



History of science and technology

Syllabus

Requisites of the Course

Cycle of Higher Education	<i>First cycle of higher education (Bachelor's degree)</i>
Field of Study	<i>12 Information Technologies</i>
Specialty	<i>121 Software Engineering</i>
Education Program	<i>Computer Systems Software Engineering</i>
Type of Course	<i>Normative</i>
Mode of Studies	<i>full-time</i>
Year of studies, semester	<i>1st year, 1st semester</i>
ECTS workload	<i>2 credit (ECTS). Time allotment - 60 hours, including hours of classroom work, and hours of self-study.</i>
Testing and assessment	<i>Final test</i>
Course Schedule	<i>Lectures (once every two weeks starting from the 1st week), Seminars (once every two weeks, preferably after the lecture) classes by the timetable http://rozklad.kpi.ua/</i>
Language of Instruction	<i>English</i>
Course Instructors	<i>Lecturer: : PhD, Associate Professor, Svitlana Boyeva, mobile +380975264048, email : svit.boyeva@gmail.com Teacher of practical work: : PhD, Associate Professor, Svitlana Boyeva</i>
Access to the course	<i>The course will be hosted on the Sikorsky remote platform using Moodle platforms</i>

1. Course description, goals, objectives, and learning outcomes

An important feature of the concept of the course "History of Science and Technology" is that it is developed at the junction of humanities and natural sciences, and therefore in contrast to the past and focused mainly on the history of science and technology "classical schemes", aimed at covering all forms of science knowledge - and natural, and technical, and humanitarian. Mastering the course material will help students get a holistic view of the development of science and technology as a historical and cultural phenomenon.

In the process of achieving this goal, students must obtain a sufficient level of knowledge of the history of science and technology certain branches of natural, social-humanitarian, technical sciences in accordance with specific historical stages of science development and the influence of socio-cultural context in order to master the intellectual wealth of world scientific culture, which is preserved in human history and on which modern science is based.

The study of the discipline is the basic knowledge of world history and other humanities, natural and exact disciplines acquired within the general secondary education.

At the end of the discipline students must obtain a sufficient level of knowledge about:

- Periodization of the history of science and technology;
- Basic principles, methods and sources of historical research;
- The origins of scientific knowledge, in particular the most important branches of science and technology;
 - Features of state policy in science and technology at different stages of historical development of mankind;
 - Features of the network of scientific and technical institutions, the history of formation and development of leading research centers, in particular higher education institutions as centers of basic and applied research;
 - Major events, dates of the most significant achievements in the development of science and technology at different stages of history;
 - Names, major milestones in the life and work of prominent scientists and engineers, in particular their contribution to the development of Ukrainian and world science;
 - The main information about the scientific and technical achievements of the teaching staff and graduates of NTUU «Igor Sikorsky Kyiv Polytechnic Institute»

Studying this course is an important means of forming students' scientific worldview, it promotes the growth of general erudition, is an organic addition to the cycle of social-humanitarian and natural-technical disciplines studied at universities.

The subject of the discipline "History of Science and Technology" is the genesis, patterns of formation and development of world science and technology, the history of mankind in science and technology from ancient times to the present in close connection with global historical and cultural processes. "History of Science and Technology" is a science that is dynamically developing and constantly replenished with new knowledge, concepts and facts.

The purpose of the discipline is:

A) Promoting the growth of general erudition; organic addition to the cycle of social-humanitarian and natural-technical disciplines studied at NTUU «Igor Sikorsky Kyiv Polytechnic Institute»

B) providing knowledge about the main stages, processes and events in the history of science and technology from ancient times to the present and the formation of a holistic view of the development of science and technology as a historical and cultural phenomenon; acquaintance with the history of accumulation of scientific knowledge within separate branches of natural, social-humanitarian, technical sciences according to concrete historical stages of development of mankind;

C) Formation of students' abilities:

- skills of interpersonal interaction (general competencies)

- preserve moral, cultural, scientific values and increase the 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 (general competencies);
- to conduct scientific debates and discussions, to argue their own position;
- to draw conclusions and generalizations, to apply historical experience to understand and determine the role of science and technology in the history of mankind;
- to be aware of the closest connection between the problems solved by scientists in technical and humanitarian fields;
- to predict the prospects of scientific and technological development.

As a result of mastering the discipline, students must demonstrate **the following learning**

outcomes:

- to ensure the formation of basic knowledge about science and technology;
- to reveal the patterns of scientific and technical knowledge at different historical stages;
- to establish connections and interaction with other forms of social consciousness and dimensions of society (economy, politics, morality, religion, philosophy, art, etc.).

To know:

- historical stages of development of science and technology and their features;
- basic concepts of history of science and technology, definition of scientific knowledge and its special characteristics;
- characteristics of the general socio-cultural context of historical stages of development of science and technology, its impact on changes in the status and purpose of science and technology in society;

To be able to:

- have the skills to reconstruct the historical past of science, which will help to understand internal trends, patterns of scientific knowledge, to understand why scientists of the past focused on certain problems and tasks; to identify features of scientific type of knowledge in comparison with technical-technological, everyday-practical, religious, artistic and other types of knowledge;
- analyze specific historical stages in the development of science and technology in terms of their main achievements
- characterize certain branches of science (natural, socio-humanitarian, technical) as a historical process of origin, formation, accumulation and significant renewal of knowledge;
- compare the development of individual sciences and certain technical innovations on a specific historical stage in order to identify links in different fields;
- analyze the scientific process in terms of the formation and evolution of organizational forms that ensure the activities of the scientific community.

Experience:

- acquisition of theoretical knowledge about the main trends in science and technology in the world;
- acquisition of skills to analyze problematic and debatable issues in the course of history of science and technology, to formulate own assessments and versions.

2. Prerequisites and post-requisites of the course (the place of the course in the scheme of studies in accordance with curriculum)

The discipline is taught in the 1st semester of the 1st year of study in all educational programs of the first (bachelor's) level of higher education and does not depend on other disciplines in the structural and logical scheme of the educational program.

For the successful mastering of the student's discipline the basic level of English language proficiency not lower than A 2 is required.

2. Content of the course

Names of sections and topics	Number of hours			
	Total	including		
		Lectures	Seminars	Self-study
Section 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"	4	2	2	
Topic 1.2. Accumulation of knowledge, techniques and technologies in prehistoric times and times of ancient civilizations	4	2	2	
Topic 1.3. Technique of the Middle Ages. Scientific knowledge of the XVI-XVIII centuries.	3,4	2	1,4	
Modular control work №1.1.	1,2		0,6	0,6
Topics of independent work under section 1.				
The state of scientific knowledge of the pre-ancient world	1,5			1,5
Science, technology and culture in the ancient world	1,5			1,5
Progress of human thought in the Middle Ages	1,4			1,4
Together under section 1	17	6	6	5
Section 2. Scientific thought and technological capabilities of mankind in the industrial age				
Topic 2.1. The development of technology and scientific knowledge in the mid-XVIII - 70's of the XIX century.	4	2	2	
Topic 2.2. New discoveries in physics, mathematics and natural sciences at the turn of the XIX-th at the beginning of the XX-th centuries.	4	2	2	
Topic 2.3. The development of technology in the early XX- th century and during the First World War.	3,4	2	1,4	
Modular control work №1.2.	1,2		0,6	0,6
Topics of independent work under section 2.				
Scientific knowledge of the Renaissance	1,5			1,5
Classical science of modern times (XVII - XIX centuries)	2			2
Technical progress and scientific knowledge in the XIX century	2,4			2,4
Together under section 2	18,5	6	6	6,5
Section 3. Defining trends in the development of science and technology in the information age				
Topic 3.1. World science and technology in the 1920-1940's.	4	2	2	
Topic 3.2. The development of science and technology in the second half of the XX th - early XXI century.	4	2	2	
Topic 3.3 History of the origin and development of engineering education and technical sciences. Generalizations to the course.	3,3	2	1,3	
Modular control work №1.3	1,5		0,7	0,8
Topics of independent work under section 3.				
Scientific and technical development in the XX th century	1,5			1,5
Science of Ukraine at different stages of formation	2			2
The main trends and prospects for the development of science in the XXI century	2,2			2,2
Together under section 3	18,5	6	6	6,5
<i>Test</i>	6		(2)	6
Hours in general	60	18	18	24

4. Course books and teaching resources

For successful study of the discipline it is enough to study the teaching material, which is taught in lectures, as well as to get acquainted with:

Basic literature

1. BERNAL, J. D. Science in History. – London: Routledge, 1954. 4 Vol.
2. Bernal J. D. The Social Function of Science. – London: Routledge, 1939.
3. BUNCH B., HELLEMANS A., THE HISTORY OF SCIENCE AND TECHNOLOGY. – Boston-New York: Houghton Milfin, 2004.
4. Encyclopedia of the History of Science, Technology, and Medicine in Non-Western Cultures / Ed. Helaine Selin. – Berlin-Heidelberg-New York: Springer: 2008.
5. Herd M., Jamison A. HUBRIS AND HYBRIDS: A Cultural History of Technology and Science. - London-New York: Routledge, 2003.
6. McClellan J. E., Dorn H., Science and Technology in world History. – Baltimore: The Johns Hopkins University Press, 2006.
7. WAR IN WORLD HISTORY: Society, Technology, and War from Ancient Times to the Present. / Ed. Stephen Morillo, Jeremy Black, Paul Lococo. – New York: mcgraw Hill, 2009. – 2 Vol.
8. The World Bank. Ukraine: Science, Technology, and Innovation Public Expenditure Analysis.

Additional literature

9. CUMO CHRISTOPHER. SCIENCE AND TECHNOLOGY IN 20THCENTURY AMERICAN LIFE. – Westport-London: Greenwood Press, 2007.
10. Dejong-Lambert William. The Cold War Politics of Genetic Research: An Introduction to the Lysenko Affair. – New York: Springer: 2012.
11. DEMING David. Science and Technology in World History. – Jefferson-London: macfarland&Company, 2010.
12. DE SYON GUILLAUME. SCIENCE AND TECHNOLOGY IN MODERN EUROPEAN LIFE. – Westport-Longon: Greenwood Press, 2008.
13. Diamond Jared. Collapse: How societies choose to fail or succeed. – New York: Viking, 2005.
14. Guicciardini, N. Isaac Newton on Mathematical Certainty and Method. – Cambridge-London: MIT Press, 2009.
15. Histories of the Electron: The Birth of Microphysics. / edited by Jed Z. Buchwald and Andrew Warwick. – Cambridge-London: MIT Press, 2001.
16. A History of Chinese Science and Technology / Ed. Yongxiang Lu. – Beijing: Springer, 2015. – 3 Vol.
17. Isaac Newton's Natural Philosophy. / Ed. Jed Z. Buchwald and I. Bernard Cohen. – Cambridge-London: MIT Press, 2001.
18. Kuhn T. S. The Structure of Scientific Revolutions. – Chicago-London: Chicago University press, 1996.
19. MACLEOD R., JOHNSON J. A. Frontline and Factory: Comparative Perspectives on the Chemical Industry at War, 1914–1924. – New York: Springer, 2006.
20. Small James S. The Analogue Alternative: THE ELECTRONIC ANALOGUE COMPUTER IN BRITAIN AND THE USA, 1930-1975. – London-New York: Routledge, 2001.
21. Turnbull David. Masons, Tricksters and Cartographers Comparative Studies in the Sociology of Scientific and Indigenous Knowledge. – London-New York: Routledge, 2003.

Informational resources

<http://www.nas.gov.ua> The National Academy of Sciences of Ukraine

www.history.org.ua Institute of History of Ukraine

<http://priansak-center.com/> O. Prijsak Research and Publishing Center

<http://www.nbu.gov.ua/portal/natural/nnz/index.html>

http://pamjatky.org.ua/?page_id=685

<http://www.epochtimes.com.ua/science/>

<http://s-osvita.com.ua>

<http://pidruchniki.com.ua>

<http://archaeology.univ.kiev.ua/j152/>
<http://gumilevica.kulichki.net/>
<http://www.fordham.edu/Halsall/science/sciencesbook.asp>
<http://www.mhs.ox.ac.uk/>
<http://www.historyworld.net/wrldhis/PlainTextHistories.asp?historyid=ab11>
http://ukrainiancomputing.org/PHOTOS/Memorial_u.html
<http://sergeydolya.livejournal.com/594097.html>

Educational content

5. Methodology

Lectures

№ in order	The title of the lecture topic and the list of main questions (list of didactic tools, tasks on the independent work with reference to the literature)
1	<p>Introduction. Theoretical and methodological foundations of «History of Science and Technology»</p> <p>List of main issues:</p> <ol style="list-style-type: none"> 1. Subject, purpose, objectives 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 subject in the life of the individual, society and the state. <p>List of didactic tools:</p> <p>a) images of outstanding monuments of history of science and technology; b) synchronistic-chronological table: history of science and technology; c) portraits of prominent scientists.</p> <p><i>Main literature:</i> [L.1 – V.1,P. 27-54]; [L.2 – P. 1-71, 241-261],[L 3 – P. 1-17] <i>Additional literature:</i> [L.18 – P. 35-42, 146-133]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. D. Huxley's concept of evolutionary humanism. 2. What should be the engineer of modern Ukraine: professional and socio-cultural portrait. <p><i>Literature for independent work:</i> [L.2 –P. 71-93; 241-290; 408-418]</p>

№ in order	The title of the lecture topic and the list of main questions (list of didactic tools, tasks on the independent work with reference to the literature)
2	<p>Accumulation of knowledge, techniques and technologies in prehistoric times and the time of ancient civilizations</p> <p>List of main issues:</p> <ol style="list-style-type: none"> 1. The emergence of simple tools. The use of fire and methods of its production. 2. Invention of bows and arrows. The emergence of sophisticated 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. The emergence of certain areas of rational knowledge. <p>List of didactic tools that provide clarity of the lecture: images showing the features and evolutionary changes: a) tools; b) household items; c) housing and other structures; d) various technical inventions; e) portraits of prominent figures of science and technology.</p> <p><i>Main literature:</i> [L.1 – V. 1, P. 61-143] ; [L.3 – P.1-50]; [L.6 –P. 3-52] <i>Additional literature:</i> [L.13 – P.77-177] ; [L.16 – V. 1, P.1-9, 440-484]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Social consequences of the development of agriculture and livestock. 2. The first man-made tools. Regional features of fire extraction. 3. Features of the development of construction in ancient Rome. 4. Common and special in the level and nature of mathematical, natural and technical knowledge of ancient civilizations. <p><i>Literature for independent work:</i> [L.1 – V. 1, P. 91-143];[L.16 – V.1, P. 4-7]</p>
3	<p>Technique of the Middle Ages. Scientific knowledge of the XVI-XVIII centuries.</p> <p>List of main issues:</p> <ol style="list-style-type: none"> 1. Development of agricultural techniques, crafts, mining and construction. 2. Scientific and technical achievements of Central Asia and the Far East in the Middle Ages. 3. Manufactories, inventions and the first machines. Scientific knowledge of the XVI-XVIII centuries. <p>List of didactic tools that provide clarity of the lecture: images that demonstrate, for different countries, common and special in development: a) tools; b) household items; c) housing and other structures; d) technical inventions; e) portraits of prominent figures of science and technology.</p> <p><i>Main literature:</i> [L.1 – V. 1, P.159-340]; [L.7 – P.100-270] <i>Additional literature:</i> [L.11 – V. 1, P.15-215]; [L.16 – V. 2, P.161-293]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Influences of Arab-Muslim culture on the development of European science. 2. Scientific and technological development of Byzantium Empire 3. The role of the church and universities in the preservation and development of scientific knowledge in the Ukrainian lands. 4. Dissemination of scientific knowledge in the Ukrainian lands in the XVII century <p><i>Literature for independent work:</i> [L.3 – P.93-115] [L.7 – P.139-159]; [L.11 – P.170-218];</p>

№ in order	The title of the lecture topic and the list of main questions (list of didactic tools, tasks on the independent work with reference to the literature)
4	<p>Development of technology and scientific knowledge in the mid-XVIII - 70's of the XIX century.</p> <p>List of main issues:</p> <ol style="list-style-type: none"> 1. Causes, beginning and stages of the industrial revolution of the late XVIII - 70's of the XIX century. 2. The development of metallurgy, the emergence of mechanical engineering, the revolution in transport and communications. 3. Development of physical and mathematical sciences and creation of classical natural sciences. <p>List of didactic tools that provide clarity of the lecture: images: a) showing the main inventions; b) portraits of prominent scientists and inventors.</p> <p><i>Main literature:</i> [L.1 – V. 2, P.379-518]; [L.5 – P.19-71]; [L.6 – P.175-275] <i>Additional literature:</i> [L.1 – P. 379-479] ;[L.18 – P. 43-91]; [L.21 – P. 1-90];</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Consequences of the industrial revolution in transport and communications. 2. Scientific discoveries in the field of electrical engineering 3. Scientific discoveries and technical inventions in Ukraine during the Industrial Revolution <p><i>Literature for independent work:</i> [L.7 – P.304-323]; [L.14 – P. 233-290]; [L.17 – P. 1-102]; [L.18 – P.111-173]; [L.21 – P. 91-174]</p>
5	<p>New discoveries in physics, mathematics and natural sciences at the turn of the XIX-XX centuries.</p> <p>List of main issues:</p> <ol style="list-style-type: none"> 1. Development of mathematics and astronomy. 2. Fundamental discoveries in physics. 3. Chemistry, geology, mechanics and biology at the forefront of scientific and technological progress. <p>List of didactic tools that provide clarity of the lecture: images: a) factory shops and workers of the industrial revolution; b) illustrating the main inventions; c) portraits of outstanding scientists, inventors.</p> <p><i>Main literature:</i> [L.1 – V. 2, P. 541-657]; [L.3 – P.230-438]; [L.6 – P. 235-437] <i>Additional literature:</i> [L.7 –P. 442-461]; [L.12 – P.37-54]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Development of mathematical logic and its meaning. 2. Application of probability theory in some natural sciences 3. Development of science and its popularization in the Ukrainian lands at the turn of the XIX - XX centuries. <p><i>Literature for independent work:</i> [L.1 – V. 2, P. 509-559]</p>

№ in order	The title of the lecture topic and the list of main questions (list of didactic tools, tasks on the independent work with reference to the literature)
6	<p>The development of technology in the early twentieth century and during the First World War</p> <p>List of main issues:</p> <ol style="list-style-type: none"> 1. Electrical engineering as the basis of a new stage of industrial development. 2. Application of new technologies in metallurgical, chemical and machine-building industries. 3. New modes of transport, communications and construction methods. 4. Military equipment during the First World War. <p>List of didactic tools that provide clarity of the lecture: images: a) new technical achievements in construction (skyscrapers); b) construction of the Panama Canal; c) samples of military equipment from the First World War.</p> <p><i>Main literature:</i> [L.1 – V. 3, P.725-860]; [L.3 – P. 438-540]; [L.7 – P.506-565]</p> <p><i>Additional literature:</i> [L.15 – P. 121-170]; [L.19 – P.1-122]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Solve the problem of long-distance power transmission. 2. New technologies during the First World War <p><i>Literature for independent work:</i> [L.7 – 535-561]; [L.19 – P.179-220]</p>
7	<p>World Science and Technology in the 1920s and 1940s</p> <p>List of main issues:</p> <ol style="list-style-type: none"> 1. Electricity, metallurgy, chemical industry and mining as the basis of technical and technological achievements of the first half of the twentieth century. 2. Features of the development of mechanical engineering in the interwar period and during the Second World War. 3. Creation of jet aircraft and missile technology. 4. Electronics is a step into the future. The beginning of the atomic era. <p>List of didactic tools that provide clarity of the lecture: images: a) which demonstrate the revolutionary scientific and technological achievements; b) portraits of outstanding scientists and inventors.</p> <p><i>Main literature:</i> [L.1 – V. 3, P.725-860]; [L.3 – P. 438-540]; [L.7 – P.506-565]</p> <p><i>Additional literature:</i> [L.15 – P. 121-170]; [L.19 – P.1-122]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Major changes in the world's fuel and energy balance in the 1930s 2. Creation of computer technology in the 1930s and 1940s 3. The contribution of Ukrainian scientific and technical specialists in the development of technology during the Second World War. <p><i>Literature for independent work:</i> [L.7 – 535-561]; [L.19 – P.179-220]</p>

№ in order	The title of the lecture topic and the list of main questions (list of didactic tools, tasks on the independent work with reference to the literature)
8	<p>The development of science and technology in the second half of the XX - early XXI century.</p> <p>List of main questions:</p> <ol style="list-style-type: none"> 1. Electric power and electrical systems. 2. Metallurgy, chemical technology and mechanical engineering. 3. Transport development. Astronautics. 4. Electrical engineering and communication. Computer systems. <p>List of didactic tools that provide clarity of the lecture: images: a) showing samples of the latest information technologies; b) portraits of outstanding scientists and inventors.</p> <p><i>Main literature:</i> [L.1 – V. 4, P.1112-1205];[L.3 – P. 624-628]; [L.7 – P. 565-704]</p> <p><i>Additional literature:</i> [L.5 – 245-308]; [L.9 – 1-100] ; [L.12 – P. 139-192]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Features of the development of electric power in the postwar period. 2. Ukraine's contribution to space exploration. 3. Creation of computer equipment in Ukraine. <p><i>Literature for independent work:</i> [L.10 – P. 29-110] ; [L.20 – P. 63-178]</p>
9	<p>History of the origin and development of engineering education and technical sciences</p> <p>List of main issues:</p> <ol style="list-style-type: none"> 1. Origin and development of education and research. 2. Formation of technical sciences and engineering. 3. Establishment of technical educational institutions and development of technical education in Ukraine. 4. Igor Sikorsky KPI: history and modernity <p>List of didactic tools that provide clarity of the lecture: images: a) demonstrating technical educational institutions in Europe and the USA; b) higher technical educational institutions in Ukraine: KhPI, KPI, LPI, etc.; c) photo portraits, plot photos of outstanding scientists who taught at different times in higher technical educational institutions.</p> <p><i>Main literature:</i> [L.1 – V. 4, P.1112-1205]; [L.3 – P. 624-628]; [L.7 – P. 565-704] [L.8 – P. 1-34]</p> <p><i>Additional literature:</i> [L.5 – P. 245-308]; [L.9 – P. 1-100] [L.10 – P. 141-182];[L.12 – P. 139-192]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Features of the establishment of higher technical educational institutions in Europe. 2. The main activities of the Department of International Cooperation of «Igor Sikorsky Kyiv Polytechnic Institute» <p>Generalization of the course.</p> <ol style="list-style-type: none"> 1. Generalization of the course material, analysis of its connections with other disciplines. 2. Prospects for the application of acquired knowledge and skills for further study and professional activities 3. Forum "Humanization and Humanization of Higher Technical Education: Tasks for the Future or Urgent Need of the Present. <p><i>Literature for independent work:</i> [L.1 – V. 4, P. 1110-1112, 1269-1318]; [L. 8 – P. 1-36]</p>

Practical classes (seminars)

The main tasks of the seminar series:

aim to develop students' ability to work with historical, socio-political, memoir and educational literature, prepare speeches, formulate and defend their position, take an active part in the discussion

№ in order	The name of the topic of the lesson
1	<p>History of science and technology as a scientific and educational discipline</p> <p>It is expected that students will prepare a report / presentation, express their own opinion justifying the following questions</p> <ol style="list-style-type: none"> 1. Sources on the history of science and technology. 2. Leading trends in the historiography of the history of science and technology. 3. Methods of research and mastering the discipline. 4. Features of development of historical-scientific and historical-technical researches in Ukraine <p><i>Main Literature</i> [L.1 – V.1, P. 27-54]; [L.2 – P. 1-71, 241-261]; [L.3 – P. 1-17] <i>Additional literature</i> [L.18 – P. 35-42, 146-133]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Models of periodization of the history of science and technology. 2. History of science and technology as a complex scientific and interdisciplinary and interactive discipline. 3. Science and technology in the context of material and spiritual culture of Ukraine. <p><i>Literature for independent work:</i> [L.2 – P.71-93; 241-290; 408-418]</p>
2	<p>Development of technology of ancient civilizations and accumulation of scientific knowledge.</p> <p>It is expected that students will prepare a report / presentation, express their own opinion justifying the following issues</p> <ol style="list-style-type: none"> 1. Man's discovery of fire and the invention of various means of obtaining it. 2. Invention and use of bows and arrows. 3. The emergence of agriculture based on complex tools. 4. Start of using metals in the production process. <p><i>Main Literature:</i> [L.1 – V. 1, P. 61-143]; [L.3 – P. 1-50]; [L.6 – P. 3-52] <i>Additional literature:</i> [L.13 – P. 77-177]; [L.16 – V. 1, P.1-9, 440-484]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Origin and development of mining in ancient times. 2. Features of construction in the East (Egypt, China, India, and Japan). 3. Military equipment of ancient times. 4. Mathematical and natural knowledge of ancient civilizations <p><i>Literature for independent work:</i> [L.1 – V. 1, P. 91-143]; [L.16 – V.1, P. 4-7]</p>
3	<p>Peculiarities of development of production and technology in the Middle Ages</p> <p>It is expected that students will prepare a report / presentation, express their own opinion with justification of the following questions</p> <ol style="list-style-type: none"> 1. Medieval guilds and their influence on the development of production. 2. Scientific and technical achievements of the Middle and Far East of the Middle Ages. 3. Features of the emergence of manufacturing. 4. Development of natural science in the Late Middle Ages <p><i>Main Literature:</i> [L.1 – V. 1, P. 159-340]; [L.7 –P. 100-270] <i>Additional literature:</i> [L.11 – V. 1, P.15-215]; [L.16 – V. 2, P. 161-293]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Blast furnace production in the XIV-XVI centuries. 2. Start of book printing. 3. The water wheel is a manufactured engine. 4. Outstanding scientists of the Middle Ages: L. da Vinci, N. Copernicus, J. Bruno, G. Galileo, J. Kepler, G.V. Leibniz, S.-F. Dufe. <p><i>Literature for independent work:</i> [L.3 –P. 93-115]; [L.7 – P.139-159]; [L.11 – P. 170-</p>

№ in order	The name of the topic of the lesson
	218]
4	<p>Development of science and technology in the days of the industrial revolution.</p> <p>It is expected that students will prepare a report / presentation, express their opinion and justify the following questions</p> <ol style="list-style-type: none"> 1. The industrial revolution in England. Invention of the steam engine. 2. The emergence of mechanical engineering. 3. Technological revolution in transport. 4. Creating classical science <p><i>Main Literature:</i> [L.1 – V. 2, P. 541-657]; [L.3 – P. 230-438]; [L.6 – P. 235-437] <i>Additional literature:</i> [L.7 – P. 442-461]; [L.12 – P. 37-54]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Development of the metallurgical industry. 2. Technical revolution in communications. 3. M. Faraday <p><i>Literature for independent work:</i> [L. 1 – V. 2, P. 509-559]</p>
5	<p>Discoveries in Physics, Mathematics and Science in the Last Quarter of the XIX th century</p> <p>It is expected that students will prepare a report / presentation, express their own opinion substantiating the following questions</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><i>Main Literature</i> [L.1 – V. 2, P. 541-657]; [L.3 – P. 230-438]; [L.6 – P. 235-437] <i>Additional literature</i> [L.7 – P. 442-461]; [L. 12 – 37-54]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. New directions in the development of astronomy in the late nineteenth century. 2. Invention of the internal combustion engine and its meaning 3. O. Lilienthal <p><i>Literature for independent work:</i> [L. 1 – V. 2, P. 509-559]</p>
6	<p>Development of technology in the early twentieth century.</p> <p>It is expected that students will prepare a report / presentation, express their own opinion justifying the following issues</p> <ol style="list-style-type: none"> 1. Electricity - the basis of industrial development. 2. Application of new technologies in mechanical engineering. 3. Features of the oil industry. 4. Development of aviation in the first decades of the twentieth century <p><i>Main Literature</i> [L.1 – V. 3, P. 725-860] ; [L.3 – P. 438-540]; [L.7 – P. 506-565] <i>Additional literature</i> [L.15 – P. 121-170]; [L. 19 – P. 1-122]</p> <p>Tasks on independent work:</p> <ol style="list-style-type: none"> 1. Technologies of metallurgical production of the early twentieth century. 2. Start creating and using 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 <p><i>Literature for independent work:</i> [L.7 – P. 535-561]; [L.19 – P. 179-220]</p>
7	<p>Science and technology in the interwar period (20-40 years of the XX century)</p> <p>It is expected that students will prepare a report / presentation, express their own opinion justifying the following issues</p>

№ in order	The name of the topic of the lesson
	<p>1. The development of mining in the 20-40's of the twentieth century. 2. Mechanical engineering in the interwar period. 3. Creation of jet aircraft. 4. Nuclear physics in the 1920s and 1940s <i>Main Literature:</i>[L.1 – V. 3, P. 725-860] ; [L.3 – P. 438-540]; [L.7 – P. 506-565] <i>Additional literature:</i>[L.15 – P.121-170] ; [L.19 – 1-122] Tasks on independent work: 1. The impact of electricity development on the production of electrical equipment. 2. Development of non-ferrous metallurgy in the 1920s and 1940s 3. Creation and use of rockets on solid and liquid fuels. 4. The beginning of the television era <i>Literature for independent work:</i> [L. 7 – P. 535-561]; [L.19 – P.179-220]</p>
8	<p>Development of science and technology in the second half of the twentieth century</p> <p>It is expected that students will prepare a report / presentation, express their own opinion with the justification of the following questions</p> <ol style="list-style-type: none"> 1. Development of electric power. 2. Stages of development of computer technology. 3. Space exploration. Space astronomy. 4. New directions of transport development <p><i>Main Literature:</i> [L.1 – V. 4, P.1112-1205]; [L.3 – P. 624-628]; [L.7 – P. 565-704] Additional literature [L.5 – P. 245-308]; [L.9 – P. 1-100] ; [L.12 – P. 139-192] Tasks on independent work: 1. Academician S. Lebedev and his contribution to modern science. 2. S. Korolev. 3. "He was the first to set foot on the moon" (N. Armstrong) <i>Literature for independent work:</i> [L.10 – P.29-110]; [L.20 –P. 63-178]</p>
9	<p>Development of science and technology at the beginning of the XXI century</p> <p>It is expected that students will prepare a report / presentation, express their own opinion justifying the following issues</p> <ol style="list-style-type: none"> 1. New directions of electric power development. 2. Development of computer technology and digital technologies. 3. Modern space programs. 4. New directions of development of ecological transport <p><i>Main Literature</i> [L.1 – V. 4, P.1112-1205]; [L.3 –P. 624-628]; [L.7 – P. 565-704] Additional literature [L.5 – P. 245-308]; [L.9 – P.1-100]; [L.12 – P.139-192] Tasks on independent work: 1. Hubble reveals the depths of the universe. 2. Creation of computer equipment in Ukraine. 3. Professional and socio-cultural portrait of a modern Ukrainian engineer <i>Literature for independent work:</i> [L.3 – P. 592-623] [L.8 – P. 1-34] [L.10 – P.141-182]</p>

6. Self-study

№ in order	The name of the topic that is submitted for independent study
1.	<p>The state of scientific knowledge of the ancient world <i>Literature:</i> [L.1 – V. 1, P. 91-143]; [L.16 – V.1, P. 4-7]</p>

№ in order	The name of the topic that is submitted for independent study
2	Science, technology and culture in the ancient world <i>Literature:</i> [L.3 – P. 1-50]; [L.6 – P. 3-52]; [L.13 – P. 77-177]; [L.16 – V. 1, P.1-9, 440-484]
3	Progress of human thought in the Middle Ages <i>Literature:</i> [L.1 – V. 1, P. 159-340]; [L.7 – P. 100-270] ; [L.11 – V. 1, P.15-215]; [L.16 – V. 2, P. 161-293]
4	Scientific knowledge of the Renaissance <i>Literature:</i> [L.3 –P. 93-115]; [L.7 – P.139-159]; [L.11 – P. 170-218]
5	Classical science of modern times (XVII - XIX centuries) <i>Literature:</i> [L.1 – V. 2, P. 541-657]; [L.3 – P. 230-438]; [L.6 – P. 235-437] [L.7 – P. 442-461]; [L.12 – P. 37-54]
6	Technical progress and scientific knowledge in the XIX th century. <i>Literature:</i> [L.1 – V. 2, P. 541-657]; [L.3 – P. 230-438]; [L.6 – P. 235-437] [L.7 – P. 442-461]; [L. 12 – 37-54]
7	Scientific and technical development in the XX th century. <i>Literature:</i> [L.1 – V. 3, P. 725-860]; [L.1 – V. 4, P.1112-1205]; [L.3 – P. 438-540, 624-628]; [L.5 – P. 245-308]; [L.7 – P. 506-704]; [L.9 – P. 1-100]; [L.12 – P. 139-192] ; [L.15 – P. 121-170] ; [L. 19 – P. 1-122]
8	The science of Ukraine at different stages of formation <i>Literature:</i> [L.1 – V. 4, P.1110-1112, 1269-1318]; [L.8 – P.1-34]; [L.10 – P.141-182]
9	Main trends and prospects of science development in the XXI century <i>Literature:</i> [L.1 – V. 4, P.1112-1205]; [L.3 –P. 624-628]; [L.5 – P. 245-308]; [L.7 – P. 565-704]; [L.9 – P.1-100]; [L.12 – P.139-192]

Students are encouraged to research and publish their results, in particular to participate in scientific and practical conferences - primarily the one held annually by the Department of History ("Ukraine: History, Culture, Memory").

Students together with the teacher are determined on the subject of theses, available literature and historical materials.

Also, under the guidance of the teacher, students get acquainted with the requirements of registration and submit theses to the conference.

Policy and Assessment

Course policy

7. Policy of academic discipline (educational component)

Processing the educational material of the discipline "History of Science and Technology", students:

At lectures:

- perform periodic express-control of residual knowledge from the sections of the discipline, which may include the implementation of three creative tasks on discussion issues or express test tasks (within 5-10 minutes with the use of tests on the platform "Sikorsky" or written work);
- Conduct an analytical review using the discussion form of communication between the lecturer and students.

At seminars:

Independently

- perform modular control work in writing or using the Sikorsky platform;

Under the guidance of the teacher:

- organize discussions between students on problematic issues of the course, focusing on the analysis and generalization of scientific information;
- formulate their own positions and their position on the assessment of the material presented. Tasks and materials for express control / creative tasks and modular control work are submitted in addition to the work curriculum.

Attendance and performance of tasks

The discipline belongs to the humanitarian cycle of disciplines, which organically combines the achievements of socio-humanitarian and natural sciences. It has extensive interdisciplinary relations with "World History", "History of Ukraine", "Local History", natural and technical sciences and unites at a new level the achievements of individual scientific directions.

"History of Science and Technology" is a dynamically changing science and is constantly replenished with new knowledge, concepts and facts. It is an important means of forming the scientific worldview of students, promotes the growth of general erudition, and is an organic addition to the cycle of social, humanitarian and natural and technical disciplines studied at universities.

Today, the rapid growth of new scientific knowledge, the formation of new scientific concepts and the relentless development of technology is significantly ahead of the process of creating modern educational publications. Therefore, it is very important for students to attend lectures, which will cover modern, systematized educational material, will be shown scientific presentations in the amount sufficient for mastering the discipline by the student. It will be difficult for the student to properly prepare for the seminar, perform express control, and prepare a report or theses for a student scientific conference if he will miss lectures. So, for students who want to demonstrate excellent results of study, active work at lecture classes is simply necessary. However, it is not necessary to specially work out the missed lectures. The processing of the missed material will take place through preparation for seminar classes and for the writing of modular control work.

Active participation of the student in seminar classes is mandatory and will be required. The student's rating will be largely based on the results of his work in seminar classes. Each missed seminar session (regardless of the reasons for the omission) reduces the final rating of the student in the discipline. There is no specific number of missed seminar classes that will require the student to independently study the relevant topics and additional communication on this subject with the teacher. However, a student who missed seminars can get a low rating, which will not allow such a student to be tested. In this case, the topics of the missed seminar classes must be studied, and the student, in agreement with the teacher, to provide creative work on problematic issues on these topics of seminar classes or prepare a video presentation on this topic and provide answers to the teacher's questions (the presentation is attached to the corresponding task in Google class on the Sikorsky platform and provide the same answers to the teacher's questions/comments).

The control of knowledge (understanding) of the student of the missed subjects (performance of tasks) will take place during communication with the teacher according to the schedule of consultations available on a site of chair of history, during a break in training ("in pairs"), or covered in Google class on Sikorsky platform. A student who completes the relevant tasks and answers the teacher's questions will receive the appropriate points for the rating depending on the quality of answers and tasks. Topics and perform tasks provided for missed classes. It is not necessary to wait for the approach of the credit-examination session for the appropriate communication with the teacher. It should be done as soon as the student is ready to demonstrate their knowledge and skills on missed topics.

Topics and tasks for seminars are provided by the work program of the discipline, available from the student's personal account in the system "Campus", on the website of the Department of History or covered on the Sikorsky remote platform using Moodle platforms in this discipline.

The use of laptops and smartphones is allowed at lectures and seminars, but only for the purposes determined by the topic of the lesson and the relevant thematic task. You should not use these (and other similar) means for entertainment or communication during the lesson. It is also not necessary to answer the teacher's questions while reading from the screen of a smartphone, laptop or textbook. This characterizes the level of preparation of the student is not the best.

A student at a seminar can use written notes on the topic of the lesson (or provided by the task), but it is not necessary to express a position by reading from a sheet of paper. It also characterizes the level of preparation of the student is not the best.

It is not recommended to use documents found from unreliable Internet sources (not recommended by the teacher), because they are usually of low quality and formed using outdated information material, or inaccurate information from a particular historical event.

Forms of work

The lectures cover the content of the main genesis, patterns of formation and development of world science and technology, the history of mankind in science and technology from ancient times to the present in close connection with global historical and cultural processes.

Topics of lectures are covered in the work program of the discipline. Questions from students to the teacher are welcomed during the lecture. The teacher can ask questions to individual students or the general audience. Dialogue between students and the lecturer is allowed and welcomed.

The form of student participation in seminars looks like a summary work which includes:

- Speech on the main issue or oral scientific report.
- Additions, questions to the speaker, review of the speech.
- Participation in discussions, interactive forms of organization of the lesson.
- Analysis of source and monographic literature.
- Written assignments (test assignments, creative works, etc.) and their design in accordance with the requirements.

During the seminar the teacher will summarize and analyze the mistakes and shortcomings of the reports made by students (personal point of view), answer students' questions, and students will evaluate each other shortcomings in the report.

University policy

Academic Integrity

The policy and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute». Read more: <https://kpi.ua/code>.(other necessary information regarding academic integrity)

Standards of ethical conduct

Standards of ethical conduct of students and staff are defined in section 2 of the Code of Honor of the National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute». Details: <https://kpi.ua/code>.

8. Monitoring and grading policy

At the first class the students are acquainted with the grading policy which is based on Regulations on the system of assessment of learning outcomes https://document.kpi.ua/files/2020_1-273.pdf

Current control: work at 9 seminars in the form of problem discussions between students on the main issues of the course, with an emphasis on the generalization of scientific information, formulation of their own position and evaluation of the above.

Calendar control: modular control work is conducted three times a semester as a control of residual knowledge in three sections of the discipline and answers to problematic questions of the course.

Semester control: credit

Assessment and control measures

Student rating in the discipline consists of points obtained for:

- 1) Control of residual knowledge from 3 sections of the discipline and includes the implementation of three creative tasks for discussion questions or express test tasks (for 5-10 minutes with the use of tests on the platform "Sikorsky");
- 2) Work at 9 seminars;
- 3) Modular test of three parts of 0.66 academic hours each

Student work:

- at nine seminars determines 45% of his rating in the discipline;
- control of residual knowledge in 3 sections of the discipline determines 18% of his rating in the discipline;

- modular control test determines 37% of its rating in the discipline

The student will receive the highest rating if he/she:

- actively participates in seminars, mostly provides complete and reasoned answers, logically teaches them, expresses his own position on the issues of discussion, this position is clearly and logically stated, substantiates it properly and also actively complements the answers of other students in the classroom; completion of each of the three thematic modules (tasks for MCT are given in Appendix B to the syllabus and to the working curriculum of the discipline. The student is given a one-time opportunity to write MCT.

Missed classes, inaccuracies, inaccuracies input, errors in answers or justifications on unreliable historical sources cause a decrease in the student's rating.

It is expected that at the seminar each student will report independently on the chosen topic on the topic of the seminar. It is expected that students will explain why they formed their own opinion in this way and will also express their opinion on the opinions (reports) of other students.

Proper preparation of a student for a seminar will take an average of 1-1.5 hours.

Detailed expectations from the work of students in each seminar, planned for each lesson learning outcomes can be found in the work program of the discipline (syllabus).

According to the university regulations on the monitoring of students' academic progress (https://kpi.ua/document_control) there are two assessment weeks, usually during 7th/8th and 14th/15th week of the semester, when students take the Progress and Module tests respectively, to check their progress against the criteria of the course assessment policy.

The students who finally score the required number of points (≥ 60) can:

- get their final grade according to the rating score;
- perform a Fail/Pass test in order to increase the grade.

Students whose final performance scores are below 60 points but more than 30 are required to complete a Fail/Pass test. If the grade for the test is lower than the grade, which the student gets for his semester activity, a strict requirement is applied - the student's previous rating is canceled and he receives a grade based on the results of the Fail/Pass test. Students whose score is below 30 are not allowed to take the Fail/ Pass Test.

The final performance score or the results of the Fail/ Pass Test are adopted by university grading system as follows:

<i>Score</i>	<i>Grade</i>
100-95	Excellent
94-85	Very good
84-75	Good
74-65	Satisfactory
64-60	Sufficient
Below 60	Fail
Course requirements are not met	Not Graded

The student's rating as of the 8th week (based on the results of 2-3 seminars) and the 16th week (based on the results of the next 5-6 seminars) is reported to the student in class or in the personal account of the electronic campus. Detailed criteria for assessing student learning outcomes are defined in the regulations on system of assessment of learning outcomes in the discipline, which is an appendix to the work program of the discipline and in appendix C to the syllabus.

The student may appeal the teacher's assessment by submitting a complaint to the teacher no later than the next day after the student's acquaintance with the teacher's grade. The complaint will be considered according to the procedures established by the university.

9. Additional information about the course

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

Recommendations for students

Working at the student's lecture should write down the main terms and concepts record the main events of the proposed topic, summarize generalizations and conclusions on the topic made by the teacher. If the student will listen carefully, record the relevant material, then read this text and use it in solving problems or preparing for a seminar. If after that the student presents his reasonable position (opinion), critically evaluates the positions (opinions) of other students, asks questions to the teacher and students - the amount of learned material and the depth of his understanding will increase many times.

Preparing for the seminar student must necessarily process lecture material on a particular topic, it is desirable to get acquainted with additional resources online. In case of questions, identification of unclear provisions, it is necessary to discuss them with the teacher. In a seminar, even a well-prepared student should not remain a passive observer, but be actively involved in the discussion of the issue. If the student is not acquainted with the study material, he should listen more carefully to the speakers, and thanks to the information received, try to compensate for the shortcomings of preparation for the lesson. You should 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 their opinion based on their own knowledge, experience, logic of the question and so on. At the same time, one should not be afraid to make mistakes - one of the important tasks of studying the humanities is to develop the ability to think logically and express one's own thoughts accordingly. However, it should be remembered 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 allows not only to master the material, but also to save effort during the semester control.

It is important in the proper preparation of the student is to develop his ability to work with documents of historical significance.

When reading a new informational historical document, one should, first of all, try to find out its authenticity, understand the logic and sequence of relevant historical events and their impact on the present. Such an analysis will allow the student not only to better absorb information, but also to analyze past historical events, their impact on the present and as a result the analysis of the deployment of possible future historical events.

If you have difficulty understanding some historical events, be sure to contact your teacher.

Extracurricular activities

Students can participate in research work and publish its results, in particular to participate in scientific and practical conferences - especially the one held annually by the Department of History ("Ukraine: History, Culture, Memory") .

Distance learning

Synchronous distance learning is possible using video conferencing platforms and a distance learning educational platform at the university.

Inclusive training

Allowed

Syllabus of the course

Is designed by teacher PhD, Associate Professor, Svitlana Boyeva

Adopted by Department of Computer Engineering (protocol № 10, 25 May 2022)

Approved by the Faculty Board of Methodology (protocol № 10, 09 June 2022)

List of issues before semester control (test)

Sample scoring ticket

NATIONAL TECHNICAL UNIVERSITY OF UKRAINE «IGOR SIKORSKY KYIV POLYTECHNIC INSTITUTE».

Level of higher education

First (Bachelor)

Specialty

121 Software Engineering

Educational program

Computer Systems Software Engineering

Academic discipline

History of science and technology

SCORING TICKET No _____

- 1 *Questions from The First Block of Issues*
- 2 *Questions from the Second Block of Issues*

Approved at the meeting of the *Of History*
Department

Protocol No.

« »

202 p.

Head of the Department of
History

(sign)

(name, surname)

QUESTIONS for the formation of credit cards *

Question I from the block of questions

1. Determine the place of the history of science and technology in the system of humanities, natural sciences, technical sciences.
2. Give a definition and reasoned assessment of the problem of humanization of scientific and technical 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 characteristics of different types of sources.
5. Analyze the level of development of knowledge and technology of mankind in the Paleolithic and Mesolithic.
6. Describe the Neolithic revolution in its main centers, linking the level of development of knowledge and technology with natural conditions.

7. Make a comparative analysis of the scientific and technological achievements of the ancient civilizations of Egypt and the Mesopotamia.
8. Identify the main achievements of science and technology of ancient India and China.
9. Describe and explain the features of technology in ancient Greece.
10. Give a reasoned assessment of the transition from mythological to scientific perception of the world in ancient Greece on the example of the impact on natural and technical knowledge.
11. Using the comparative-historical method, identify new features of the development of scientific and 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 the answer.
13. Compare approaches to the development of scientific knowledge in the Christian and Muslim world of the Middle Ages.
14. Describe the versions of leading researchers on the role of the Middle Ages in the development of technology and highlight the most likely. Justify the answer.
15. Explain how the spread of humanism and the Reformation influenced the development of science in Renaissance Europe.
16. Identify the essence of the Great Geographical Discoveries and their implications for scientific and technological development.
17. Give a reasonable version of whether it is appropriate to use the terms "powder revolution" and "agro-technical revolution" in relation to Renaissance Europe.
18. Identify the prerequisites and reveal the essence of the scientific revolution of the seventeenth century.
19. Explain the spread of Enlightenment ideology and scientific and technological progress.
20. Describe the main consequences of the scientific revolution of the seventeenth century. and the essence of the mechanistic picture of the world.

Question II from block of questions

1. Indicate what caused the industrial revolution of the eighteenth and nineteenth centuries. and caused its uneven distribution around the world.
2. Give a comparative description of machine and manufacturing.
3. Discover and evaluate the contribution of leading scientists to the development of classical science in the eighteenth - mid-nineteenth century.
4. Highlight the main stages and directions of the industrial revolution.
5. Identify the essence and consequences of fundamental scientific discoveries of the late nineteenth - early twentieth century.
6. Explain the difference between non-classical and classical science.
7. Give a reasonable 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 rate of improvement of peaceful and military production in the interwar period.
10. Give a reasoned assessment of the general state of science and technology during the Second World War, depending on the degree of participation of countries in hostilities.
11. Explain the structure, periodization and main consequences of the scientific and technological revolution.
12. Identify the positive and negative impacts of scientific and technological progress on the ecosystem.
13. Give a reasoned assessment of the effectiveness of major international conservation programs.
14. Compare the leading concepts for defining the information society and its components.
15. Follow 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 scientific and technological development of Ukraine in market conditions.
18. Compare the achievements of academic and branch scientific institutions and the achievements of higher education scientists in independent Ukraine.

19. Describe Ukraine's international cooperation in the field of science and technology, possible ways to expand and deepen such cooperation.

20. Give a reasoned assessment of international cooperation NTUU «Igor Sikorsky KPI» in scientific and technical sphere and outline its possible prospects.

Modular test workAcademic discipline
History of science and technology**first (bachelor) level of higher education degree "Bachelor"****form of education**

Full-time

Upon completion of each of the three thematic modules, students are given a one-time opportunity to write an MCR, which consists of test tasks. The first and second MTW are rated at 12 points each. Third MTW - 13 points. The maximum number of points for three MTWs is 37.

TASKS for MTW 1.1. For Section 1. Historical aspects of the development of science and technology in the agrarian era

Test tasks are formed from the following blocks

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

TASKS for MTW 1.2. For Section 2. Scientific thought and technological capabilities of mankind in the industrial age

Test tasks are formed from such blocks

1. The development of technology and scientific knowledge in the mid-XVIII - 70's of the XIX century. Classical science of modern times (XVII - XIX centuries);
2. Technical progress in the XIX century. New discoveries in physics, mathematics and natural sciences at the turn of the XIX-XX centuries.
3. The development of technology in the early twentieth century and during the First World War.

TASKS for MTW 1.3. For Section 3. Defining trends in the development of science and technology in the information age

Test tasks are formed from the following blocks

1. World science and technology in the interwar period (1920-1940's);
2. Development of science and technology in the second half of the twentieth century;
3. The main trends and prospects for the development of science in the XXI century;
4. Science of Ukraine at different stages of formation;
5. History of origin and development of engineering education and technical sciences.

**Rating system for assessing learning outcomes
in academic discipline**

History of science and technology

Of the first (bachelor) level of higher education degree "Bachelor"

form of study

Full-time

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

- Control of residual knowledge at 9 lectures
- Work at 9 seminar classes
- Modular control work of three parts of 0.66 academic hours each

System of rating (weight) points and evaluation criteria:

1. Control of residual knowledge at 9 lectures (maximum number of points per lecture is 2):

- full response (not less than 90% of the required information), appropriate justifications and personal opinion	2
- a full answer is enough (not less than 75% of the required information), which is fulfilled in accordance with the requirements to the level of "skills", or minor inaccuracies)	1,5
- incomplete response (not less than 60% of the required information)	1

2. Works at 9 seminar classes (the maximum number of points at the one seminar is 5 points)

– full response (not less than 90% of the required information), appropriate justifications and personal opinion	5
– a full answer is enough (not less than 75% of the required information), which is fulfilled in accordance with the requirements to the level of "skills", or minor inaccuracies)	4
– incomplete response (not less than 60% of the required information)	3

3. Writing an MCW from 3 parts of 37 tests (the maximum number of points for 1 test is 1 point).
Correct answer – 1 point
Wrong answer – 0 points

Calculation of the scale (R) rating:

The sum of weight 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 test by the so-called "automatic" in accordance with the rating scored.

Students who have not completed the MCW not less than "satisfactory" and did not receive at least 30 starting points are not allowed to the test.

Students who have complied with the conditions of admission to the test, but scored less than 60 points during the semester ($RD < 0.6 R$) perform scoring control work.

The test is evaluated with 100 points and consists of two questions. (*Maximum number of points for 1 question is 50 points*)

full response (not less than 90% of the required information)	5 0-45
a full answer is enough (not less than 75% of the necessary information)	4 4-38
incomplete response (not less than 60% of the required information)	3 7-30

For its results, the student will be given the results (the ECTS and traditional) according to the table.

<i>RD</i>	ECTS score	The traditional assessment
95 – 100	Excellent	Excellent
85 – 94	Very good	Good
75 – 84	Good	
65 – 74	Satisfactory	Satisfactory
60 – 64	Sufficient	
<i>RD</i> < 60	Fail	Fail