

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL TECHNICAL UNIVERSITY
«KHARKIV POLYTECHNIC INSTITUTE»

METHODICAL GUIDELINES
for preparing for practical classes and self-study on
"History of Science and Technology"
for English-speaking Students

Затверджено
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Kharkiv
NTU "KhPI"
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Методичні вказівки до практичних занять та самостійної роботи з «Історії науки й техніки» для англомовних студентів / уклад. М.В. Гутник, С.А. Радогуз. – Харків : НТУ «ХПІ», 2025. 14 с.

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Укладачі: М.В. Гутник, С.А. Радогуз

Рецензент доц. В.В. Маліков

Кафедра українознавства, культурології та історії науки

The purpose of the discipline “History of Science and Technology” is to foster the formation of a holistic scientific worldview by understanding the patterns of development in science and technology as a unique historical and cultural phenomenon.

DESCRIPTION OF THE EDUCATIONAL DISCIPLINE
(Distribution of teaching time per semester classes and types)

Semester	Total amount			By type of classroom studies (hours)			Individual student task (CP, CW, CG, C, report)	Current control	Semester control	
	Total amount (hours) ECTS credits	From this		Lectures	Laboratory work	Practical studies, seminars		Control works (number of works)	Credit	Exam
		Classroom studies (hours)	independent work (hours)							
1	2	3	4	5	6	7	8	9	10	11
5, 6	90/3	32	58	16		16	R	-	credit	-

Preparing for the practical classes: a guide

- ⇒ *Review the provided reading materials before the workshop.*
- ⇒ *Prepare a brief presentation on a significant invention or scientist from a chosen historical period.*
- ⇒ *Engage in group discussions to evaluate the societal impact of technological advancements.*
- ⇒ *Submit an outline of your key arguments prior to the session.*

TOPIC 1. SCIENCE AND TECHNOLOGY AS A HISTORICAL AND CULTURAL PHENOMENON. THE INITIAL STAGE OF FORMATION

1. The essence of scientific and engineering activities.
2. Initial knowledge in the pre-civilization period.
3. Achievements of ancient civilizations of Egypt, Mesopotamia, India and China.

TOPIC 2. SCIENTIFIC AND TECHNICAL KNOWLEDGE OF ANTIQUITY AND THE MIDDLE AGES

Questions:

1. The achievements of ancient science and technology.
2. Contradictions in the development of science and technology of the Middle Ages.

TOPIC 3. SCIENCE AND TECHNOLOGY IN THE 17TH CENTURY

Questions:

1. Characteristics of the stages of the scientific revolution of the XVII century.
2. Achievements of the natural sciences.
3. Features of technology development.

TOPIC 4. DEFINING CHARACTERISTICS OF SCIENCE AND TECHNOLOGY IN THE 18TH CENTURY

Questions:

1. The emergence of new areas of scientific research.
2. The beginning of the industrial revolution and its consequences.

TOPIC 5. TECHNOLOGICAL PROGRESS IN THE 19TH CENTURY

Questions:

1. Application of scientific achievements in the field of electricity and magnetism in practice. The electrical revolution.
2. Distribution and improvement of machines. Development of transport, aviation, communication technology.
3. Formation of machine-building industry and its influence on the development of chemistry and electrical engineering.

TOPIC 6. TECHNOLOGICAL ACHIEVEMENTS OF THE FIRST HALF OF THE 20TH CENTURY

Questions:

1. Scientific revolution in natural science. Electrodynamical picture of the world.
2. The directions of development of science and technology in the late nineteenth - early twentieth century.

TOPIC 7. SCIENCE AND TECHNOLOGY IN THE 21ST CENTURY

Questions:

1. The concept of NTR. Its essence. Periodization.
2. Trends in the development of science and technology in the XXI century.

TOPIC 8. STAGES OF DEVELOPMENT OF THE NATIONAL TECHNICAL UNIVERSITY 'KHARKIV POLYTECHNIC INSTITUTE'

Questions:

1. Formation of the Material and Technical Base of NTU "KhPI"
2. Scientific Schools
3. Student Clubs

Assessment Criteria for the Discipline "History of Science and Technology"

Assessment for Practical Classes (maximum 40 points):

During each practical class, a student can earn from 1 to 5 points.

Points are distributed according to the following criteria:

Quality of Preparation (2 points):

Familiarity with the recommended materials.

Availability of a clear plan or outline of the presentation.

Activity during the Class (2 points):

Participation in discussions.

Providing arguments to support one's point of view.

Creative Approach (1 point):

Use of additional materials or a creative way of presenting information (e.g., a presentation or interactive activity).

Methodical guidelines for self-study

Self-study is a crucial component of modern education. It allows students to deepen their understanding of topics, develop independent thinking, and enhance problem-solving skills. These guidelines aim to help students organize their self-learning process effectively.

1. Planning your study

- Set clear goals: define what you want to achieve during your self-study session.
- Create a schedule: allocate specific times for studying and stick to the plan.
- Prioritize tasks: focus on the most challenging or important topics first.

2. Organizing resources

- Collect study materials: use textbooks, lecture notes, and reliable online sources.
- Use multimedia: videos, podcasts, and interactive tools can enhance understanding.
- Maintain a notebook: keep notes of key concepts, definitions, and questions for revision.

3. Effective study techniques

- Active reading: highlight important points and summarize in your own words.
- Practice problems: apply concepts to solve exercises or case studies.
- Self-testing: quiz yourself to evaluate your understanding.

4. Maintaining focus and motivation

- Avoid distractions: study in a quiet, organized environment.
- Set short breaks: follow techniques like the Pomodoro method to stay refreshed.
- Reward yourself: celebrate small achievements to stay motivated.

5. Seeking help when needed

- Ask questions: reach out to teachers or peers for clarification.
- Join study groups: collaborative learning can provide new insights.
- Utilize online platforms: participate in forums or use educational apps for support.

So, effective self-study requires discipline, organization, and the use of diverse resources. By following these guidelines, students can maximize their learning potential and achieve academic success. Remember, consistent effort and a positive attitude are the keys to mastering any subject.

Questions:

1. The role of science in the progress of human civilization.
2. Emergence of natural sciences in ancient civilizations.
3. Chemistry and Medicine in Ancient Egypt, Mesopotamia, India, and China.
4. Development of mathematical and astronomical knowledge in antiquity.
5. Scientific contributions of Aristotle and Archimedes.
6. Alchemy in the ancient world.
7. Arab medieval science.
8. Preconditions for the Scientific Revolution of the early modern period.
9. Outstanding mathematicians of the late 16th to 17th centuries.
10. Scientific achievements of Galileo Galilei, René Descartes, and Isaac Newton.
11. Scientific and engineering activities of Leonardo da Vinci.
12. The Influence of mechanics and other sciences in the 18th century.
13. Development of chemistry in the 18th century. Achievements of A. Lavoisier.
14. Characteristics of the Industrial Revolution in leading countries.
15. Electromagnetic theory of Faraday-Maxwell and the scientific worldview.
16. World's fair as a means of scientific connections revival.

17. Higher technical educational institutions in ukraine as centers of scientific thought.
18. The Scientific legacy of the Curie family.
19. Revolution in physics at the turn of the 19th and 20th centuries.
20. Notable Ukrainian scientists of the early 20th century.
21. Development of military technology from the late 19th to early 20th century.
22. History of computing technology, periodization, and characteristics.
23. Development of modern technologies worldwide.
24. Prospects for the development of technical sciences in the 21st century.
25. Notable scientific and technical achievements in the early 21st century.
26. Use of nuclear and chemical weapons.
27. The Use of Artificial Intelligence: challenges and consequences.
28. The phenomenon of professor V.L. Kyrpychov as a rector among other university rectors.
29. Activities of NTU „KhPI“ during the german occupation.
30. History of the graduation department (student’s choice).
31. Scientists of KhTI Institute and their participation in mineral exploration in the territory of modern Ukraine.
32. Activities of A. Mevius, K. Zvorykin.

The knowledge acquired through self-study is assessed during the credit examination

Video-lectures in history of science and technology:

Technological advancements in ancient Egypt: Wonders of Antiquity

<https://av.tib.eu/media/67746>

The scientific and technological achievements of ancient Mesopotamia

<https://av.tib.eu/media/67745>

Ancient science

<https://av.tib.eu/media/68383>

Science and Technology of the Middle Ages

<https://av.tib.eu/media/68380>

Science of a New Time

<https://av.tib.eu/media/68378>

World physics in Ukraine: a unique experience of consolidation of scientists of the Kharkiv physics center (the 1920s – 1930s)

<https://av.tib.eu/media/68379>

Ecological urban planning of Ukrainian cities in the late XIX - early XX centuries: tram traffic and research in the field of electric traction

<https://av.tib.eu/media/68381>

The formation of electrical engineering and education of Ukraine under the influence of the European scientific school (late 19th - early 20th centuries)

<https://av.tib.eu/media/68382>

Literature:

1. Tkachenko S., Gutnyk M., Sadkovska V. History of Science and Technology : tutorial / Tkachenko S., Gutnyk M., Sadkovska V. Kharkiv : NTU “KhPI”, 2020. 114 p. <https://repository.kpi.kharkov.ua/handle/KhPI-Press/48965>
2. History of Science and Technology: guidelines for the preparation for a credit in all specialties / compiled by: Maryna Gutnyk, Olena Tverytnykova, Serhii Radohuz. – Kharkiv: NTU “KhPI”, 2024. 28 p. <https://repository.kpi.kharkov.ua/handle/KhPI-Press/75492>
3. Gutnyk M. Development of technical education in the city of Kharkov: the contribution of Vikentii Khomych Gerburt-Geibovych // Часопис української історії. Київ, 2019. Вип. 40. С. 102-112. <http://doi.org/10.17721/2522-4611.2019.40.13>
4. Gutnyk M., Tverytnykova E., Sklyar V. Commercialization of scientific activity at the higher technical school of east Ukraine in the late 19th and early 20th century- Acta Baltica Historiae et Philosophiae Scientiarum. Vol. 7, № 3 (Autumn 2019). P. 125–138. doi: 10.11590/abhps.2019.3.05
5. Gutnyk M., Radohuz S. The impact of decisions of Mining Industrialists Congresses on the Industrial Revolution increasing in Ukraine in the late XIX century. History of science and technology, 2020, vol.10, iss. 1 (16), p. 50–61. doi:10.32703/2415-7422-2020-10-1(16)-50-61
6. Gutnyk M., Chrzan K.L. 135 lat Politechniki Charkowskiej. Zeszyty Naukowe Wydziału Elektrotechniki i Automatyki Politechniki Gdańskiej Nr 70, V Sympozjum Historia Elektryki (Białystok, 9-10 listopada 2020), s.17–21 doi: 10.32016/1.70.02
7. Tverytnykova E., Gutnyk M., Salata H. Professors of the Kharkiv Technological Institute: unknown pages of biography. History of science and technology, 2020, Vol. 10, iss. 2, p. 383–399. Scopus doi. 10.32703/2415-7422-2020-10-2-383-399
8. Tverytnykova E., Gutnyk M. The patent-license system of Ukraine in the second half of the XX century. Studies in History and Philosophy of Science and Technology. Vol 29, № 2·2020, P.76–83. DOI: 10.15421/272023
9. Gutnyk M., Tverytnykova O., Chrzan K.L. The origins of electrical engineering studies in the Ukraine and their shaping under the influence of the European scientific school (the end of the 19th and the beginning of the 20th centuries) // Przeglądu Nauk Historycznych (Review of Historical Sciences), Vol. XX, No. 1 (2021), p. 247–270. <https://doi.org/10.18778/1644-857X.20.01.09>
10. Larin A. A., Gutnyk M. V., Tkachenko S. S., Horielova S. O. The contribution of Kharkiv enterprises to the rocket and space industry development. Space Science and Technology. 2021. 27, № 4 (131). С. 83–90. <https://doi.org/10.15407/knit2021.04.083>

11. Gutnyk Maryna, Tverytnykova Elena. The professor G. De-Metz's contribution to the development of physical science in Ukraine. *Ukr. J. Phys.* 2021. Vol. 66, No. 9, 819–829. <https://doi.org/10.15407/ujpe66.9.819>
12. Zhurilo D. Yu., Gutnyk M. V., Zhurilo A. G. George Bothezat's contribution to the world aviation and cosmonautics *Космічна наука і технол.* 2022; 28(1):70–80. <https://doi.org/10.15407/knit2022.01.070>
13. Gutnyk M., Tverytnykova O. The contribution of technological institute teachers to the transformation of the architectural space of Kharkiv city. *Studies in History and Philosophy of Science and Technology*, 2022, Vol 31 (2), pp. 48–61. doi: 10.15421/272219
14. Tverytnykova E., Gutnyk M. Abram Slutskin and Radiophysics in Ukraine of the first half of the 20th Century: World Dimension. *Studia Historiae Scientiarum*, 2022, 21, 397-420. <https://doi.org/10.4467/2543702XSHS.22.012.15978>
15. Tverytnykova E., Gutnyk M. World Physics in Ukraine: A Unique Experience of Consolidation of Scientists at Kharkiv Research Center of Physics (in the 1920s–1930s). *Acta Baltica Historiae et Philosophiae Scientiarum*. Vol. 10, No. 2 (Autumn 2022), p.5–23, <https://doi.org/10.11590/abhps.2022.2.01>
16. Tverytnykova E.E., Gutnyk M.V., Salata H.V. Ecological urban planning of ukrainian cities in the late 19th – early 20th cent.: tram traffic and research in the field of electric traction (to the 130th anniversary of the 1st electric tram in Ukraine). *Сторінки Історії*, 2022, № 55, 24–45, <https://doi.org/10.20535/2307-5244.55.2022.269592>
17. Gutnyk M., Nürnberger F. The Fe-C diagram – History of its evolution. *History of science and technology*, 2023, Vol. 13, Iss. 2, p.243–262, doi: 10.32703/2415-7422-2023-13-2-243-262
18. Radoguz S., Gutnyk M., Zaitsev R. The contribution of Kharkiv Practical Technological Institute Scientists to Electrification of Kharkiv City at the end of XIX – the beginning of XX century // 2018 IEEE Ukraine Student, Young Professional and Women in Engineering Congress (UKRSYW). Conference proceedings (October 2-6, 2018, Kyiv, Ukraine), 2018, pp. 82–87.
19. Radoguz S., Gutnyk M., Zaitsev R., Tverytnykova O. The Development of Researches in the Electrical Engineering Field in Kharkiv Practical Technological Institute. The personalities. 2019 IEEE 2nd Ukraine Conference on Electrical and Computer Engineering (UKRCON). Conference proceedings (June 2-6, 2019, Lviv, Ukraine), 2019, pp.1260–1264 <https://doi.org/10.1109/ukrcon.2019.8879924>
20. Tverytnykova E., Radohuz Se., Gutnyk M. Research in the field of mathematical modeling of power assets and systems in Ukraine. 2020 IEEE 3rd Ukraine Conference on Electrical and Computer Engineering (UKRCON) 2020 IEEE KhPI Week on Advanced Technology (KhPIWeek), 314–318 doi: 10.1109/KhPIWeek51551.2020.9250180
21. Gapochenko S., Gutnyk M., Tkachenko S. The problem of “technocratism” in higher technical education and the role of “History of science and technology” course in the formation of the spiritual values of the engineer. *Матеріали III всеукраїнської науково-практичної конференції «Неперервна освіта для сталого розвитку: філософсько-теоретичні контексти та педагогічна практика» (Дніпро, 4 грудня 2020 р.) КЗВО «ДАНО» ДОР».* / *Наук. ред. О.Є. Висоцька.* – Дніпро: СПД «Охотнік», 2021, с. 91–93.

22. Tverytnykova E., Gutnyk M., Salata H., Bachynska N. Scientific Research on Biomedical Engineering in Ukraine: Origins of Development, 2021 IEEE 2nd KhPI Week on Advanced Technology (KhPIWeek), 2021, pp. 163-167, doi: 10.1109/KhPIWeek53812.2021.9570029.
23. Gutnyk M., Sklyar V., Radohuz S., Volosnikova N., Tverytnykova E. The Formation of Computer Science Centers in Ukraine in the second half of the XXth century, 2021 IEEE 2nd KhPI Week on Advanced Technology (KhPIWeek), 2021, pp. 639-643, doi: 10.1109/KhPIWeek53812.2021.9570093.
24. Gutnyk M., Tverytnykova E., Demidova Yu. Transistors. Do American scientists really have priority? 2022 IEEE 2nd Ukrainian Microwave Week, November 14th–18th, 2022 Paper Collection, pp. 674-679, <https://doi.org/10.1109/UkrMW58013.2022.10037148>
25. Voitiuk O., Tverytnykova E., Gutnyk M., Kuzmenko N., Kolisnyk T. Development and Practical application of the Space System of Earth Observation in Ukraine (from experience DO “Pivdenne” and JSC “Khartron”) 2022 IEEE 2nd Ukrainian Microwave Week, November 14th–18th, 2022 Paper Collection, pp. 680-685 <https://doi.org/10.1109/UkrMW58013.2022.10037147>
26. Gutnyk M.V. Materials and checking their properties. Матеріали IV міжнародної науково-технічної конференції «Автоматизація, електроніка, інформаційно-вимірювальні технології: освіта, наука, практика» 01-02 грудня 2022 р., с. 172-174
27. Tverytnykova E., Gutnyk M., Liashuha I. Founder of the Scientific Radioelectronic School of Ukraine: Professor Dmytro Rozhanskyi 2023 IEEE Sixth International Conference on Information and Telecommunication Technologies and Radio Electronics (UkrMiCo), Kyiv, Ukraine, 2023, pp. 352–355, doi: 10.1109/UkrMiCo61577.2023.10380380
28. Gutnyk M., Ruhalenko S. History of theoretical programming in Ukraine (contribution of Kateryna Yushchenko) 2023 IEEE Sixth International Conference on Information and Telecommunication Technologies and Radio Electronics (UkrMiCo), Kyiv, Ukraine, 2023, pp. 356–359, doi: 10.1109/UkrMiCo61577.2023.10380381.

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Укладачі:

ГУТНИК Марина Валеріївна

РАДОГУЗ Сергій Анатолійович

Відповідальний за випуск професорка Тверитникова О.Є.

Роботу до видання рекомендував професор Кіпенський А.В.

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