



## History of Science of Technology

### Working Programme of the Academic Discipline (Syllabus)

Particulars of the academic discipline	
Level of higher education	<i>First (bachelor's degree)</i>
Branch of knowledge	<i>16 Chemical and bioengineering</i>
Programme Subject Area	<i>163 Biomedical engineering</i>
Educational programme	<i>Medical engineering</i>
Status of the discipline	<i>Compulsory</i>
Mode of study	<i>Full-time (day-time)/Distance/Mixed</i>
Year of study, semester	<i>First year, Autumn semester</i>
The scope of the course	<i>2 ECTS credits / 60 hours</i>
End-of-semester control / control measures	<i>Test</i>
Schedule	<i><a href="http://rozkład.kpi.ua">http://rozkład.kpi.ua</a></i>
Language of instruction	<i>English</i>
Information about course supervisor and lecturers	<i>Lecturer: Associate Professor Vitalii Buzan, Candidate of Historical Sciences, e-mail <a href="mailto:buzan.vitalii@lll.kpi.ua">buzan.vitalii@lll.kpi.ua</a> Seminars: Associate Professor Vitalii Buzan, Candidate of Historical Sciences, e-mail <a href="mailto:buzan.vitalii@lll.kpi.ua">buzan.vitalii@lll.kpi.ua</a></i>
Course placement	<i>Google classroom</i>

#### Curriculum of the discipline

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

*The course aims at creation of historical consciousness, familiarization with main historical periods, processes and events in History of Science and Technology. The student should create complex knowledge of scientific and technological development as complex historical process on its basis.*

*The educational component contributes to the development of professional expertise in history studies. Students will understand the general logics of scientific and technological development that could be used during their following study in engineering.*

*The history of science and technology is an integral component of personal formation of the specialist. It positively influences personal abilities of communication and logical thinking.*

**The programme competencies** (The programme was put into effect by the Rector's Order № 89/2021 from 19.04.2021):

- GC 1** – Ability to apply knowledge in practical situations.
- GC 3** – Ability to communicate in the state language both orally and in writing.
- GC 4** – Skills in the use of information and communication technologies.
- GC 6** – Ability to search process and analyze information from various sources.
- GC 7** – Ability to generate new ideas (creativity).
- GC 8** – Ability to make well-grounded decisions.
- GC 9** – Ability to communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge / types of economic activity).
- GC 12** – The ability to realize their rights and responsibilities as a member of society, to appreciate the values of civil (free democratic) society and the need for its sustainable development, the rule of law, rights and freedoms of human and of Ukraine's citizen.

The **purpose** of the study discipline is a formation of student's abilities to:

- Expand the student's historical knowledge;
- Organize scientific disputes, acquire skills of scientific discussion;
- Predict the perspectives of scientific and technical development;
- Use the historical experience of scientific and technological development for further researches in engineering during his/her study and professional career.

Students should demonstrate the following **learning outcomes** after passing the discipline:

**Knowledge of:**

- Scientific periodization of history of science and technology;
- Main principles, methods and sources of historical research;
- Process of emergence of educational and research facilities as major centers of scientific activities during the history;
- Main events and key figures in scientific and technical development;
- Ukrainian scientists and inventors during the history.

**Skills:**

- Ability to adopt the historicism principle for scientific and technical development;
- To understand interdependency of technological development and historical conditions of each historical period;
- Analyze different kinds of sources for further understanding of historical processes;
- Estimate the level of reliability of modern historical theories and literature;
- Use the historical knowledge to answer difficult questions in your main field of study (Biomedical Engineering);
- Understand the importance of historical artefacts and preserve it for future generations;
- Operate with corresponding terminology.

**Experiences:**

- The main tools of analysis of historical written sources and texts of contemporary period;
- Organization and taking part in public discussions and speeches;
- Creation of presentations of papers, including multimedia.

## **2. Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of the education according to the relevant educational programme)**

*The academic discipline is an integral part of to mandatory (compulsory) components of educational programme and refers the general training cycle. This course usually proposed to students during their first year of study (1st semester). English language levels (CEFR) B2–A2 is assumed knowledge and prerequisites to that discipline.*

## **3. The content of the discipline**

*The topics, tasks, terms and conditions are explained during the first lecture and seminar.*

### **List of topics:**

*Section 1. The accumulation of knowledge, science and technology during first periods of history*

*Topic 1. History of science and technology as study discipline.*

*Topic 2. The accumulation of knowledge, science and technology during prehistory. The emergence of first civilizations.*

*Topic 3. The evolution of theoretical knowledge, technical development during Antiquity and Middle Ages history.*

*Topic 4. Technological development of Early Modern History.*

*Section 2. The achievements of Science and technology during the industrial age*

*Topic 5. The Industrial revolution.*

*Topic 6. Technological development of the first half of 20th century.*

*Section 3. The post-industrial (informational) period of scientific and technological development*

*Topic 7. Post-industrial society (starting from the mid-20th century).*

*Topic 8. The development of technology during STR.*

*Topic 9. Ukraine and its scientific achievements.*

## **4. Teaching materials and resources**

### **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. Encyclopaedia 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: mcgrave 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 20th century 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.*

### **Information resources:**

[www.nas.gov.ua](http://www.nas.gov.ua)  
[www.history.org.ua](http://www.history.org.ua)  
[www.pritsak-center.com](http://www.pritsak-center.com)  
[www.nbu.gov.ua/portal/natural/nnz/index.html](http://www.nbu.gov.ua/portal/natural/nnz/index.html)  
[www.fordham.edu/Halsall/science/sciencesbook.asp](http://www.fordham.edu/Halsall/science/sciencesbook.asp)  
[www.mhs.ox.ac.uk/](http://www.mhs.ox.ac.uk/)  
[www.historyworld.net/wrldhis/PlainTextHistories.asp?historyid=ab11](http://www.historyworld.net/wrldhis/PlainTextHistories.asp?historyid=ab11)  
[www.ukrainiancomputing.org/PHOTOS/Memorial\\_u.html](http://www.ukrainiancomputing.org/PHOTOS/Memorial_u.html)  
[www.n-t.ru/tp/it/](http://www.n-t.ru/tp/it/)  
[www.astro-cabinet.ru/](http://www.astro-cabinet.ru/)  
[www.computerhistory.narod.ru/](http://www.computerhistory.narod.ru/)  
[www.sergeydolya.livejournal.com/594097.html](http://www.sergeydolya.livejournal.com/594097.html)

## **Educational content**

### **5. Methods of mastering the discipline (educational component)**

*The course consists of three main parts: lectures, seminars and self-study.*

Lectures should provide students with an understanding of cause-effect relations of historic processes, substance of the issues, reasons, and consequences of historical or momentous events. It recommends using different visual support materials (multimedia presentations, historical maps, photographs, illustrations, timeline chart, and chronology) on lectures.

At the end of the lecture, students would take an intermediate test. Intermediate test is a form of an interim assessment. It helps the educator to evaluate the academic achievements of students and determine further learning process. Preparing an essay offers students an opportunity to summarize gained knowledge and improve academic writing skills.

### **Lectures**

<b>No</b>	<b>The subject of the lecture and a list of the main issues</b>
1.	<p><b>History of Science and Technology as an academic discipline</b></p> <ol style="list-style-type: none"> <li>1. Objectives of the course.</li> <li>2. Sources and methodology of historical sciences.</li> <li>3. The main forms of interaction of social and natural sciences.</li> <li>4. The role of history of science and technology in personal development of technical specialist.</li> </ol> <p>Self-study task: 1. Main requirements for technical specialist in the post-industrial age.</p>
2.	<p><b>Knowledge accumulation, development of science and technology during pre- and Ancient history</b></p> <ol style="list-style-type: none"> <li>1. Technology and worldview during the human evolution process.</li> <li>2. Late Stone Age development, transition to breeding technologies and its impact on history of humankind.</li> <li>3. Science and technology of Ancient Middle East (Egypt, Mesopotamia).</li> <li>4. Science and technology of Ancient Far East (India, China).</li> </ol> <p>Self-study task: Writing systems of ancient civilizations (Egypt, Mesopotamia, India, and China).</p>
3.	<p><b>Knowledge accumulation, development of science and technology during Antiquity and Middle Ages</b></p> <ol style="list-style-type: none"> <li>1. Scientific and technological achievements of Ancient Greece and Hellenistic World.</li> <li>2. The emergence of Roman Empire and its technology.</li> <li>3. The main features of technological development of Medieval Europe.</li> <li>4. The technological progress of Medieval East.</li> </ol> <p>Self-study task: Scientific and technological development of Byzantium Empire.</p>
4.	<p><b>Scientific development in Europe during Early Modern History. The Scientific Revolution of 17th century.</b></p> <ol style="list-style-type: none"> <li>1. The formation of science during the Renaissance era.</li> <li>2. Manufacturing and technical innovation.</li> <li>3. Scientific revolution in Europe.</li> <li>4. Societal outcomes of progress and innovation during Early Modern History.</li> </ol> <p>Self-study task: 1. The necessary prerequisites for scientific breakthrough during Early Modern period. 2. Geographical discoveries of the period and their influence on worldview.</p>
5.	<p><b>Industrial revolution (18 – first half of 20th century)</b></p> <ol style="list-style-type: none"> <li>1. Prerequisites for the Industrial Revolution.</li> <li>2. The main periods of the Industrial Revolution and its most important innovations.</li> <li>3. Transfer from classical to post-classical scientific paradigm.</li> </ol>

	<p>4. <i>The emergence of engineering and engineering education.</i>  <i>Self-study task: 1. The role of science in technological development during the Industrial Revolution.</i></p>
6.	<p><b><i>The scientific and technological progress of the first half of 20th century</i></b>  <i>1. Main outcomes of WWI for science and technology. 2. Depression in technological progress during the Interwar period. 3. Military technologies before and during WWII. 4. The peak of industrial development paradigm. New technological branches as an outcome of WWII.</i>  <i>Self-study task: 1. The comparative analysis of influence of WWI and WWII on technological progress.</i></p>
7.	<p><b><i>Post-industrial society (starting from the mid-20th century)</i></b>  <i>1. Scientific and technical revolution (STR). It's meaning for the mankind.</i>  <i>2. Main stages of STR and its locations.</i>  <i>3. Development of technical education during STR.</i>  <i>Self-study task: The main features for emergence of information-oriented society in Ukraine.</i></p>
8.	<p><b><i>The development of technology during STR</i></b>  <i>1. New technologies of STR.</i>  <i>2. The role of a human during the STR.</i>  <i>3. The emergence of information-oriented society</i>  <i>Self-study task: 1. The exploration of Universe during the STR</i></p>
9.	<p><b><i>Contemporary Ukraine in context of STR</i></b>  <i>1. The proclamation of Ukrainian independence and its influence on industrial, technical, and scientific development.</i>  <i>2. The structure of scientific institutions in Ukraine.</i>  <i>3. System for education of engineering specialists in Ukraine and perspectives for its development.</i>  <i>4. The main features of Ukrainian impact in international scientific and technical cooperation projects.</i>  <i>Self-study task: Ukrainian scientific and technological projects and international competitive activity</i></p>

*On seminars, we consider principal developments and important processes of history. It is important to encourage students to discuss on controversial problems, disputable questions, shape and express their own opinion, draw general conclusions. Prescribed material should help students to prepare for careful consideration of key points.*

#### **Seminars**

<b>No</b>	<b>The title of the lessons and a list of the main issues</b>
1.	<p><b><i>History of Science and Technology as a Course of Study.</i></b>  <i>1. Objectives of the course.</i>  <i>2. Sources and methodology of historical sciences;</i>  <i>3. The main forms of interaction of social and natural sciences.</i>  <i>4. The role of history of science and technology in personal development of technical specialist.</i>  <i>Self-study task: 1. The development of technical activity during 21st century.</i></p>
2.	<p><b><i>Knowledge accumulation, development of science and technology during pre- and Ancient history</i></b></p>

	<p>1. <i>Technology and worldview during the human evolution process.</i></p> <p>2. <i>Late Stone Age development, transition to breeding technologies and its impact on history of humankind.</i></p> <p>3. <i>Science and technology of Ancient Middle East (Egypt, Mesopotamia).</i></p> <p>4. <i>Science and technology of Ancient Far East (India, China).</i></p> <p><i>Self-study task: 1. Calculation systems of ancient civilizations (Egypt, Mesopotamia, India, China).</i></p>
3.	<p><b>Knowledge accumulation, development of science and technology during Antiquity and Middle Ages</b></p> <p>1. <i>Scientific and technological achievements of Ancient Greece and Hellenistic World.</i></p> <p>2. <i>The emergence of Roman Empire and its technology.</i></p> <p>3. <i>The main features of technological development of Medieval Europe.</i></p> <p>4. <i>The technological progress of Medieval East.</i></p> <p><i>Self-study task: 1. Scientific and technological influences of the Antiquity on surrounding civilizations.</i></p>
4.	<p><b>Scientific development in Europe during Early Modern History. The Scientific Revolution of 17th century.</b></p> <p>1. <i>The formation of science during the Renaissance era.</i></p> <p>2. <i>Manufacturing and technical innovation.</i></p> <p>3. <i>Scientific revolution in Europe.</i></p> <p>4. <i>Societal outcomes of progress and innovation during Early Modern History</i></p> <p><i>Self-study task: The most important personalities of the Scientific Revolution and Geographical discoveries' period.</i></p>
5.	<p><b>Industrial revolution (18 – first half of 20th century)</b></p> <p>1. <i>Prerequisites for the Industrial Revolution.</i></p> <p>2. <i>The main periods of the Industrial Revolution and its most important innovations.</i></p> <p>3. <i>Transfer from classical to post-classical scientific paradigm.</i></p> <p>4. <i>The emergence of engineering and engineering education.</i></p> <p><i>Self-study task: The invention of the steam engine and its influence on technological development during the Industrial Revolution.</i></p>
6.	<p><b>The scientific and technological progress of the first half of 20th century</b></p> <p>1. <i>Main outcomes of WWI for science and technology.</i></p> <p>2. <i>Depression in technological progress during the Interwar period.</i></p> <p>3. <i>Military technologies before and during WWII.</i></p> <p>4. <i>The peak of industrial development paradigm. New technological branches as an outcome of WWII.</i></p> <p><i>Self-study task: 1. The comparative analysis of influences of WWI and WWII on technological progress.</i></p>
7.	<p><b>Post-industrial society (starting from the mid-20th century)</b></p> <p>1. <i>Scientific and technical revolution (STR). Its meaning for the mankind.</i></p> <p>2. <i>Main stages of STR and its locations.</i></p> <p>3. <i>Development of technical education during STR.</i></p> <p><i>Self-study task: 1. The main features for emergence of information-oriented society in Ukraine.</i></p>
8.	<p><b>The development of technology during STR</b></p> <p>1. <i>New technologies of STR.</i></p> <p>2. <i>The role of a human during the STR.</i></p> <p>3. <i>The emergence of information-oriented society.</i></p> <p><i>Self-study task: 1. The Space race during 20-21st centuries.</i></p>

<b>9.</b>	<p><b>Contemporary Ukraine in context of STR</b></p> <ol style="list-style-type: none"> <li>1. Ukrainian independence proclamation and its influence on industrial, technical, and scientific development.</li> <li>2. The structure of scientific institutions in Ukraine.</li> <li>3. System for education of engineering specialists in Ukraine and perspectives for its development.</li> <li>4. The main features of Ukrainian impact in international scientific and technical cooperation projects.</li> </ol> <p>Self-study task: 1. Ukrainian scientific and technological projects and international competitive activity.</p>
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## 6. Students' Individual Work

*Prepare an essay on the topic «Inventions That Changed the World».*

*Essay requirements. The text should be typed. Length: 1-2 pages; front: Times New Roman; font-size: 12 or 14; margins: justify; line and paragraph space: 1 or 1,5. An essay of more than one page should have page numbering. On the first page of your work, you should indicate your first and last name, e-mail address, study year, group number. Remember to hand in by the deadlines specified by the educator.*

*Students are required to be committed to the principles of academic integrity. Special software would analyze the text of an essay and check it for plagiarism.*

*Deadline: 14th week of education. The file (doc or pdf version) you can send lecturer via e-mail or submit to Google classroom.*

## Policy and control

### 7. Policy of academic discipline (educational component)

#### Attending classes

*It is strongly recommended to the students to be present at classes and prepare to each of them because it is the best opportunity to receive marking points for it. Students have to cooperate among themselves as a group and with teacher personally. It is the best model of interaction that provides the best performance during this course.*

*The grading system is focused on obtaining points for student activity, as well as performing tasks that are able to develop practical skills and abilities.*

*The student could repeat those tests and classes that were missed by student during the consulting hours after an arrangement with teacher. This task could be fulfilled by independent preparation of materials of missed lecture or seminar and their presentation to the teacher during consulting hour. After that the student would write an express test in the same way as it was on the lecture.*

#### 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>.*



## **Norms of ethical behavior**

*Normative principles of behavior of students and employees are outlined in sections 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: <https://kpi.ua/code>.*

## **Procedure for appealing the results of control measures**

*Students have the opportunity to raise any issue related to the control procedure and expect it to be addressed according to predefined procedures.*

*Students have the right to appeal the results of the control measure according to the approved provision on appeals in the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (approved by the order №NON/128/2021 from 20.05.2021) - <https://osvita.kpi.ua/index.php/node/182>*

## **Inclusive education**

*The discipline can be taught to students with special educational needs.*

## **Distance learning**

*Distance learning takes place through the Sikorsky Distance learning Platform «Sikorsky» or Google Classroom.*

*Some part of instruction material is undertaken by blended and online learning. The educator uses various electronic resources and digital tools for learning and teaching. Among them are photographs, audio recordings, videos, primary and secondary sources, data visualization, digital atlas and interactive websites.*

## **Learning a foreign language**

*Teaching in English is carried out only for foreign students.*

## **8. Type of control and rating system for assessing learning outcomes**

### **Continuous assessment (current control):**

#### *1) Lecture Participation (taking tests)*

*Students would pass a test at the end of the lecture. Approximate duration of the test is 20 min.*

*Maximum rating point – 12 points per test.*

*Overall answer (not less than 90% of information) – 12 points.*

*Sufficiently complete answer (not less than 75% of information) – 7-8 points.*

*Insufficient answer (not less than 50 % of information) – 3-5 points.*

*Unsatisfactory answer – 0 points.*

*Maximal grade point for all tests are 3 tests × 12 points = 36 points.*

*Maximum grade points for all lectures are: 36 points.*

#### *2) Seminar Participation (delivering reports)*

*All students would participate in seminars and deliver reports.*

*Maximum rating point – 5 points per seminar.*

*Criteria for assessments:*

*High competence in the topic, active participation in the discussion – 5 points. Strong interest to the point of the issue, partial participation in debates – 4 points.*

*Mild interest to the matter of discussion, occasionally participation – 2 points.*

*Indifference to issue under discussion, total inactivity – 0 points.*

*Maximum grade points for seminar participation are: 8 seminars × 5 points = 40 points.*

*3) An accomplishment of a task (writing an essay)*

*Writing an essay about «Inventions That Changed the World».*

*Maximum rating point – 24 points.*

*Criteria for assessments:*

*The text has high distinctiveness and novelty – 24 points.*

*The text has middle distinctiveness and novelty – 12 points.*

*The text has low distinctiveness and novelty – 6 points.*

*The text has no academic/studying value or the text infringes the values of academic integrity – 0 points.*

*Maximum grade points for the accomplishment of a task is 24 points.*

*The final grade point is the sum of points received by a student during the semester plus the sum of the incentive and penalty points. Highest possible grade point for the course «History of Science of Technology» is 100 points.*

*The course final grade = 36+40+24=100 points*

<i>Activity</i>	<i>Quantity</i>	<i>Points</i>	<i>Sum</i>
<i>Lectures (tests)</i>	<i>3</i>	<i>12</i>	<i>36</i>
<i>Seminars (reports)</i>	<i>8</i>	<i>5</i>	<i>40</i>
<i>Individual Work (essay)</i>	<i>1</i>	<i>24</i>	<i>24</i>
			<i>100</i>

*Incentive points:*

*participation in a student conference – 7 points;*

*participation in a student history competition – 7 points.*

**Interim assessment (calendar control or so-called «attestation»):**

*There are two interim assessments of student academic achievements per semester. First interim assessment (after 8 weeks) is passed if a student received not less than 20 points. Second assessment (after 14 weeks) is passed if a student received not less than 40 points.*

	<i>First attestation</i>	<i>Second attestation</i>
<i>Terms</i>	<i>8th week</i>	<i>14th week</i>
<i>Quantity of points</i>	<i>≥ 20</i>	<i>≥ 40</i>

**Precondition for admittance to a test:**

*At least 40 points per semester are an essential prerequisite for admission to the test. The educator could exempt a student from examination for good performance. At least 60 points per semester give student a possibility to pass the course without a taking a test. A student is obliged to take a test in history if they received less than 60 points per semester. A*

*student has a right to take a test in order to receive the highest-grade points. The rigid appraisal rating system is applied. It means that previous grade point on course is cancelled if a student is willing to take a test. A final grade point of such student rest on the results of the test.*

**Final assessment (Semester control):**

*The final test is a terminal examination.*

*Maximum point for taking tests – 100 points.*

*The test consists of 2 questions from the list of questions. The highest possible grade point for an answer for every question – 50 points.*

*Criteria for assessments of a test:*

*100-95 points – a good answer to all questions or some minor faults, no more than one mistake;*

*94-85 points – some mistakes in the answers to the test question and problem-solving task;*

*84-75 points – partial answers to the test question and problem-solving questions, no more than four mistakes;*

*74-65 points – insufficient answers to test question, significant mistakes in problem-solving question or such answer is absent;*

*64-60 points – insufficient answer to test question, an answer to a problem-solving question has numerous mistakes.*

*0 points – unsatisfactory answers to all questions or answers are absent.*

The educator assigns scores in ECTS and university system to examination record list in accordance with the table:

Final grade point	University mark
95-100	Excellent
85- 94	Very good
75- 84	Good
65-74	Satisfactory
60-64	Sufficient
Less than 60	Unsatisfactory

**Additional information on the discipline**

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

*List of test questions:*

- 1. Development of technology during the Paleolithic period.*
- 2. Development of technology in the period of the Mesolithic and Neolithic.*
- 3. Development of military equipment of ancient times.*
- 4. Achievements of pre-Columbian American civilizations.*
- 5. Development of scientific knowledge in the Middle Ages. Medieval universities.*
- 6. Arabic Medieval Science.*
- 7. Technical inventions of medieval China.*
- 8. The emergence of firearms in Europe.*
- 9. The emergence of book printing in Europe and Ukraine.*
- 10. Development of ideas about the model of the universe: geocentrism and heliocentrism.*

11. *The emergence of classical science: from Galileo Galilei to Isaac Newton.*
12. *The Industrial Revolution in England and its outcomes.*
13. *Invention of the Steam Engine. Thomas Savery, Thomas Newcomen, James Watt.*
14. *The impact of the Industrial revolution on transport. Richard Trevithick, George Stephenson, Robert Fulton.*
15. *History of telecommunication. Charles Wheatstone, Alexander Bell, Elisha Gray, Guglielmo Marconi, Samuel Morse.*
16. *Solving the problem of electricity transmission over long distances (late nineteenth - early twentieth century). Electrical engineer Marcel Deprez.*
17. *Emergence and development of railway transport.*
18. *History of the invention of the internal combustion engine.*
19. *History of the automobile. Inventors: Nicolaus Otto, Gottlieb Daimler, Wilhelm Maybach, Carl Benz.*
20. *Emergence and development of automobile transport.*
21. *The invention of the film camera and the advent of cinema. Auguste and Louis Lumière.*
22. *X-rays: the history of discovery and significance in medicine.*
23. *Discovery of radioactivity. Marie Skłodowska Curie, Pierre Curie, Ernest Rutherford, Frdric and Irene Joliot-Curie.*
24. *New equipment and technologies during the First World War.*
25. *Devices developed by inventors Thomas Edison and Nikola Tesla.*
26. *Establishment of Ukrainian Academy of Sciences and the main directions of its activity in the first half of the XX century. Volodymyr Vernadsky.*
27. *Development of electric welding and bridge construction. The activity of Evgeny Paton.*
28. *History of computing and the Internet. Alan Turing and the development of theoretical computer science.*
29. *The emergence and development of mobile phones.*
30. *History of aviation and rockets (invention of airplanes and helicopters, jet aviation, launch vehicle, unmanned aerial vehicle).*
31. *Creation and use of rockets on solid and liquid fuels.*
32. *Discovery of antibiotics. Alexander Fleming. The origin of genetics. Thomas Hunt Morgan.*
33. *The creation of nuclear weapon. Manhattan Project. Robert Oppenheimer, Enrico Fermi.*
34. *History of human space exploration (artificial satellites of the Earth, human flight into space, Moon landing, Mars exploration program).*
35. *Ukraine's contribution to space exploration.*
36. *Igor Sikorsky and his contribution to development of aviation.*

**Working programme of the academic discipline (syllabus):**

**Prepared by** Associate Professor, Candidate of Historical Sciences Vitalii Buzan

**Approved by** the Department of History (protocol № \_\_\_ from \_\_\_\_\_)

**Adopted by** the Methodical Commission of the Faculty of Sociology and Law (protocol № \_\_\_ from \_\_\_\_\_)