



Syllabus Course Program

Preparation and enrichment of hydrocarbon raw materials

Specialty

161 – Chemical technologies and engineering

Institute

SEI chemical technologies and engineering

Educational program

Oil, gas and solid fuel processing technologies

Department

Oil, gas and solid fuel processing technologies

Level of education

Bachelor's level

Course type

Special (professional), Mandatory

Semester

5

Language of instruction

English

Lecturers and course developers



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Doctor of technical sciences, professor, head of the department « Oil, gas and solid fuel processing technologies » NTU «KhPI»

Author of more than 270 scientific and educational and methodological . Leading lecturer in the disciplines: "Classification of combustible fossils", "Synthesis based on solid fossil fuels", "Fundamentals of solid solid fossil fuels processing technologies", Equipment of solid solid fossil fuels processing plants"

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

General information

Summary

The subject of the discipline is the preparation and improvement of the quality of coal raw materials in the production of blast furnace coke, the rational use of coal resources of Ukraine as one of the world's leading producers of metallurgical products

Course objectives and goals

Mastering theoretical and practical knowledge regarding the process of coal preparation for coking, its technological parameters, calculation and effective use of coal preparation equipment

Format of classes

Lectures, practical classes, consultations. Independent work. The final control is an exam

Competencies

Ability to demonstrate knowledge and understanding of basic facts, concepts, principles and theories related to the modern technology of preparation of coal raw materials for coking.

Ability to use methods of observation, description, identification, classification of objects of industrial production.

Ability to use knowledge and understanding of general chemical technology, processes and apparatus of chemical industries for analysis, evaluation and design of technological processes and equipment.
Ability to process and interpret data related to chemical technology and engineering, to relate them to relevant theories.
Ability to select and use appropriate equipment, tools and methods for implementation and control of coke production.
The ability to use computing and information technologies to solve practical problems in the coke industry.
Ability to take into account the commercial and economic context when designing coke plants.
The ability to process the results of experiments using modern statistical methods and software tools.
Skills of safe handling of chemical materials, taking into account their physical and chemical properties, including the dangers associated with their use.
Ability to draw up scientific and technical documentation in accordance with current requirements

Learning outcomes

The ability to apply knowledge and understanding of chemistry to solve qualitative and quantitative problems of the technology of preparing coal raw materials for coking.
Ability to demonstrate an understanding of the broad interdisciplinary context of the major.
The ability to solve complex specialized tasks and practical problems in education and professional activity based on a critical understanding of knowledge of the main theories, principles, methods and advanced achievements of chemical engineering and technologies, as well as alternative energy.
The ability to solve complex, unpredictable tasks and problems of chemical engineering and technology, which involves the collection and interpretation of information (data), the selection of methods and tools, the use of innovative approaches.
The ability to assess the influence of technological factors on the composition of the final product.
Ability to search literature, consult and critically use scientific databases and other relevant sources of information, perform modeling and analysis for the purpose of detailed study and research of engineering issues according to specialization.
The ability to correlate the results of experimental research and mathematical modeling of chemical and chemical-technological processes with relevant theories.
The ability to use modern information and communication technologies to solve the problems of chemical engineering and technologies, as well as alternative energy sources.
The ability to carry out technical and economic substantiation of chemical production, to possess methods of improving the technological process, to understand theoretical and practical approaches to the creation and management of production.
Technical skills and ability to develop and perform experimental studies and laboratory measurements, interpret the obtained data and draw conclusions according to the educational program.
The ability to convey information, ideas, problems, solutions and own experience in the field of chemical engineering to specialists and non-specialists in the state language and one of the main European languages.
Ability to follow safety procedures at the workplace.
Ability to effectively form a communication strategy.

Student workload

The total volume of the discipline is 120 hours (4 ECTS credits): lectures – 32 hours, practical classes – 16 hours, independent work – 72 hours.

Course prerequisites

"Fundamentals of solid fossil fuels processing technologies", "Equipment of solid fossil fuels processing industries", "Physics and chemistry of fossil fuels."

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

Lectures are conducted interactively using multimedia technologies. A project-based approach to education is introduced, attention is focused on the application of information technologies in the



development of technological production schemes and engineering calculations of technological equipment

Program of the course

Topics of the lectures

- Topic 1. Technological properties of coking coal of the main grades.
- Topic 2. Composition of charges for coking. The influence of the composition and properties of the charge on the quality of coke
- Topic 3. Main and auxiliary coal preparation workshops.
- Topic 4. The essence of coal enrichment. Schemes and technological parameters of enrichment.
- Topic 5. Flotation enrichment method.
- Topic 6. Methods of dehydration of enrichment products.
- Topic 7. Layout and maintenance of dosing departments.
- Topic 8. Crushing of coal. Grinding schemes.
- Topic 9. Thermal preparation of the charge.
- Topic 10. Increasing the bulk mass of coal charge
- Topic 11. Tamping of coal charge
- Topic 12. The essence of coking technology
- Topic 13. Coking of the charge with additives
- Topic 14. Automation of coal preparation shops
- Topic 15. Environmental protection in coal preparation shops
- Topic 16. Technical and economic performance indicators of coal preparation shops

Topics of the workshops

- Topic 1. Structural elements of coke production.
- Topic 2. General laws of management of complex systems.
- Topic 3. Change in properties of coal during storage
- Topic 4. Conditions for storing coal stocks.
- Topic 5. Advantages and disadvantages of different grinding schemes.
- Topic 6. Calculation of the properties of the charge for coking.
- Topic 7. Dehydration of enrichment products.
- Topic 8. Measures to improve the performance of filters during dehydration

Topics of the laboratory classes

Laboratory work within the discipline is not provided

Self-study

The course involves independent study and analysis of the material on the following topics:
"Main properties of coal charges for coking"; "Change in properties of oxidized coal, influence on coke quality"; "Purpose of coal depots"; "The main factors of reactivity and post-reaction strength of the obtained coke"; "Advantages and disadvantages of using certain grades of coal for coking"; "Real coal charges of operating enterprises"; "Water Management of Enrichment Factories"; "Production control in the coal preparation shop"; "Main measures to increase the yield of concentrate for coal enrichment"; "Safety techniques in coal preparation shops"; "Rules for starting and stopping the equipment of coal preparation shops"

Course materials and recommended reading

Basic materials:

1. Starovoit A. H. Theory and practice of raw material modification processes in the production of blast furnace coke of improved quality / A. H. Starovoit, Ye. I. Malyi, M. S. Chemerynskyi, M. A. Starovoit – Kharkiv: FE Liburkina L.M. 2019. – 184 p.



2. Yaroshevskiy S. L. Resource-saving technologies of metallurgical production based on the use of Ukrainian coal / S. L. Yaroshevskiy, A. V. Yemchenko, I. V. Shulha та ін. – Kharkiv : Kontrast, 2012. – 204 p.
3. Smyrnov V.O., Serhieiev P.V., Biletskyi V.S. Technology of coal enrichment. – Donetsk : Eastern publishing house, 2011. – 476 p.
4. Zbykovskiy Ye. I. Resource-saving technology of complex energy-chemical-technological processing of coal in the conditions of coke-chemical production / Ye. I. Zbykovskiy. – Pokrovsk : DVNS «DonNTU», 2019. – 271 p.

Additional materials:

1. Miroshnychenko D.V. Development of the theory and practice of using oxidized coal for the production of blast furnace coke. – NTU «KhPI». Kharkiv, «Planeta-Print», 2019. – 312 p.
2. Kuznichenko V. M. Coal expansion pressure and charges in the coking process. / V. M. Kuznichenko, I. V. Shulha, O. V. Sytnyk – Kharkiv: Planeta-Print, 2021. – 210 p.
3. Tiutiunnykov Yu. B. Organic additives in coke production. / Yu. B. Tiutiunnykov, L. H. Sintserova, V. S. Lialiuk, Yu. I. Hrechko. – Kyiv : Tekhnika, 1971. – 94 p.
4. PTE-2017 Rules of technical operation of coke chemical enterprises. – Kharkiv : SE «GIPROKOKS», 2018. – 283 p.

Assessment and grading

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

Points are awarded according to the following ratio:

- laboratory work: 20% of the semester grade;
- independent work: 60% of the semester grade;
- exam: 20% of the semester grade

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

Approved by

Date, signature

Head of the department

Denys MIROSHNYCHENKO

Date, signature

Guarantor of the educational program



National Technical University
"Kharkiv Polytechnic Institute"

Iryna SINKEVICH



National Technical University
"Kharkiv Polytechnic Institute"