

**Machines and equipment for biotechnology**

Instructors:

Oleksandr Hanzhenko

Lyubov Shymko



**Course Handbook**

TREATY - Nurturing deep tech talents for clean and sustainable energy transition

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## Course Information

Title: Machines and equipment for biotechnology

Instructor(s): Oleksandr Hanzhenko, Lyubov Shymko

ECTS: 3

|  |  |
| --- | --- |
| Course structure: | 90 hours |
| Lecture classes | 15 hours |
| Laboratory classes | 15 hours |
| Personal Activities | 60 hours |

Mode of delivery: *[ hybrid]*

### Course Summary

*The aim of the discipline is to develop the future specialist's ability to apply the acquired knowledge, skills, communication skills and abilities in solving problems and issues related to the design of machinery and equipment required for the implementation of biotechnological processes and to apply the acquired knowledge in professional activities.*

*The objective of the specialization is to acquire knowledge and practical skills related to machines and equipment for the implementation of biotechnological processes in the agricultural sector.*

### Learning Outcomes

Upon completion of the course, students will be able to know about:

*1. Designs of machinery and equipment for the realization of technological processes for the production and use of liquid fuels from plant material, such as biodiesel, bioethanol, pyrolysis oil, etc.*

*2. Designs of machinery and equipment for the realization of technological processes for the production and use of gaseous fuels from plant material, such as biogas, generator gas, pyrolysis gas.*

*3. Designs of machinery and equipment for the realization of technological processes for the production and use of solid biofuels from plant material.*

### Assessment

In order for each participant to complete successfully the course and be awarded the corresponding ECTS credits, they must pass the course assessment. The outcome of the assessment can be either Pass or Fail.

**Assessment methods**

* Exam

|  |  |
| --- | --- |
| **Learning outcomes** | **Assessment examples** |
| * *Designs of machinery and equipment for the realization of technological processes for the production and use of liquid fuels from plant material, such as biodiesel, bioethanol, pyrolysis oil, etc.* | Oral presentation, quiz, laboratory research |
| * *Designs of machinery and equipment for the realization of technological processes for the production and use of gaseous fuels from plant material, such as biogas, generator gas, pyrolysis gas.* | Oral presentation, quiz, laboratory research |
| * *Designs of machinery and equipment for the realization of technological processes for the production and use of solid biofuels from plant material.* | Oral presentation, quiz, laboratory research |

### Bibliography

*[Please provide of a list of bibliography and useful resources]*

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2. Відновлювана енергетика в аграрному виробництві / Скидан О.В., Голуб Г.А., Кухарець С.М., Ярош Я.Д., Чуба В.В., Медведський О.В., Цивенкова Н.М., Соколовський О.Ф., Кухарець В.В.; за ред. О.В. Скидна і Г.А. Голуба. Київ-Житомир: НУБіП України-ЖНАЕУ, 2023. 449 с.
3. Машини та обладнання для біоенергетики: навч. посіб. / Голуб Г. А., Цивенкова Н. М., Марус О. А., Павленко М. Ю., Яременко О. А.; за ред. Г. А. Голуба. – К.: НУБіП України, 2022. 203 с.
4. Біогаз. Серія навчально-методичних матеріалів, модуль 7 / Голуб Г.А., Дубровін В.О., Поліщук В.М. та ін. К.: ЮНІДО, 2015. 48 с.
5. Виробництво та використання дизельного біопалива. Механіко-технологічні основи: монографія / за ред. Г. А. Голуба. К.: НУБіП України, 2017. 340 с.
6. Біоенергетичні системи в аграрному виробництві: навчальний посібник / за ред. Г.А. Голуба. К.: НУБіП України, 2017. 229 с.
7. Виробництво і використання біопалив в агроекосистемах. Механіко-технологічні основи: монографія / Голуб Г. А., Кухарець С.М., Чуба В. В., Марус О.А.; за ред. Г. А. Голуба. К.: НУБіП України, 2018. 254 с.
8. G. Golub, O. Marus V. Chuba, M. Pavlenko. Research of the hydro-mechanical mixer parameters for diesel biofuel production with using Box-Benghken experiment plan. – Agricultural Engineering International: CIGR Journal, 2019, vol. 21, no. 4, 121–131.
9. Golub G., Kukharets S., Zavadska O., Marus O. Determination of the rate of organic biomass decomposition in biogas reactors with periodic loading. – International Journal of Renewable Energy Research, 2019, vol. 9, no. 4, 1741-1750.
10. G. Golub, S. Kukharets, O. Skydan, Y. Yarosh, V. Chuba, V. Golub. The optimization of the gasifier recovery zone height when working on straw pellets. – International Journal of Renewable Energy Research, 2020, vol. 10, no. 2, 529-536.
11. Golub G., Tsyvenkova N, Holubenko А., Chuba V., Tereshchuk M. Investigation of substrate mixing process in rotating drum reactor. – INMATEH-Agricultural Engineering, 2021, vol. 63, no. 1, 51-60. DOI: https://doi.org/10.356.33/inmateh-63-05
12. G. Golub, V. Chuba, N. Tsyvenkova, O. Marus, Y. Yarosh. Bioenergy potential of Ukrainian agriculture. – International Journal of Renewable Energy Research, 2021, vol. 11, no. 3, 1223-1229.
13. G. Golub, N. Tsyvenkova, V. Golub, V. Chuba, I. Omarov, A. Holubenko. Determining the effect of the structural and technological parameters of a gas blower unit on the air flow distribution in a gas generator. – Eastern-European Journal of Enterprise Technologies, 2022, 4/8 (118), Energy-saving technologies and equipment, 29-43.
14. [Golub, G.](https://www.scopus.com/authid/detail.uri?authorId=57193889313), [Tsyvenkova, N.](https://www.scopus.com/authid/detail.uri?authorId=57202639794), [Yaremenko, O.](https://www.scopus.com/authid/detail.uri?authorId=57226831532), .Marus O., [Omarov, I.](https://www.scopus.com/authid/detail.uri?authorId=57209270067), [Нolubenko, A.](https://www.scopus.com/authid/detail.uri?authorId=57884690800) Determining the efficiency of installing fixed solar photovoltaic modules and modules with different tracking options. (2023). Eastern-European Journal of Enterprise Technologies, 4 (8(124)), pp. 15-25.
15. Golub G., Tsyvenkova N., Kukharets S., Holubenko A., Omarov I., Klymenko O., Mudryk K., Hutsol T. European Green Deal: An Experimental Study of the Biomass Filtration Combustion in a Downdraft Gasifier. Energies 2023, 16, 7490.

### Course Timetable

**The 1-st and the 2-nd groups**

|  |  |  |  |
| --- | --- | --- | --- |
| **Lecture** | **Date and Time** | **Instructor** | **Venue** |
| 1st | 24.04.2024,  13:30 – 14:50 | Prof. Oleksandr HANZHENKO | NUBiP, building 11, classroom 208; https://meet65.webex.com/meet/pr1327098956 |
| 2nd | 01.05.2024,  13:30 – 14:50 | Prof. Oleksandr HANZHENKO | NUBiP, building 11, classroom 208;  https://meet65.webex.com/meet/pr1327098956 |
| 3rd | 08.05.2024,  13:30 – 14:50 | Prof. Oleksandr HANZHENKO | NUBiP, building 11, classroom 208;  https://meet65.webex.com/meet/pr1327098956 |
| 4th | 15.05.2024,  13:30 – 14:50 | Prof. Oleksandr HANZHENKO | NUBiP, building 11, classroom 208;  https://meet65.webex.com/meet/pr1327098956 |
| 5th | 22.05.2024,  13:30 – 14:50 | Prof. Oleksandr HANZHENKO | NUBiP, building 11, classroom 208;  https://meet65.webex.com/meet/pr1327098956 |
| 6th | 29.05.2024,  13:30 – 14:50 | Prof. Oleksandr HANZHENKO | NUBiP, building 11, classroom 208;  https://meet65.webex.com/meet/pr1327098956 |
| 7th | 05.06.2024,  13:30 – 14:50 | Prof. Oleksandr HANZHENKO | NUBiP, building 11, classroom 208;  https://meet65.webex.com/meet/pr1327098956 |
| **Summarizing. Presentation of certificates to graduates.** | 17.06.2024  08:30 – 09:50 | Prof. Gennadii GOLUB  Prof. Viacheslav BRATISHKO  Assoc. Prof. Zinovii RUZHILO | building 11,  library reading room |

**The 1-st group**

|  |  |  |  |
| --- | --- | --- | --- |
| **Seminars, practice and laboratory works** | **Date and Time** | **Instructor** | **Venue** |
| 1st | 24.04.2024,  15:10 – 16:30 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |
| 2nd | 01.05.2024,  15:10 – 16:30 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |
| 3rd | 08.05.2024,  15:10 – 16:30 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |
| 4th | 15.05.2024,  15:10 – 16:30 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |
| 5th | 22.05.2024,  15:10 – 16:30 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |
| 6th | 29.05.2024,  15:10 – 16:30 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |
| 7th | 05.06.2024,  15:10 – 16:30 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |
| 8th | 12.06.2024  15:10 – 16:30 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |

**The 2-nd group**

|  |  |  |  |
| --- | --- | --- | --- |
| **Seminars, practice and laboratory works** | **Date and Time** | **Instructor** | **Venue** |
| 1st | 24.04.2024,  16:50 – 18:10 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |
| 2nd | 01.05.2024,  16:50 – 18:10 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |
| 3rd | 08.05.2024,  16:50 – 18:10 | Acoss. Prof.  Lyubov SHYMKO | https://us04web.zoom.us/j/78722654043?pwd=3Q4L4QYiyxwJu3RG5czQWTOgKd6naC.1 |
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**Contact Details of Instructor(s)**

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| --- | --- | --- |
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