



Syllabus Course Program

" Production of motor fuels from non-traditional raw materials "

Specialty

161 – Chemical technologies and engineering

Educational program

Oil, gas and solid fuel processing technologies

Level of education

Bachelor's level

Semester

8

Institute

SEI chemical technologies and engineering

Department

Oil, gas and solid fuel processing technologies

Course type

Special (professional), Selective

Language of instruction

English

Lecturers and course developers



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

Author of more than 200 scientific and educational and methodological works

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

General information

Summary

The discipline is aimed at mastering theoretical knowledge regarding the definition of raw materials, production technology and properties of motor fuels obtained from non-traditional raw materials.

Course objectives and goals

To provide students with knowledge about the criteria for determining non-traditional raw materials, methods of their preparation, technology of processing into motor fuels that meet the modern requirements of Euro-4 and Euro-5 environmental safety standards.

Format of classes

Lectures, practical classes, consultations. Final control - exam.

Competencies

- Ability to design chemical processes taking into account technical, legislative and environmental constraints.
- Ability to use modern materials, technologies and apparatus designs in chemical engineering.

Learning outcomes

- Choose and use appropriate equipment, tools and methods for solving complex problems of chemical engineering, control and management of technological processes of chemical production.

- Understanding chemical engineering as a component of modern science and technology, its place in the development of engineering, the Ukrainian state and world culture.

Student workload

The total volume of the discipline is 120 hours: lectures - 40 hours, practical classes - 10 hours, independent work - 70 hours.

Course prerequisites

To successfully complete the course, you must have knowledge and practical skills in the following disciplines: Introduction to the specialty, familiarization practice", "Chemistry (inorganic, organic, physical, analytical)", "Physics and chemistry of combustible fossils", "Automotive operational materials".

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

The training classes of the course consist of classroom classes (lectures, practical classes, 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 examination).

The main type of classroom work is lectures, during which the teacher focuses on the selection of non-traditional raw materials, methods of their preparation, technological methods and equipment for the production of motor fuels.

The knowledge gained at the lectures is consolidated by students during other types of training sessions in order to transform them into knowledge and skills necessary for future practical work.

The independent work of students 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 The current state and prospects for the development of processing of secondary resources in Ukraine

Topic 2 Secondary organic raw materials for the production of motor fuel

Topic 3 Preparation of secondary raw materials for the production of motor fuels

Topic 4 Technological processes of processing secondary raw materials into motor fuels

Topic 5 Biofuel. Properties and areas of application

Topic 6 Products obtained by thermal and thermo-catalytic processing of secondary raw materials (polymer and rubber products). Properties and areas of application

Topic 7 Production of commercial motor fuels from secondary raw materials

Topic 8 Ecological principles of production of motor fuels from secondary raw materials

Topic 9 Compatibility of fuels obtained from secondary raw materials with petroleum-based fuels

Topic 10 Change in the quality of motor fuels under conditions of long-term storage

Topic 11 Increasing the level of operational properties of fuels under conditions of long-term storage

Topics of the workshops

Practical class 1 Algorithm for the selection of secondary raw materials for the production of motor fuels

Practical class 2 Ways of preparing secondary raw materials for technological processing

Practical class 3 Features of processing secondary raw materials into motor fuels

Practical class 4 Determination of the main indicators of fuel quality

Practical class 5 Determination of optimal conditions for long-term storage of motor fuel

Practical class 6 Determination of the compatibility of different types of fuels obtained from secondary raw materials.

Topics of the laboratory classes

Laboratory works within the discipline are not provided.

Self-study

1. Scope of application of motor fuels obtained from secondary raw materials.



2. Classification of secondary raw materials for the production of motor fuel.
3. Hygroscopicity of fuels.
4. Technological modes of processing secondary raw materials into motor fuels.
5. Catalysts for the processing of secondary raw materials.
6. Compounding schemes of motor fuels obtained from secondary raw materials and petroleum-based fuels.

Course materials and recommended reading

Basic materials:

1. Kaletnik H.M. Orhanizatsiya i ekonomika vykorystannya bioresursiv: pidruchnyk: 2-he vydannya, pereroblene i dopovnene / H.M. Kaletnik, D.M. Tokarchuk, O.P. Skoruk – Vinnytsya: TOV «Druk», 2020. – 372 s.
2. Bioenerhetyka: Kurs lektsiy. Chastyna 1 [Elektronnyy resurs] : navch. posib. / KPI im. Ihorya Sikors'koho ; uklad.: M. O. Bud'ko. – Elektronni tekstovi dani (1 fayl: 1,84 Mbayt). – Kyiv : KPI im. Ihorya Sikors'koho, 2021. – 109 s.
3. Zelena knyha. Rehulyuvannya vyrobnytstva ridkykh motornykh biopalyv : elektronnyy resurs / O. Orzhel', A. Zorkin, K. Kykot', O. Nechytyaylo, S. Rehelyuk. SAF Ukrayina, 2019. – 109 s. URL: <https://saf.org.ua/wp-content/uploads/2019/06/regulation-of-production-of-liquid-motor-biofuels-2019.pdf>
4. Kaletnik G. Production and Use of Biofuels: Second edition, supplemented: textbook / G. Kaletnik. K.: Agrarian Science, 2018. – 336 p.
5. Krozer Y. Economics of Bioresources: Concepts, Tools, Experiences / Y. Krozer, M. Narodoslawsky. Springer Nature Switzerland AG; 1st ed., 2019. – 210 r.
6. Liquid Biofuels: Bioethanol / Carlos Ricardo Soccol, Gonçalo Amarante Guimarães Pereira, Claude-Gilles Dussap, Luciana Porto de Souza Vandenbergh. Springer Cham, 2022. – 515 s.
7. Biofuels Production – Sustainability and Advances in Microbial Bioresources / Ajar Nath Yadav, Ali Asghar Rastegari, Neelam Yadav, Rajeeva Gaur. Springer Cham, 2020. – 387 s.

Additional materials:

1. Upravlinnya ta rekuperatsiya vidkhodiv: navch. posib. / S. V. Stankevych, L.V. Holovan', YE.M. Bilets'kyy ta insh. – KH.: Vydavnytstvo Ivanchenko I. S., 2020. – 134 s.
2. Chemical Conversion of Polymer Wastes into Motor Fuels and Petrochemical Raw Materials (A Review) M. L. Gringolts, K. I. Dement'ev, Kh. M. Kadiev, A. L. Maksimov, E. Sh. Finkel'shtein // Petroleum Chemistry volume. – 2020. – № 60. – pp. 751-761.
3. Brych V. Stratehiya upravlinnya pidpryyemstvom z vyrobnytstva biopalyva: monohrafiya / V. Brych, N. Halysh, O. Borysyak. - Ternopil': VPTS «Ekonomichna dumka TNEU», 2020. – 224 s.

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;
- practical tasks: 20% of the semester grade;
- individual tasks: 20% of the semester grade;
- credit: 40% 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**

Iryna SINKEVYCh

