



Syllabus Course Program



Innovative technologies in the industry

Specialty

161 – Chemical Technology and Engineering

Institute

Institute of Chemical Technology and Engineering

Educational program

Chemical Technology and Engineering

Department

Department of technology of ceramics, refractories, glass and enamels (183)
Department of plastics and biologically active polymers technology (190)
Department of Chemical Technology of Inorganic Substances, Catalysis and Ecology (181)
Department of Organic Chemistry, Biochemistry, Paints and Coatings (193)
Department of Integrated Technologies, Processes and Apparatuses (191)

Level of education

Master's level

Course type

Mandatory

Semester

1

Language of instruction

English

Lecturers and course developers



Oksana Borysenko

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Doctor of Technical Sciences, Professor, Professor of the Department of Technology Ceramics, Refractories, Glass and Enamels

Work experience – over 12 years. Author of over 200 scientific and educational and methodological works. Leading lecturer in the disciplines: "Production of refractory materials", "Production of thermal insulation materials", "Innovative technologies in the industry"

[More about the lecturer on the department's website](#)

General information

Summary

The discipline "Innovative Technologies in the Industry" explores the general principles and patterns of using material, information, energy and other resources of a modern enterprise in the production of materials, as well as the features of determining the shortcomings of production activities to develop recommendations for innovative renewal of industry enterprises. When teaching the discipline, considerable attention is paid to mastering the basic concepts, terms used in the production of materials, as well as the essence of technological innovations. It is shown that the competitiveness and strategic advantages of industry enterprises are impossible without the use of technological innovations.

Course objectives and goals

Formation of competencies in future specialists regarding innovative technologies for creating modern materials, determining the features of functioning and directions of development of innovative technological systems of industry enterprises.

Format of classes

Lectures, practical classes, consultations, self-study. Final control in the form of an exam.

Competencies

- K1. Ability to generate new ideas (creativity).
- K2. Ability to apply knowledge in practical situations.

Learning outcomes

PP5. Communicate fluently in the state and foreign languages orally and in writing to discuss and present the results of professional activities, research and projects.

PP6. Develop and implement projects in the field of chemical technology and related interdisciplinary projects, taking into account social, economic, environmental and legal aspects.

PP7. Search for the necessary information on chemical technology, processes and equipment for the production of chemical substances and materials based on them in scientific and technical literature, patents, databases and other sources, systematize, analyze and evaluate the relevant information.

Student workload

The total volume of the course is 120 hours (4 ECTS credits): lectures - 32 hours, practical classes - 16 hours, self-study - 72 hours.

Course prerequisites

To successfully complete the course, you must have knowledge and practical skills in professional disciplines at the bachelor's level.

Features of the course, teaching and learning methods, and technologies

The entire course is presented using a systemic approach to form systemic knowledge, holistic ideas about the discipline, and the formation of skills for synthesizing, comparing, and generalizing information.

Lectures

They involve the disclosure in verbal form of the essence of phenomena, scientific concepts, and processes that are logically interconnected and united by a common theme with an emphasis on their importance and use in the future specialty. They are accompanied by the use of multimedia equipment to provide clarity to illustrative materials, demonstration of chemical experiments to form students' cognitive interests, as well as active learning methods, such as drawing up problem situations.

Practical classes

Designed for organizing practical training work using a specific technology and providing for the consolidation of theoretical lecture material. Used to connect theory with practice, equipping students with the basic skills of modern calculations.

Independent work with information

It involves independent study of individual course topics with their subsequent analysis in order to learn to think independently, practically analyze and use the mastered material.

Practical teaching methods are aimed at achieving the final stage of the cognitive process. They contribute to the formation of skills and abilities, the logical completion of the cognitive process in relation to a specific section, topic.

Program of the course

Topics of the lectures

Topic 1. The essence of innovative technologies.

Innovations and innovative activity. Classifications of innovations. Innovative processes. Innovative technologies. Development directions of innovative activity.

Topic 2. High technologies.

The essence of digital technologies. The essence of microtechnology and microelectronics. Social technologies. Robotics. Artificial intelligence. Nanotechnology. The essence of 3D printing. Biotechnology.

Topic 3. The importance of science in the development of innovative technologies.

Basic concepts and definitions in technology. Science content of technologies. Modern scientific and technological development. Combination of production, science and innovation.

Topic 4. Modern technologies in the chemical industry and construction sector.

Characteristics of technologies in the chemical industry. Chemical industry of Ukraine. Production of inorganic substances. Production of organic substances. Modern technologies of production of materials and housing construction. Properties of building materials and their classification.

Topic 5. Fundamentals of creating resource-saving and waste-free technologies.

The value of material resources in human life. The main ways of resource conservation in industry. The place and role of technologies in resource conservation. Heat conservation and resource conservation in everyday life. Replacing basic resources with biofuels.

Topic 6. Ergonomic and environmental factors of modern technologies.

The main disadvantages of modern technologies from the point of view of ergonomics and ecology. The essence of ergonomics. The essence of ecology. Examples of Earth pollution and measures to eliminate pollution. Air pollution and measures to eliminate it. Water pollution and measures to eliminate it.

Topic 7. State support for innovative entrepreneurship.

The purpose and principles of state regulation of innovative activity. Forms and methods of state regulation of innovative activity. Institutional support for innovative activity in Ukraine.

Topic 8. National innovation systems.

Components of the national innovation system and the level of their development in Ukraine. The structure of the national innovation system. Prerequisites and problems of creating a national innovation system in Ukraine. Foreign experience in forming national innovation systems.

Topic 9. Risks in innovation activity and their management.

The essence of risks and the features of their manifestation in the innovation activity of enterprises. Factors of risk formation in the innovation activity of an enterprise. Methods of risk analysis when assessing the feasibility of innovation projects.

Topic 10. Principles of open science and scientific data management.

Practices of open science. Open access to the results of scientific research. The process of managing scientific data, including their receipt, storage and use. The FAIR principle (Findable, Accessible, Interoperable, Reusable)

Topics of the workshops

Topic 1. Study of the legislation of Ukraine on innovation activity.

Topic 2. Modern strategy of innovation development of the European Union.

Topic 3. Organizational forms of integration of science and production.

Topic 4. Chemical complex of Ukraine and the world.

Topic 5. Resource conservation as an alternative way of managing enterprises.

Topic 6. Problems of creating a national innovation system.

Topic 7. FAIR principle (Findable, Accessible, Interoperable, Reusable).

Topics of the laboratory classes

Laboratory work is not provided within the discipline.

Self-study

Study of lecture material. Independent study of topics not included in the lecture course. Preparation of a report on a given topic.

Course materials and recommended reading

Basic literature:

1. Микитюк П. П., Крисько Ж. Л., Овсянюк-Бердадіна О. Ф., Скочиляс С. М. Інноваційний розвиток підприємства. Навчальний посібник. Тернопіль: ПП «Принтер Інформ», 2015. 224 с.
2. Логвінков С. М., Літвінова І. М. Інноваційні технології виробництва продукції та надання послуг : конспект лекцій. Харків : ХНЕУ ім. С. Кузнеця, 2021. 95 с
3. Новіков Ф. В., Новіков Д. Ф., Жовтобрюх В. О. Інноваційні технології та їх застосування : навчальний посібник. Дніпро : ЛІРА, 2024. 628 с.
4. Новіков Ф. В., Новіков Д. Ф., Єрмоленко О. А., Жовтобрюх В. О. Техніко-економічне обґрунтування сучасних технологій виробництва: навчальний посібник. Дніпро: ЛІРА, 2022. 256 с.
5. New Technology Trends and How to Apply Them in Business. URL: <https://www.ditdot.hr/en/technology-trends-in-business>.
6. Закон України № 40-IV "Про інноваційну діяльність". URL: <https://zakon.rada.gov.ua/laws/show/40-15#Text>.

Additional literature:

1. Закон України № 848-VIII. "Про наукову і науково-технічну діяльність". URL: <https://zakon.rada.gov.ua/laws/show/848-19#Text>.
2. Закон України № 3715-VI. Про пріоритетні напрями інноваційної діяльності в Україні. URL: <https://zakon.rada.gov.ua/laws/show/3715-17#Text>.

Assessment and grading

Criteria for assessment of student performance, and the final score structure

100% of the final grade consists of the results of the exam (40%) and the ongoing assessment (60%).

Exam: written assignment (2 theory questions + practical assignment) and oral answer.

Ongoing assessment: assignments by topic, tests and calculation assignment.

Grading scale

Total points	National	ECTS
90-100	Excellent	A
82-89	Good	B
75-81	Good	C
64-74	Satisfactory	D
60-63	Satisfactory	E
35-59	Unsatisfactory (requires additional learning)	FX
1-34	Unsatisfactory (requires repetition of the course)	F

Norms of academic integrity and course policy

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, good manners, kindness, honesty, and responsibility. Conflict situations should be openly discussed in academic groups with a lecturer, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management.

Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website: <http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/>

Approval

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