



## Syllabus Course Program

# Methods of analysis of products of processing of combustible fossils

**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**

Selective

**Semester**

4

**Language of instruction**

English

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## Lecturers and course developers



Iryna Valeriivna Sinkevych

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Candidate of technical sciences, associate professor, professor of the department "Technologies of oil, gas and solid fuel processing" of KhPI National Technical University

Author of more than 120 scientific and educational and methodological works.

[Learn more about the teacher on the department's website](#)

## General information

### Summary

Mastering the basic methods of substance analysis, modern equipment design and the latest achievements in the direction of substance analysis and systematization of knowledge on the issues of choosing an adequate analysis method to the requirements of the research of a specific object of analysis, assimilation of knowledge on modern methods of analysis and the possibility of their use..

### Course objectives and goals

To form theoretical concepts that provide: substantiation of the possibility of using measurements of analytical signals (AS) when determining the concentrations of various inorganic and organic components; substantiation and application in the analysis of elements of regression analysis, methods of estimating concentration determination errors...

### Format of classes

Lectures, Laboratory works, consultations. The final control is an exam.

### Competencies

- reasonably choose modern methods of analysis of fuel processing;;
- use methods of observation, description, identification, classification of objects of chemical technology and industrial products;
- use theoretical knowledge and practical skills of natural and scientific disciplines to master the basics of theory and methods of chemical and technological research

### Learning outcomes

- to know the theoretical foundations and principles of experimental and computational means of determining the composition of materials by optical and electrochemical methods of analysis.

-to be able to: use a complex of experimental methods and calculation tools to determine components in systems of various types and estimate errors in determining concentrations..

### **Student workload**

The total volume of the discipline is 120 hours: lectures - 32 hours, laboratory works - 16 hours, independent work - 72 hours.

### **Course prerequisites**

To successfully pass the course, you need to have knowledge and practical skills in the following disciplines: "General and inorganic chemistry", "Organic chemistry", "Analytical chemistry".

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

The training sessions of the course consist of classroom sessions (lectures, practical sessions, interviews with the teacher during the defense of test papers, consultations, exams) and independent work of students (performance of test papers, calculation tasks, preparation for their defense and exam).

The main type of classroom work is lectures, during which the teacher pays the main attention to ensuring knowledge of classification, theoretical foundations, hardware design of physico-chemical methods of analysis of raw materials and products, evaluating the possibilities of analysis methods and reasonably choosing a method for a specific practical analysis.

The knowledge gained at lectures is consolidated by students during other types of training sessions with the aim of transforming them into knowledge and skills necessary for future practical work.

Students' independent work consists of performing control tasks, writing an essay, preparing for their defense and the exam..

### **Program of the course**

#### **Topics of the lectures**

Topic 1 Introduction to instrumental methods of analysis.

Topic 2 Spectroscopic methods of analysis.

Topic 3 Electrochemical methods of analysis.

Topic Chromatographic methods of analysis.

Topic 5 Kinetic methods of analysis.

Topic 6 Methods based on the interaction of matter with a magnetic field..

#### **Topics of the workshops**

Practical classes within the discipline are not provided..

#### **Topics of the laboratory classes**

. Laboratory work 1 Method for determining the optical density of alkaline extracts of coal to assess its degree of oxidation.

Laboratory work 2 Determination of the number of neutralization of an oil product by potentiometric titration.

Laboratory work 3 Classification of chromatography methods.

Laboratory work 4 Determination of the content of tar-asphalt substances.

Laboratory work 5 Gasoline analysis. Determination of actual resins (according to Budarov.

Laboratory work 6 Method of determining softening temperature by ring and ball.

Laboratory work 7 Determination of specific electrical resistance of carbon powder.

Laboratory work 8 Viscosity of oil products.

Laboratory work 9 The method of determining the conditional viscosity of petroleum products viscometer type VU..

### **Self-study**

1. The main components of the technological project of chemical production
2. Development of a technological scheme
3. Design of large and technically complex objects
4. Working project and documentation



## Course materials and recommended reading

Basic materials:

1. [V. K. Ahluwalia](#) Instrumental Methods of Chemical Analysis. 570 p. 2023. Springer Cham.
2. D Muralidhara Rao | AVN Swamy | D Dharaneeswara Reddy. Instrumental Methods of Analysis. CBS Publishers & Distributors. 2023. 384 p.
3. Analytical chemistry. S. Grytsenko, V. V. Bolotov, L. Yu. Klimenko; Kharkiv: NUPh: Golden Pages, 2019. 600 p.

## Assessment and grading

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

Points are awarded according to the following ratio:

- test papers: 20% of the semester grade;
- individual tasks: 60% of the semester grade;
- credit: 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<br>(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

Iryna SINKEVYCH

