**SYLLABUS**

**Fall semester 2022-2023 academic years**

**on the educational program “***, 2 Course*

*6B05101 Biological Engineering, full-time, 3 Course (Spring)*

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| **Discipline’s code** | **Discipline’s title** | **Independent work of students (IWS)** | **Number of credits** |  | **Number of credits** | **Independent work of student with teacher (IWST)** |
| **Lectures (L)** | **Practical training (PT)** | **Laboratory (Lab)** |  |
| **MUO 3320** | **Waste management**  |  | 1 | 2 |  |  |  |  |
|  | **Academic course information** |
| **Form of education** | **Type of course**  | **Types of lectures** | **Types of practical training**  |  | **Form of final control** |
| Full-time | daytime | presentation |  |  |
| Lecturer  | Prof. Kenzhebaeva S.S. |  |  |
| e-mail | kenzhebss@gmail.com |  |
| Telephone number |  |  |

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| **Aim of course**  | **Expected Learning Outcomes (LO)\***As a result of studying the discipline the undergraduate will be able to: | **Indicators of LO achievement (ID)**(for each LO at least 2 indicators) |
|  | 1. to know the conceptual apparatus necessary for the successful development of the discipline. | 1.1. the concepts such as:" waste management)", " Industrial wastewater treatment, “Energy recovery, Solid waste, “Industrial waste, Biological reprocessing Sewage sludge treatment " and others. |
| 2. to form a science-based socially responsiblerelation to the problem of waste management . | 2.1. to develop personal, professional and social competencies such as creativity, criticality, social responsibility.2.2. assessment of food safety in organic farming, organic principles and regulation2.3. Putting the safety of organic food into perspective. synthetic agrochemicals, environmental pollutants, animal feeds and veterinary drugs |
| 3. to acquire fundamental knowledge about the waste management, principces, methods and purposes of this system; natural wastewater treatment | 3.1. fundamental knowledge about the nature of waste management s, methods and purposes of this system,1.2. seach and analyze information about waste management; 3.2. the assesmetn of the range of benefits associated with the distribution and use of waste management.3.3. the personal, professional and social competencies such as creativity,criticality, social responsibility. |
| 4 to know the purpose of issues for natural wastewater treatment Systems. a) to give modern ideas about the goals and methods of management practices for environmental sustainability;b) show the benefites associated with the proper waste management c) to get knowledge of terms of pyrolysis technologies for municipal solid waste, mechanical recycling process | 4.1. Modification of Energy recovery4.2 Improvement in technological and utility trends. 4.3. International waste tradeis alterations in functional traits, important in the technlogical and processing processes. |
| 5. to get knowledge of terms will form the basis for successful development subsequent topics of the studied disciplines, principles of Sustainability   | 5.1. the knowledge which will form the basis for successful development subsequent topics of the studied disciplines5.2 waste management, a person fundamentally changes the speed and the scale of such processes, which cannot but change the pace evolutionary process and lead to unpredictable results.5.3. understanding that, moleculartechnologies are not very accurate, reliable and security, terefore, the creation and use of waste management principles |
| **Prerequisites** | general biochemistry, molecular biology, plant physiology,microbiology, biotechnology, ecology.  |
| **Post requisites** | the formation of a scientific worldview and natural science picture of the world among Ms students. |
| **Information resources \*\*** | **Literature:\*\***1. Waste to Resources. A Waste Management Handbook. The Energy and Resources Institute, 2014. P. 90.

Zero Waste: Management Practices for Environmental Sustainability by Ashok K. RathoureCall Number: TD793.9 .Z47 2020ISBN: 9780367180393, 2019. Waste Management by Er Sunil Kumar P. 240Wastewater Management Through Aquaculture by B. B. Jana (Editor); R. N. Mandal (Editor); P. Jayasankar (Editor)Call Number: TD755 .W294 2018ISBN: 9789811072475, 2018Household Recycling and Consumption Work by Kathryn Wheeler; Miriam GlucksmannCall Number: HD4482 .W47 2015ISBN: 1137440430, 2015 Natural Wastewater Treatment Systems, Second Edition by Ronald W. Crites; E. Joe Middlebrooks; Robert K. BastianCall Number: TD755 .C75 2014ISBN: 1466583266, 2014 Waste Management Practices by John PichtelCall Number: TD791 .P46 2014ISBN: 1466585188, 2014 Principles of Sustainability by Donald Franceschetti (Editor)Call Number: GE196 .P75 2017ISBN: 9781682176078, 2017 [Sustainable Solid Waste Management by Ni-Bin Chang](https://wisconsin-uwsp.primo.exlibrisgroup.com/permalink/01UWI_SF/1c32tab/cdi_askewsholts_vlebooks_9781118964545)ISBN: 1118964543, 2015 Publication Date: 20151. Gollakota, Anjani R. K.; Gautam, Sneha; Shu, Chi-Min (1 May 2020). "Inconsistencies of e-waste management in developing nations – Facts and plausible solutions". *Journal of Environmental Management*. 2617
2. Gollakota, Anjani R. K.; Gautam, Sneha; Shu, Chi-Min (1 May 2020). ["Inconsistencies of e-waste management in developing nations – Facts and plausible solutions"](https://www.sciencedirect.com/science/article/pii/S0301479720301699). *Journal of Environmental Management*. **261**7.
3. Cook, E.; Velis, C. A. (6 January 2021). ["Global Review on Safer End of Engineered Life"](http://eprints.whiterose.ac.uk/169766/). *Global Review on Safer End of Engineered Life*.
4. [*Journal of Environmental Economics and Management*](https://en.wikipedia.org/wiki/Journal_of_Environmental_Economics_and_Management)
5. Chen, Dezhen; Yin, Lijie; Wang, Huan; He, Pinjing (December 2014). "Pyrolysis technologies for municipal solid waste: A review". Waste Management.
6. Ding, Yin (2021). "A review of China's municipal solid waste (MSW) and comparison with international regions: Management and technologies in treatment and resource utilization". Journal of Cleaner Production. **293**: 126144
7. Types of Recycling". *ISM Waste & Recycling*.  February 2020.
8. Segregation of waste". *The Nation*. 2 February 2019.

**Internet resources:**Internet resources (at least 3-5)1. http://elibrary.kaznu.kz/ru2. [Waste Valorization"](https://www.aiche.org/topics/energy/waste-valorization). *www.aiche.org*. Retrieved 17 June 2021.3.  [*"what is recycling"*](https://recycling-important.phpwww.conserve-energy-future.com/why-is-). What is Recycling. 28 September 2020 – via conserve energy future.4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4484336>[Energies"](http://www.mdpi.com/journal/energies). *www.mdpi.com*. [Archived](https://web.archive.org/web/20201011025330/https%3A/www.mdpi.com/journal/energies) from the original on 11 October 2020. |

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| **Academic policy of the course in the context of university moral and ethical values** | **Academic Behavior Rules:** All students are required to register for the MOOC. The deadlines for completing the modules of the online course must be strictly observed in accordance with the schedule for studying the discipline. Leave in case of current MOOC or SPOC courses.**ATTENTION!** Failure to meet deadlines results in loss of points! The deadline for each task is indicated in the calendar (schedule) for the implementation of the content of the training course, as well as in the MOOC. Leave in case of current MOOC or SPOC courses.**Academic values:**- Practical trainings/laboratories, IWS should be independent, creative.- Plagiarism, forgery, cheating at all stages of control are unacceptable.- Students with disabilities can receive counseling at e-mail \*\*\*\*\*\*\*@gmail.com. |
| **Evaluation and attestation policy** | **Criteria-based evaluation:** assessment of learning outcomes in relation to descriptors (verification of the formation of competencies in midterm control and exams).**Summative evaluation:** assessment of work activity in an audience (at a webinar); assessment of the completed task. |

**CALENDAR (SCHEDULE) THE IMPLEMENTATION OF THE COURSE CONTENT:**

|  |  |  |  |
| --- | --- | --- | --- |
| week | Topic name | Number of hours | Max.score\*\*\* |
| **Module 1 Title** “Safety assessment of GMOs |
| 1 | **Lec 1.** Introduction to the problem. Waste management , types of waste. The purpose of waste management.  | 1 |  |
| 1 | **Sem 1.** Meaning of waste from industrial, commercial, and household activity | 2 | 10 |
| 2 | **Lec 2.** Theme Impact of waste management on human health and life | 1 |  |
| 2 | **Sem 2.** Theme Waste management practices are not uniform among countries (developed and developing nations. | 2 | 10 |
| 2 | IWST 1. Consultation on the implementation of IWS1 on the topic: 1. The examples of GM crops related to tolerance to abiotic stress.2. The examples of GM crops related to resistance to biotic stress (bacteria, fungus, virous).3. Automated vacuum collection.4. Waste separation.5. Disposal methodssingle-stream recycling. |  | 20 |
| 3 | **Lec 3.** Principles of waste management | 1 |  |
| 3 | **Sem 3.** Theme: The current practice of waste hierarchy | 2 | 10 |
| 3 | **SIW 1.** Topic, type of task. Life-cycle of a productProduct lifecycleSolid waste management  |  |  |
| 4 | **Lec 4.** Theme Life-cycle of a product | 1 |  |
| 4 | **Sem 4.** Solid wasteOrganic matterIndustrial wasteRecovery methods | 2 | 10 |
|  | **IWST 2. Colloquium (test, project, essay, situational task, etc.).**The topis is given for **SIW 1.** |  | 20 |
| 5 | **Lec 5.** Theme Recycling. Incineration | 1 |  |
| 5 | **Sem 5.** Polluter-pays principle | 2 | 10 |
| **Module 2 Title .** Resource recovery |
| 6 | **Lec 6.** Theme: Waste handling and transport  | 1 |  |
| 6 | **Sem 6.** Theme: Biological reprocessing Composting, Home composting, Anaerobic digestion, and Microbial fuel cell | 2 | 10 |
| 7 | **Lec 7.** Theme: Biological reprocessing | 1 |  |
| 7 | **Sem 7.** Theme: Waste-to-energy | 2 | 10 |
| 7 | IWST 3. Consultation on the implementation of the IWS 2. |  |  |
|  |  **LEVEL CONTROL 1** |  | **100** |
| 8 | **Lec 8.** Theme: Resource recovery. | 1 |  |
| 8 | **Sem 8.** Theme: Pyrolysis and gasification  | 2 | 10 |
| 8 | **IWS 3.** Topic, type of task. Topic 1. Re-use of waste.Topic 2 Waste collection vehicle*,*Waste collector, and Waste sorting. Topic 3 Process of organic farming practices Topic 4. Biodegradation of RefuseTopic 5. Biodegradation ProcessesTopic 6. Energy recovery |  |  |
| 9 | **Lec 9.** Theme Waste valorization |  |  |
| 9 | **Sem 9.** Theme Liquid waste-management. | 5 |  |
| 10 | **Lec 10** Theme Industrial wastewater |  |  |
| 10 | **Sem 10**. Theme Industrial wastewater treatment. | 5 |  |
| 10 | **IWST 4. Colloquium (test, test, project, essay, situational task, etc.). Topic, type of task.** |  | **20** |
|  | **Module 3 Title .** Sewage sludge**.** |  |  |
| 11 | **Lec 11** Theme Sewage sludge treatment  | 1 |  |
| 11 | **Sem 11.** Theme Solid Waste Management System | 2 | 10 |
| 12 | **Lec 12** Theme Sewage sludge treatment | 1 |  |
| 12 | **Sem 12.** Theme Mechanical Recycling Process. | 2 | 10 |
| 12 | IWST 5. Consultation on the implementation of the IWS 3. |  | 20 |
| 13 | **Lec 13** Theme Waste minimization | 1 |  |
| 13 | **Sem 13.** Theme Environmental monitoring. | 2 | 10 |
| 13 | *IWS 4*. Topic, type of task. Topic 1. Waste management by regionTopic 2. Biological reprocessingTopic 3. Range of benefits from waste management.Topic 4. Waste valorizationTopic 5. Contaminant of Synthetic agrochemicalsTopic 6. Contaminant of environmental pollutants |  |  |
| 14 | **Lec 14** Theme: International waste trade | 1 |  |
| 14 | **Sem 14.** Theme Ban on pesticides | 2 | 10 |
|  | **IWST 6. Colloquium (test, project, essay, situational task, etc.). Topic, type of task.**The topics are givenfor **IWS 3.** |  |  |
| 15 | **Lec 15** Theme Transboundary movement of e-waste | 1 |  |
| 15 | **Sem 15.** Theme Methodsof waste handling and transport | 2 | 10 |
| 15 | IWST 7. Consultation on examination issues |  | 20 |
|  |  **LEVEL CONTROL 2** |  | **100** |

Dean \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Zayadan B.K.

Head of Department\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Kistaubayeva A.S.

Lecturer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_prof. Kenzhebayeva s.S.