st (2nd) semester of the 1st year of study from all educational programs of the first (bachelor) level of higher education and does not depend on other academic disciplines (credit modules) in the structural-logical scheme of the educational program.. The basis of the study of the academic discipline is the basic knowledge of world history, the history of Ukraine and other humanitarian, natural and exact disciplines acquired within the framework of general secondary education.

Post-requisites - this educational discipline forms students' skills / ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area of the corresponding OPP of the first (bachelor's) level of higher education.

3. Content of the academic discipline

Chapter 1. Historical aspects of the development of science and technology in the agrarian era.

Topic 1.1. Introduction. Theoretical and methodological foundations of "History of Science and Technology".

Topic 1.2. Accumulation of knowledge, technique and technology in prehistoric times and the age of ancient civilizations.

Topic 1.3. Technique of the Middle Ages. Scientific knowledge of the XVI-XVIII centuries.

Topics of independent work according to chapter 1.

The state of scientific knowledge before the ancient world.

Science, technology and culture in the ancient world.

The progress of human thought in the Middle Ages.

Chapter 2. Scientific thought and technological capabilities of mankind in the industrial era.

Topic 2.1. Development of technology and scientific knowledge in the mid-18th - 70s of the 19th century.

Topic 2.2. New discoveries in physical, mathematical and natural sciences on the border of the 19th and 20th centuries. Topic

2.3. The development of technology at the beginning of the 20th century. and during the First World War.

Topics of independent work according to section 2.

Scientific knowledge of the Renaissance.

Classical science of modern times (XVII - XIX centuries).

Technical progress and scientific knowledge in the 19th century.

Chapter 3. Determining trends in the development of science and technology in the information age.

Topic 3.1. World science and technology in the 1920s-1940s.

Topic 3.2. Development of science and technology in the second half of the 20th - at the beginning of the 21st century.

Topic 3.3 History of the origin and development of engineering education and technical sciences. Generalization to the course.

Topics of independent work according to chapter 3.

Scientific and technical development in the 20th century.

Science of Ukraine at different stages of formation.

The main trends and prospects for the development of science in the 21st century.

4. Educational materials and resources

Basic and additional literature (hereinafter referred to as literature) is used to prepare for lectures, seminars, modular test work (consists of three parts), independent work, etc. The literature that must be used to master the discipline is developed by students independently using Internet resources, Google classroom. Under the conditions of distance learning, you can use literature that is placed in electronic form on university and external media. Architectural elements (memorial plaques, panels, sculptures, bas-reliefs, etc.) placed on the territory of the university campus are used as visual demonstration materials from the academic discipline.

4.1 Basic literature.

1. History of science and technology: education. manual for foreign students / I.A. Dychka, S.O. Kostyleva, S.Yu. Boyeva and others. - K.: NTUU "KPI", 2015. - pp. 3-10, 11-14, 35-38, 61-73, 101-115, 139-152, 180-194, 222-239, 269-285.
2. History of science and technology: education. manual / R. V. Gula, I. G. Perederii, O. V. Vitrynska, L. B. Harashchenko. – Kyiv: Karavela, 2020. – pp. 10-22, 24-48, 50-59, 60-75, 76-93, 95-105, 106-116, 117-125, 127-141, 142-172, 173-178.
3. History of science and technology: a study guide for students / I.K. Lebedev, L.R. Ignatova, A.I. Makhinko; KPI named after Igor Sikorsky. – Kyiv: KPI named after Igor Sikorsky. Publication "Polytechnic", 2021. - pp. 4-10, 11-21, 22-32, 33-48, 49-60, 61-74, 75-90, 91-109, 110-124.
4. History of science and technology: study guide / O.O. Melnyk, O.I. Orach. – Melitopol: FD-Odnorig T.V., 2018. – pp. 11-22, 24-83, 86-112, 115-124, 124-131, 134-168, 170-181, 181-192, 195-254.
5. Larin A. O. History of science and technology: textbook / A. O. Larin; Kharkiv: NTU "KhPI", 2021. - P. 6-14, 15-106, 107-169, 170-211, 212-238, 254-276.
6. Mykhailychenko O.V. Essays on the history of science and technology: a study guide for students of humanitarian specialties / O.V. Mykhailichenko. - East Finchley London, GlobeEdit, 2023. - P. 11-33, 34-64, 65-83, 84-150, 153 - 201, 210 - 277, 280-350.
7. Lebedev I.K. History of science and technology. Organization of independent work of students on the study of the discipline: teaching-method. study materials. f-th example. we have / I.K. Lebedev, L.R. Ignatova. – Kyiv: KPI named after Igor Sikorskyi, "Polytechnic" publishing house, 2022. - 24 p.

4.2. Additional literature.

8. Annenkova N.G. Stages of the development of the machine-tool industry in Ukrainian lands since the end of the 19th century. until the 1940s [Electronic resource] / N. G. Annenkova. // History of science and biography: electronic. of science profession. view. : between subject coll. / National of science s.-g. b-ka Nats. Acad. agrarian of Sciences of Ukraine. – Kyiv, 2019. – Issue 2. – Access mode: http://nbuv.gov.ua/UJRN/INB_Title_2019_2_10
9. Bynum V. Short history of science / trans. English Natalia Yatsyuk. - K.: Nash format, 2023, - 272
10. Kolesnyk K. E. History of science and technology in the ancient world (ancient Greek and Hellenistic periods) [Electronic resource]: lecture notes on the discipline "History of science and technology" /

- K. E. Kolesnyk. – Kharkiv: UkrDUZT, 2019. – pp. 4-25, 27-32, 33-43. – Access mode: <http://lib.kart.edu.ua/handle/123456789/2115>
11. Melnyk O.O. Synopsis of lectures on the discipline "History of Science and Technology" for higher education degree holders "Bachelor" in the specialty 208 "Agroengineering" correspondence form of study - Melitopol, / O.O. Melnyk, – Melitopol: FOP Odnorog T.V., – 2021. – P. 5 – 19, 21 – 60, 62 – 77, 79 – 90, 93 – 127, 129 – 173.
 12. Scientific and technical revolution of the New times [Electronic resource] // History of science and technology: education. manual / R. V. Gula, I. G. Perederii, O. V. Vitrynska, L. B. Harashchenko. – Kyiv, 2020. – P. 76–93. – Access mode: <http://reposit.nupp.edu.ua/handle/PoltNTU/6703>
 13. Titova O.O. History of science and technology: study guide for higher education bachelor's degree holders "Information systems and technologies". / O.O. Titova. – Zaporizhzhia: Zaporizhzhia National University, 2021. – P. 6 – 21, 27-39, 45 – 56, 60 – 71.

4.3. Information resources.

1. <http://www.nas.gov.ua> – Center for research of scientific and technical potential and history of science named after G. M. Dobrova.
2. <http://www.nbu.gov.ua/portal/natural/nnz/index.html> - Website of the National Library of Ukraine named after V. I. Vernadskyi, archive of the international scientific journal "Science and Science".
3. http://pamjatky.org.ua/?page_id=685 – Archive of issues of the journal "Questions of the History of Science and techniques".
4. <http://www.epochtimes.com.ua/science/> – The Great Epoch. Science.
5. <http://www.history.com.ua/index.shtml> – Ukrainian historical portal.
6. <http://s-osvita.com.ua> – Modern education in Ukraine and abroad.
7. <http://surl.li/ajmrb> <http://surl.li/ajmqv> - Development of computer technology
8. http://ukrainiancomputing.org/PHOTOS/Memorial_u.html – History of the development of information technologies in Ukraine. European virtual computer museum.

Educational content

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

Nine lectures and nine seminar classes are planned for the study of the academic discipline, during which students must complete a modular control work (in 3 parts) and express control or creative works (tests during distance learning).

The following **teaching methods** are used during the study of the educational material :

Method code teaching	Teaching method	Recommended when conducting	
		Lecture classes	Seminars classes
MN 1	Explanatory and illustrative method or informational and receptive (video method in combination with the latest information technologies and computer learning tools (distance, multimedia, web-oriented, etc.))	+	+
ÿÿ 2	Verbal method (lecture, conversation, instruction, etc.) Visual	+	+
ÿÿ 3	method (method of illustrations and demonstration method) Discussion	+	+
MN 4	method Business	+	+
MN 5	game (method of active creative learning) Semi-		+
MN 6	exploratory, or heuristic, method (organization of an active search for a solution to the set cognitive tasks)		+
MH 7	Method of problem presentation (to the presentation of the material: a problem is posed - a task is formed on the basis of various sources and means. The method of solving the problem is considered in the lesson).		+

Code method teaching	Teaching method	Recommended when conducting	
		Lecture classes	Seminars classes
MN 8	Research method (independent research work from literary and informational sources / tasks, etc. and analysis of material / task).		+

Distribution of classroom hours by course topics and the calendar plan for their implementation.

Names of sections and topics	Lectures		Seminary		Assessment
	Year - we	Weekly no	Year-Weeks we	Weeks no	
Chapter 1. Historical aspects of the development of science and technology in the agrarian era					
Topic 1.1. Introduction. Theoretical and methodological foundations of "History of science and technology"	2	1	2	2	Seminar class
Topic 1.2. Accumulation of knowledge, technique and technology in prehistoric times and the age of ancient civilizations	2	3	2	4	Express control of lectures. Seminary occupation
Topic 1.3. Technique of the Middle Ages. Scientific knowledge of the XVI-XVIII centuries.	2	5	1.4	6	Seminar class
<i>Modular control work No. 1.1 Topics of independent work according to chapter 1.</i>			0.6		MKR-1
The state of scientific knowledge before the ancient world					
Science, technology and culture in the ancient world					
The progress of human thought in the Middle Ages					
Together by chapter 1	6		6		
Chapter 2. Scientific thought and technological capabilities of humanity in the industrial era					
Topic 2.1. Development of technology and scientific knowledge in the mid-18th - 70s of the 19th century.	2	7	2	8	Seminar class
Topic 2.2. New discoveries in physical, mathematical and natural sciences on the border of the 19th and 20th centuries.	2	9	2	10	Express control of lectures. Seminary occupation
Topic 2.3. The development of technology at the beginning of the 20th century. and during the First World War.	2	11	1.4	12	Seminar class
<i>Modular control work No. 1.2 Topics of independent work according to chapter 2.</i>			0.6		MKR-2
Scientific knowledge of the Renaissance					
Classical science of modern times (XVII - XIX centuries)					
Technical progress and scientific knowledge in the 19th century					
Together according to chapter 2	6		6		
Chapter 3. Determining trends in the development of science and technology in the information age					
Topic 3.1. World science and technology in the 1920s-1940s year	2	13	2	14	Seminar class
Topic 3.2. Development of science and technology in the second half of the 20th - at the beginning of the 21st century.	2	15	2	16	Express control of lectures. Seminary occupation
Topic 3.3 History of the origin and development of engineering education and technical sciences. Generalization to the course.	2	17	1.3	18	Seminar class
<i>Modular control work No. 1.3 Topics of independent work according to chapter 3.</i>			0.7		MKR-3
Scientific and technical development in the 20th century.					

Names of sections and topics	Lectures		Seminary		Assessment
	Year - we	Weekly no	Year-Weeks we	no	
Science of Ukraine at different stages of development					
The main trends and prospects for the development of science in the 21st century					
Total by section 3 Credit	6		6		
Total			(2)		
hours	18		18		

The correspondence of teaching and assessment methods is reflected in the rating system of assessment, which provides for: creative tasks, express control works, modular control work, final assessment.

5.1. Lecture classes.

No s/p	The name of the topic of the lecture and a list of main questions
1	<p>Introduction. Theoretical and methodological foundations of "History of science and technology".</p> <p><i>List of main questions:</i></p> <ol style="list-style-type: none"> 1. Subject, purpose, tasks and structure of the course. 2. Sources, methodology of the history of science and technology. 3. Forms of interaction of natural, physical, mathematical and technical sciences. 4. The place and significance of the history of science and technology in the life of an individual, society and the state.
2	<p>Accumulation of knowledge, technique and technology in prehistoric times and the age of ancient civilizations.</p> <p><i>List of main questions:</i></p> <ol style="list-style-type: none"> 1. The appearance of simple tools. Use of fire and methods of obtaining it. 2. Invention of the bow and arrows. Emergence of complex tools. Neolithic revolution. 3. The use of metals in the production process and the separation of crafts from agriculture. 4. Technical achievements of ancient civilizations and the Ancient world. <p>Emergence of separate branches of rational knowledge.</p>
3	<p>Technique of the Middle Ages. Scientific knowledge of the XVI-XVIII centuries.</p> <p><i>List of main questions:</i></p> <ol style="list-style-type: none"> 1. Development of agricultural, handicraft, mining and construction technology. 2. Scientific and technical achievements of the countries of Central Asia and the Far East during the Middle Ages. 3. Manufactures, inventions and the first machines. Scientific knowledge of the XVI-XVIII centuries.
4	<p>Development of technology and scientific knowledge in the mid-18th - 70s of the 19th century.</p> <p><i>List of main questions:</i></p> <ol style="list-style-type: none"> 1. Causes, beginning and stages of the industrial revolution of the late 18th - 70s of the 19th century. 2. The development of metallurgy, the emergence of mechanical engineering, a revolution in transport and means of communication. 3. Development of physical and mathematical sciences and creation of classical natural science. <p>New</p>
5	<p>discoveries in physical, mathematical and natural sciences on the border of the 19th and 20th centuries.</p> <p><i>List of main questions:</i></p> <ol style="list-style-type: none"> 1. Development of mathematics and astronomy. 2. Fundamental discoveries in physics. 3. Chemistry, geology, mechanics and biology are at the forefront of scientific and technological progress. <p>The development of technology</p>
6	<p>at the beginning of the 20th century. and during the First World War.</p> <p><i>List of main questions:</i></p> <ol style="list-style-type: none"> 1. Electrical engineering as the basis of a new stage of industrial development.

No s/p	The name of the topic of the lecture and a list of main questions
	2. Application of new technologies in the metallurgical, chemical and machine-building industries. 3. New types of transport, communication and construction methods. 4. Military equipment during the First World War.
7	<p>World science and technology in the 1920s-1940s.</p> <p><i>List of main questions:</i></p> <p>1. Electric power, metallurgy, chemical industry and mining as the basis of technical and technological achievements of the first half of the 20th century. 2. Peculiarities of the development of mechanical engineering in the interwar period and during the Second World War. 3. Creation of jet aircraft and rocket technology. 4. Electronics is a step into the future. The beginning of the atomic era.</p>
8	<p>Development of science and technology in the second half of the 20th - at the beginning of the 21st century. <i>List</i></p> <p><i>main questions:</i></p> <p>1. Electric power engineering and electrical systems. 2. Metallurgy, chemical technologies and mechanical engineering. 3. Transport development. Astronautics. 4. Electrical engineering and communication. Computer systems.</p>
9	<p>The history of the emergence and development of engineering education and technical sciences</p> <p><i>List of main questions:</i></p> <p>1. Origin and development of education and scientific research. 2. Development of technical sciences and engineering. 3. Creation of technical educational institutions and development of technical education in Ukraine. 4. KPI named after Igor Sikorsky: history and modernity.</p>

5.2. Seminar classes.

The main tasks of the cycle of seminar classes:

The purpose of the seminar classes is to contribute to the in-depth assimilation and consolidation of problematic theoretical issues of the academic discipline; to form in students the ability to work with historical, socio-political, scientific and educational and methodological literature, to promote the development of language culture, logical thinking, general personality culture taking into account the specialty chosen by the student, as well as the skills to prepare speeches, formulate and defend one's position, take active participation in the discussion, making scientifically based assessments of the achievements of the past and current level of historical and cultural development; generalize, critically interpret and adequately evaluate foreign and domestic historical and cultural experience accumulated in history.

No. z/p	Name of the subject of the lesson
1	<p>History of science and technology as a scientific and educational discipline.</p> <p><i>It is expected that students will prepare a report / presentation, express their own opinion with justification of the following questions:</i></p> <p>1. History of science and technology as a science and educational discipline. Sources and historiography. 2. Methodology of the history of science and technology and methods of mastering the discipline. 3. Models of periodization of the history of science and technology. 4. Features of the development of historical-scientific and historical-technical research in Ukraine.</p> <p>Tasks on SRS.</p> <p>1. History of science and technology is a complex interdisciplinary and interactive discipline. 2. Science and technology in the context of material and spiritual culture of Ukraine.</p>

No. z/p	Name of the subject of the lesson
2	<p>Development of technology of ancient civilizations and accumulation of scientific knowledge. <i>It is expected that students will prepare a report / presentation, express their own opinion with justification of the following questions:</i></p> <ol style="list-style-type: none"> 1. The discovery of fire by man and the invention of various means of its extraction. 2. Invention and use of the bow and arrows. 3 The emergence of agriculture based on complex tools. 4. The beginning of the use of metals in the production process. <p>Tasks on SRS.</p> <ol style="list-style-type: none"> 1. Origin and development of mining in ancient times. 2. Features of construction in the countries of the East (Egypt, China, India, Japan). 3. Military equipment of ancient times. 4. Mathematical and natural knowledge of ancient civilizations.
3	<p>Features of the development of production and technology in the Middle Ages. <i>It is expected that students will prepare a report / presentation, express their own opinion with justification of the following questions:</i></p> <ol style="list-style-type: none"> 1. Medieval workshops and their influence on the development of production. 2. Scientific and technical achievements of the countries of the Middle and Far East during the Middle Ages. 3. Features of the emergence of manufacturing production. 4. Development of natural science during the Late Middle Ages <p>Tasks on SRS.</p> <ol style="list-style-type: none"> 1. Blast furnace production in the XIV–XVI centuries. 2. Beginning of book printing. 3. A water wheel is a manufactured engine. 4. Outstanding scientists of the Middle Ages: L. da Vinci, N. Copernicus, J. Bruno, H. Galileo, Y. Kepler, G.V. Leibniz, Sh.-F. Dufet
4	<p>The development of science and technology in the era of the industrial revolution. <i>It is expected that students will prepare a report / presentation, express their own opinion with justification of the following questions:</i></p> <ol style="list-style-type: none"> 1. Industrial revolution in England. Invention of the steam engine. 2. The emergence of mechanical engineering. 3. Technological revolution in transport. 4. Creation of classical natural science. <p>Tasks on SRS.</p> <ol style="list-style-type: none"> 1. Development of the metallurgical industry. 2. Technical revolution in means of communication. 3. M. Faraday: life and activity
5	<p>Discovery in the physical, mathematical and natural sciences of the last quarter of the 19th century Art. <i>It is expected that students will prepare a report / presentation, express their own opinion with justification of the following questions:</i></p> <ol style="list-style-type: none"> 1. Fundamental discoveries in physics. 2. Development of mathematics. 3. Chemistry at the forefront of scientific and technological progress. 4. Emergence of new branches of mechanics. <p>Tasks on SRS.</p> <ol style="list-style-type: none"> 1. New trends in the development of astronomy at the end of the 19th century. 2. Invention of the internal combustion engine and its importance. 3. O. Liliental: life and activity.
6	<p>The development of technology at the beginning of the 20th century. <i>It is expected that students will prepare a report / presentation, express their own opinion with justification of the following questions:</i></p> <ol style="list-style-type: none"> 1. Electricity is the basis of industrial development. 2. Application of new technologies in mechanical engineering.

No. z/p	Name of the subject of the lesson
	<p>3. Features of the creation of the oil industry. 4. Development of aviation in the first decades of the 20th century.</p> <p>Tasks on SRS.</p> <ol style="list-style-type: none"> 1. Metallurgical production technologies of the beginning of the 20th century. 2. Beginning of creation and use of artificial materials. 3. Academician O. Krylov and his contribution to the development of shipbuilding. 4. New equipment on the fields of the First World War.
7	<p>Science and technology in the interwar period (20-40s of the XX century)</p> <p><i>It is expected that students will prepare a report / presentation, express their own opinion with justification of the following questions:</i></p> <ol style="list-style-type: none"> 1. Development of mining in the 20s-40s of the 20th century. 2. Mechanical engineering in the interwar period. 3. Creation of jet aircraft. 4. Nuclear physics in the 1920s-1940s. <p>Tasks on SRS.</p> <ol style="list-style-type: none"> 1. The influence of the development of the electric power industry on the production of electrical equipment. 2. Development of non-ferrous metallurgy in the 1920s-1940s. 3. Creation and use of rockets on solid and liquid fuel. 4. The beginning of the era of television.
8	<p>Development of science and technology in the second half of the 20th century.</p> <p><i>It is expected that students will prepare a report / presentation, express their own opinion with justification of the following questions:</i></p> <ol style="list-style-type: none"> 1. Development of electric power industry. 2. Stages of development of computer technology. 3. Space exploration. Space astronomy. 4. New directions of transport development <p>Tasks on SRS</p> <ol style="list-style-type: none"> 1. Academician S. Lebedev and his contribution to modern science. 2. S. Korolev: life and activity. 3. "He was the first to step on the moon": N. Armstrong.
9	<p>Development of science and technology at the beginning of the 21st century.</p> <p><i>It is expected that students will prepare a report / presentation, express their own opinion with justification of the following questions:</i></p> <ol style="list-style-type: none"> 1. New directions of development of electric power industry. 2. Development of computer technology and digital technologies. 3. Modern space programs. 4. New directions for the development of ecological transport <p>Tasks on SRS.</p> <ol style="list-style-type: none"> 1. "Hubble" discovers the depths of the universe. 2. Creation of computer equipment in Ukraine. 3. Professional and sociocultural portrait of a modern Ukrainian engineer.

Distance learning platform:

For better assimilation of the material of the educational discipline in the period of remote work, e-mail, the distance learning platform "Sikorsky" based on the Google Classroom system and the platform for holding online meetings Google Meet and ZOOM are used.

by means of which:

- placement of methodical recommendations, educational materials, and literature is simplified etc;
- feedback is provided to students regarding educational tasks and content academic discipline;
- completed tasks are checked and evaluated;
- keeping records of the students' implementation of the study plan, adherence to the schedule submission of educational/individual tasks and their assessment

6. Independent work of the student.

Independent work includes: preparation for lectures and seminar classes; to participate in the discussion of the relevant topic; self-control of acquired knowledge; development of recommended sources and literature; creation of presentations (on request) to visually accompany the report; preparation for the performance of modular control work (three parts are provided); preparation for the test, etc.

6.1. Topics for independent study (each topic is allocated up to 1.5 hours):

No. z/p	The name of the topic submitted for independent processing
1.	The state of scientific knowledge before the ancient world
2	Science, technology and culture in the ancient world
3	Progress of human thought in the Middle Ages.
4	Scientific knowledge of the Renaissance.
5	Classical science of the modern age (XVII - XIX
6	centuries). Technical progress and scientific knowledge in the XIX century.
7	Scientific and technical development in the 20th century.
8	Science of Ukraine at different stages of development.
9	The main trends and prospects for the development of science in the 21st century

6.2. *Preparation for lectures and seminars.* To prepare for lectures and seminars, the student needs to study the planned basic and auxiliary literature, recommended sources and prepare material for discussion in classes. For this, the student is allocated approximately 1 hour for each topic of the discipline.

6.3. *Modular control work.* Up to 2 hours of study time are allocated to preparation for the MKR (up to 0.6 hours of study time for each of the three parts). A list of questions for preparation for the MKR is provided in **Appendix B**. 6.4. *Test.* Assessment

is conducted during the semester control period (assessment week), at the end of the academic semester after the students have written a modular assessment paper (consists of three parts) based on the results of the rating points for the semester or by the teacher's decision, the assessment paper is written. 6 hours of SR are allotted for preparation for the test. The list of questions for preparing for the test is provided in **Appendix A**. During the distance learning period, the test can be conducted according to the class schedule using Google Classroom and the Google Meet and ZOOM online meeting platforms.

Policy and control

7. Policy of academic discipline (educational component)

Students are advised to follow the rules of attending classes and behavior on them

7.1. Rules for attending classes:

Lectures. Today, the rapid growth of new scientific knowledge, the formation of the latest scientific concepts and the relentless development of technology significantly outpace the process of creating modern educational publications. Therefore, it is very important for students to attend lectures where modern, systematized educational material will be covered, and scientific presentations will be demonstrated in an amount sufficient for the student to master the academic discipline. It will be difficult for a student to properly prepare for a seminar class, perform an express control, prepare a report or theses for a student scientific conference if he does not attend lectures. Seminar classes. Students are recommended to attend seminars, because the final rating score largely depends on the results of the seminar classes.

The active participation of the student in the seminar classes is mandatory: the student's rating will be largely formed by the results of his work in the seminar classes. Absence from seminar classes or lack of preparation for them leads to a decrease in the final rating in the academic discipline.

7.2. Rules for performing tasks:

Working out the educational material of the academic discipline "Ukraine in context historical development of Europe", students:

1) at lectures:

- perform periodic express control of residual knowledge from sections of the academic discipline, which may include the performance of either three creative tasks on debatable issues or express test tasks (within 5–10 minutes using tests on the Sikorsky platform); - participate in discussions.

2) at seminar classes:

-
- prepare reports according to their own plan based on the study of sources and literature with obligatory reference to them. It is desirable to accompany the reports with self-prepared presentations.
 - participate in discussions on problematic issues of the course, make their own analysis and generalization of scientific information;
 - substantiate their formulated own positions and their position;
 - perform modular control work using the Sikorsky platform.

Tasks and materials for conducting express controls / creative tasks are formed by the teacher on the basis of educational material and are submitted in Google Classroom or in another form.

7.3. Rules of behavior in classes.

While studying the material of the "History of Science and Technology" subject, students listen carefully to the lecturer at lectures and, if necessary, write down important information. The teacher will talk about the regularities of the formation and development of world science and technology, the history of human activity in the scientific and technical sphere from the earliest times to the present in close connection with global historical and cultural processes. Dialogue between students and the teacher in the form of questions and answers is allowed.

At seminar classes, students make oral presentations and announce them, demonstrate presentations, express their own opinion on the topic, participate in discussions. When searching for information on the Internet, it is recommended to use reliable and verified sources. The student's work involves participation in interactive forms of organizing an educational session (providing answers to questions posed by the teacher or students). Each student is expected to be prepared for all issues of the seminar plan, to complement the presentations of other students and to express their own opinion during thematic discussions. Students are allowed to use their own written notes and notes. It is allowed to use laptops, tablets, phones for educational purposes. At the same time, you should try to express your opinion independently, and not read other people's texts. The teacher critically analyzes the delivered reports, comments on mistakes made, moderates discussions between students.

The topics of lectures and seminars are covered in the work program of the discipline (syllabus), which is posted on the Electronic Campus, on the website of the Department of History, on the Sikorsky platform (Moodle, Google Classroom).

7.4. Incentive and penalty points

Incentive points

Students are encouraged to engage in scientific research and publicize its results, in particular to participate in the All-Ukrainian Student Scientific and Practical Conference "Ukraine:

history, culture, memory", which is organized annually by the Department of History of the Igor Sikorsky Kyiv Polytechnic Institute. Theses delivered at the conference on the subject of the academic discipline are evaluated with a maximum of + 10 points. Students together with the teacher determine the topic of theses, available sources and literature. Also under the guidance of the teacher, students familiarize themselves with the design requirements and submit theses to the conference.

Students are encouraged to participate in the annual "History of Ukraine" Olympiad (provided more than 80% of correct answers + 8 points).

Performing a creative task (for example, writing an essay recommended by the teacher film) (maximum + 8 points).

Other tasks and scientific projects.

Penalty points -

Untimely performance of MKR (at an unscheduled lesson) - 5 points.

- Violation of integrity policy (use of material without appropriate references, presentation of someone else's work as one's own) - 8 points.

However, according to the provisions of <https://osvita.kpi.ua/node/37> clause 2.7, the amount of incentives / penalty points cannot exceed 10% of the rating scale.

7.5. Policy of deadlines and rescheduling.

Processing of missed lecture material takes place through increased preparation for seminar classes. Missed seminar classes can be worked up at consultations by answering questions from missed seminars. To retake missed modular tests and/or express tests, the student needs to contact the teacher who organizes the retaking of the MKR.

7.6. University policy

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>

Norms of ethical behavior.

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 Sikorsky Kyiv Polytechnic Institute". More details: <https://kpi.ua/code>

8. Types of control and rating system for evaluating results training (RSO)

Current control: is carried out during training sessions and aims to check the level of preparation of students for training sessions. During the seminars, a survey of education seekers is conducted on the issues of the topic. The modular control work is carried out three times a semester as a control of residual knowledge from three sections of the academic discipline. Express control in written form is conducted during lectures three times per semester.

Calendar control: conducted twice a semester as a monitoring of the current state of fulfillment of the syllabus requirements. There are two possible calendar control results: certified (a) and non-certified (n/a). The result depends on the number of points scored at the time of the calendar control in accordance with the requirements of KPI named after Igor Sikorsky.

Semester control: assessment

Evaluation and control measures

The student's rating in the discipline consists of points obtained for:

1) control of residual knowledge from 2 sections of the discipline and includes the performance of three creative tasks on discussion questions or express test tasks (within 5-10 minutes using tests on the "Sikorsky" platform); 2) work on 9 seminar classes; 3) modular control work

Student work:

- determines 45% of his rating in the discipline in nine seminar classes;
- control of residual knowledge from sections determines 18% of his rating from the discipline;
- the modular control work determines 37% of his rating in the discipline.

In order to receive the highest rating, a student needs to take an active part in seminar classes, deliver properly prepared and reasoned oral presentations on seminar issues, actively supplement the answers of other students, clearly and logically express his own position on debated issues, timely complete MKR and express control. The student is given a one-time opportunity to complete the MKR and express control.

A decrease in a student's rating leads to: non-fulfillment of the MCR and express controls; improper preparation for seminars; inaccuracies, incompleteness, errors in answers or basing on unreliable historical sources.

The teacher evaluates the student's work in each seminar session and assigns points for the work in the seminar sessions and the results of the MKR and express controls to the "Current control" module of the Electronic Campus. The results of the first and second calendar control depend on the student's current rating and are entered by the teacher in the "Calendar control" module of the Electronic Campus in the eighth and sixteenth weeks of study, respectively (see **Appendix C**)

The student can appeal the teacher's assessment by submitting a corresponding complaint to the teacher no later than the next day after the student has been informed of the teacher's assessment. The complaint will be processed according to the procedures established by the university.

Conditions for admission to the semester control: Availability of points not less than 40 points, implementation of the ICR is no less than "sufficient".

Table of correspondence of rating points to grades on the university scale:

<i>Number of points</i>	<i>Rating</i>
100-95	Perfectly
94-85	Very good
84-75	Good
74-65	Satisfactorily
64-60	Enough
Less than 60	Unsatisfactorily
Admission conditions not met	Not allowed

9. Additional information on the discipline (educational component).

NPPs can make clarifications to content modules, RSO and MKR tasks, respectively to the form of study chosen by the students and their own methodological developments.

The recommended list of questions for the semester control (credit) is provided in **Appendix A** to the syllabus.

If the student has documents confirming his participation in olympiads and scientific conferences (city, intercity, All-Ukrainian, etc.) on the topic of a seminar class or section of an academic discipline, students can be enrolled according to the corresponding topic and the corresponding points of RSO.

Recommendations for students

While working at lectures, the student should write down the main terms and concepts, record the main events of the proposed topic, summarize the generalizations and conclusions he makes

teacher. This material will be useful when preparing for a seminar class, MKR, express controls.

While preparing for the seminar class, the student must study the lecture material of a certain topic, it is desirable to get acquainted with additional resources on the network. If questions arise, unclear provisions are identified, it is necessary to discuss them with the teacher. At a seminar class, even a well-prepared student should not remain a passive observer, preferably actively involved in the discussion of the issue. Do not refuse to answer the teacher's questions. Even if the student does not know the answer, it is advisable to try to answer, express his opinion, based on his own knowledge, experience, logic of the question, etc. At the same time, one should not be afraid to make a mistake - one of the important tasks of studying humanitarian disciplines is developing the ability to think logically and express one's own opinions accordingly. However, it is worth remembering that ignorance of the material of the discipline is a significant disadvantage of the student's work and will negatively affect his overall rating. A responsible attitude to the preparation for each seminar session allows not only to learn the educational material correctly, but also to save effort when passing the semester control.

An important point in a student's training is developing the ability to work with historical sources. When getting acquainted with a historical document that is new to you, you should, first of all, find out the authenticity, conditions and reasons for its creation, understand the logic and sequence of relevant events and their impact on the present. Such an analysis will allow the applicant not only to better understand and assimilate information, but also to analyze past historical events, draw conclusions and generalizations, apply historical experience to understand and determine the role and place of a particular scientist and inventor in the history of the development of science and technology. Acquiring scientific historical knowledge is interesting, but not an easy task. By studying the academic discipline

"History of Science and Technology", you lay the foundations of your future professional formation and development. This course will help to correctly understand the phenomenon of science and technology in the history of mankind and the main features of the process of accumulation of scientific and technical knowledge in accordance with specific historical stages of the development of mankind.

Students can be enrolled in a course topic if they have certificates of completion of distance or online courses on the relevant topic or receiving prizes at history olympiads on the given topic.

Extracurricular activities.

Students can participate in:

- research work and publication of its results, in particular, at the All-Ukrainian Student Scientific and Practical Conference "Ukraine: History, Culture, Memory", which annually held by the Department of History and others;
- activities of the scientific student group "History Fans Club";
- olympiads in historical disciplines.

Distance learning.

Synchronous and asynchronous distance learning is possible using platforms for video conferences (Google Meet, Microsoft Teams, Zoom, Skype, etc.) and the "Sikorsky" distance learning educational platform (Moodle, Google Classroom).

Inclusive education is

allowed.

The working program of the academic discipline (syllabus) was compiled:

Professor of the Department of History, Doctor of Science, Professor Ihor TARNAVSKY

Associate Professor of the Department of History, Associate Professor, Candidate of Science Lyudmila IGNATOVA

Associate Professor of the Department of History, Associate Professor, Candidate of Science Ihor Lebedev

Associate Professor of the Department of History, Associate Professor, Candidate of Science Olga LABUR

Approved by the Department of History (protocol No. 11 dated 05/10/2023)

Agreed by the Methodical Council of the university (protocol No. 8 dated June 2, 2023).

List of questions for semester control (credit)**A sample of a credit card**

NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
"KYIV POLYTECHNIC INSTITUTE named after Igor Sikorsky"

Level of higher education first (bachelor's)
(title of degree)

Specialty All specialties
(code and name of training direction)

Educational program for all OPP specialties (code and name of the specialty)

Educational discipline History of science and technology
(name)

ASSESSMENT TICKET No _____

1 2 Questions from the 1st block of questions
Questions from the II block of questions

Approved at the department meeting Stories
(name of department)

Protocol no _____ from " _____ » _____ 202 p.

Head of the Department of History _____
(signature) (First Name Surname)

QUESTIONS for forming credit cards ***Question I from the block of questions**

1. Determine the place of the history of science and technology in the system of humanitarian, natural, and technical sciences.
2. Give a definition and reasoned assessment of the problem of humanization of science and technology knowledge.
3. Compare the main versions of the periodization of the history of science and technology.
4. Describe the source base of the history of science and technology, taking into account the peculiarities different types of sources.
5. Analyze the level of development of human knowledge and technology in the Paleolithic and Mesolithic.
6. Give a description of the Neolithic revolution in its main centers, connecting the level of development of knowledge and technologies with natural conditions.
7. Make a comparative analysis of the scientific and technical achievements of the ancient civilizations of Egypt and the Mesopotamia.
8. Define the main achievements of science and technology of ancient India and China.
9. Describe and explain the features of the development of technology in ancient Greece.
10. Give a reasoned assessment of the transition from mythological to scientific perception of the world in ancient Greece using the example of the influence on natural and technical knowledge.
11. Using the comparative-historical method, identify new features of the development of scientific technical knowledge in the Hellenistic period.
12. Highlight the key features of the development of science and technology in the era of the Roman Empire. Justify your answer.
13. Compare approaches to the development of scientific knowledge in the Christian and Muslim worlds of the Middle Ages.

14. Describe the versions of leading researchers regarding the role of the Middle Ages in development techniques and select the most likely one. Justify your answer.
15. Explain how the spread of humanism and the Reformation affected the development of science in Renaissance Europe.
16. Define the essence of Great geographical discoveries and their consequences for science and technology development
17. Give a reasoned version of whether it is appropriate to use the term "gunpowder revolution" and "agro-technical revolution" in relation to Renaissance Europe.
18. Define the prerequisites and reveal the essence of the scientific revolution of the 17th century.
19. Explain how the spread of the Enlightenment ideology and science and technology are related progress.
20. Describe the main consequences of the scientific revolution of the 17th century. and the essence of the mechanistic picture of the world.

Question II from the block of questions

1. State what caused the industrial revolution of the 18th-19th centuries. and caused its uneven distribution around the world.
2. Give a comparative description of machine and manufacturing production.
3. Reveal and evaluate the contribution of leading scientists to the development of classical natural science in the 18th and mid-19th centuries.
4. Highlight the main stages and directions of the industrial revolution.
5. Define the essence and consequences of the fundamental scientific discoveries of the late 19th and early 20th centuries.
6. Explain the difference between non-classical and classical science.
7. Give a well-founded version of the impact of the First World War on the development of science and technology.
8. Describe the leading scientific discoveries in the period between the First and Second World Wars.
9. Compare the rates of improvement of the production of peaceful and military direction in the interwar period.
10. Give a reasoned assessment of the general situation of science and technology during the Second World War World War depending on the degree of participation of countries in hostilities.
11. Reveal the structure, periodization and main consequences of the scientific and technological revolution.
12. Define the positive and negative effects of scientific and technological progress on the ecosystem.
13. Give a reasoned assessment of the effectiveness of the main international environmental protection measures programs
14. Compare the leading concepts for defining the information society and its components.
15. Trace the main stages of development of the latest information technologies.
16. Describe the Internet as an environment for building an information society.
17. Highlight the main features of the scientific and technical development of Ukraine in market conditions. 18. Compare the achievements of academic and industry research institutions and achievements scientists of higher education in independent Ukraine.
19. Describe Ukraine's international cooperation in the field of science and technology, possible ways expansion and deepening of such cooperation.
20. Give a reasoned assessment of the international cooperation of NTUU "KPI named after Igor Sikorsky" in scientific and technical field and outline its possible prospects.

MODULAR CONTROL WORK

from the academic discipline

HISTORY OF SCIENCE AND TECHNOLOGY

of the first (bachelor) level of higher education "*bachelor*" degree*

After completing each of the three thematic modules, students are given a one-time opportunity to write the MKR, which consists of test tasks. The first and second MKR are estimated at 12 points each. Third MKR with 13 points. The maximum number of points for three MKR is 37 points.

TASKS for MKR 1.1. from Chapter 1. Historical aspects of the development of science and technology in agrarian era

Test tasks are formed from such blocks

1. Theoretical and methodological foundations of "History of Science and Technology";
2. Accumulation of knowledge, technique and technology in prehistoric times and the age of ancient civilizations. The state of scientific knowledge before the ancient world. Science, technology and culture in the ancient world;
3. Technique of the Middle Ages. The progress of human thought in the Middle Ages. Scientific knowledge of the era Renaissance and New times (XV-XVIII centuries).

TASKS for MKR 1.2. from Chapter 2. Scientific thought and technological capabilities of mankind in the industrial age

Test tasks are formed from such blocks

1. Development of technology and scientific knowledge in the mid-18th - 1970s of the 19th century. Classical science modern times (XVII - XIX centuries);
2. Technical progress in the 19th century. New discoveries in physical, mathematical and natural sciences sciences at the border of the 19th and 20th centuries.
3. Development of technology at the beginning of the 20th century. and during the First World War.

TASKS for MKR 1.3. from Chapter 3. Determining trends in the development of science and technology in the information age

Test tasks are formed from such blocks

1. World science and technology in the interwar period (1920-1940s);
2. Development of science and technology in the second half of the 20th century;
3. The main trends and prospects of the development of science in the 21st century;
4. Science of Ukraine at different stages of development; The
5. history of the emergence and development of engineering education and technical sciences.

RATING SYSTEM FOR ASSESSMENT OF LEARNING RESULTS

from the academic discipline

HISTORY OF SCIENCE AND TECHNOLOGYof the first (bachelor) level of higher education "**bachelor**" degree*

1. The rating of a student in an academic discipline consists of the points he receives for 1 :

- control of residual knowledge in 9 lectures;
- work on 9 seminar classes;
- modular control work (MCW) with three parts of 0.66 academic hours each.

System of rating (weighted) points and evaluation criteria:

1. Control of residual knowledge can be carried out either in 9 lectures (then the maximum the number of points for 1 lecture control is 2 points):

- a complete answer (at least 90% of the required information), appropriate justification and personal opinion are provided – a	2
sufficiently complete answer (at least 75% of the required information) performed in accordance with the requirements for the "skill" level, or minor inaccuracies)	1.5
- incomplete answer (at least 60% of the required information)	1

Or

Control of residual knowledge can be carried out in 3 lectures (then the maximum number points for 1 lecture control is 6 points):

- a complete answer (at least 90% of the required information), relevant justifications and a personal view are provided	6
- a sufficiently complete answer (at least 75% of the required information), completed in accordance with the requirements for the "skills" level, or minor inaccuracies)	5-4
- incomplete answer (at least 60% of the required information)	3.5

2. Work in 9 seminar sessions (the maximum number of points in the 1st seminar session is 5 points, additional points are provided for active work at the seminar, but no more than 5)

- a complete answer (at least 90% of the required information), appropriate justification and personal opinion are provided – a	5
sufficiently complete answer (at least 75% of the required information) performed in accordance with the requirements for the "skill" level, or minor inaccuracies)	4
- incomplete answer (at least 60% of the required information)	3

3. Writing MKR in 3 parts of 37 tests (*the maximum number of points for 1 test is 1 point*). Correct answer - 1 point

Incorrect answer - 0 points

Calculation of the rating scale (R):

The sum of the weighted points of control measures during the semester is:

$$RD = 18+45+37 = 100 \text{ points.}$$

Students who scored 60 or more points during the semester (**$RD \geq 0.6 R$**) receive a so-called "automatic" credit in accordance with the obtained rating.

1 NPPs can make clarifications to the RSO in accordance with the form of study chosen by students and their own methodological developments

Students who did not meet the MKR (less than "sufficient") and received less than 40 starting points are not allowed to be counted

Students who met the admission requirements for credit, but scored less during the semester 60 points ($RD < 0.6 R$) perform a credit test.

The credit work is evaluated out of 100 points and consists of two questions. (*maximum the number of points for 1 question is 50 points*)

– complete answer (at least 90% of the required information) –	50-45
sufficiently complete answer (at least 75% of the required information) – incomplete	44-38
answer (at least 60% of the required information)	37-30

Based on its results, the student receives an appropriate grade according to the table.

Number of points	Rating
100–95	Perfectly
94–85	Very good
84–75	Good
74–65	Satisfactorily
64–60	Enough
Less than 60	Unsatisfactorily
Admission conditions not met	Not allowed