SZKOŁA GŁÓWNA GOSPODARSTWA WIEJSKIEGO

Bioengineering in food industry

Educational subject description sheet

Basic information

Field of study Food Science - Technology and Nutrition **Speciality** - **Organizational unit** Faculty of Food Technology **Study level** first cycle (bachelor's degree) **Study form** full-time studies **Education profile** General academic	**Didactic cycle** 2023/24 **Subject code** NoZTNS_D.120.04172.23 **Lecture languages** english **Mandatory** Elective subjects **Block** Major subjects **Disciplines** Food technology and nutrition

Coordinator	Anna Kamińska-Dwórznicka
Teacher	Anna Kamińska-Dwórznicka

Period	**Examination**	**Number of ECTS points**
Semester 6	Pass with grade **Activities and hours** Lecture: 30 Laboratory exercises: 15	3

Goals

Code	Goal
C1	students are able to characterize diffrent stages of the bioengineering production
C2	students are able to give an example of the biotechnological production of some polymers
C3	students are able to project up stream and down stream processes

Entry requirements

Students should know basic information in biochemistry, microbiology and process engineering.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	the concept of bioengineering, biotechnological material	TN_K1_W01, TN_K1_W02, TN_K1_W05, TN_K1_W06	Report, Presentation, Test (written or computer based)
W2	individual stages and processes of biopolymer production	TN_K1_W01, TN_K1_W02, TN_K1_W03, TN_K1_W04	Report, Presentation, Test (written or computer based)
Skills – Student can:			
U1	to give strains and conditions of the bioreactor for selected examples of biopolymers	TN_K1_U01, TN_K1_U02, TN_K1_U03, TN_K1_U04	Report, Presentation, Test (written or computer based)
U2	to design a manufacturing process	TN_K1_U03, TN_K1_U04, TN_K1_U05, TN_K1_U06, TN_K1_U07	Report, Presentation, Test (written or computer based)
Social competences – Student is ready to:			
K1	prepare bio-process design and carry out thorough it analysis of the technological and economic parameters	TN_K1_K01, TN_K1_K02, TN_K1_K03, TN_K1_K04	Report, Presentation

Study content

No.	Course content	Subject's learning outcomes	Activities
1.	During the course, students will be familiarized with the concepts of biotechnology, bioengineering and biological material. The stages of the production process will be discussed on the examples of specific biopolymers - enzymes, polysaccharides or vitamins.	W1, W2, U1	Lecture
2.	Small project of the production of selected biomolymer (enzyme, vitamin, protein).	W1, W2, U1, U2, K1	Laboratory exercises

Course advanced

Activities	Methods of conducting classes
Lecture	Lecture, Discussion
Laboratory exercises	Presentation, Design method, Teamwork

Activities	Examination method	Percentage
Lecture	Test (written or computer based)	70%
Laboratory exercises	Report	20%

Activities	Examination method	Percentage
Laboratory exercises	Presentation	10%

Activities	Credit conditions
Lecture	Test exam on minimum 51%
Laboratory exercises	Minimum 51% for the project

Literature

Obligatory

1. Pavlovic M. 2015. Bioengineering. A Conceptual Approach. Springer International Publishing A, XXV, 298, p.255.
2. . Grumezescu A., Holban A. M. 2018. Biopolymers for Food Design, Elsavier, vol. 20., 536.
3. Linnemann A. R., Schroën C. G. P. H., Van Boekel M. A. J. S. 2011. Food Product Design. An integrated approach. Wageningen Academic Publisher, p. 288.

Optional

1. Khan T., Park J.K., Kwon J.H. (2007). Functional biopolymers produced by biochemical technology considering applications in food engineering. Korean Journal Chemical Engineering, 24, 816–826.
2. Rodriguez Couto S., Sanroman A. (2006). Application of solid-state fermentation to food industry - A review. Journal of Food Engineering, 76, 291–302.
3. Adamiec J, Kamiński W, Markowski AS, Strumiłło C. (1995). Drying of biotechnological products. In: Handbook of Industrial Drying (ed. AS Mujumdar). Marcel Deker Inc., New York, vol. 2, 775-808
4. Morgan C. A., Herman N., White P. A., Vesey G., 2006. Preservation of microorganisms by drying; a review. J. Microb. Meth., 66, 183–193.
5. Samborska K, Witrowa-Rajchert D, Gonçalves A. 2005. Spray drying of alpha-amylase – the effect of process variables on the enzyme inactivation. Drying Technology, 23(4), 941-953.

Calculation of ECTS points

Activity form	Activity hours*
Lecture	30
Laboratory exercises	15
Preparation for the exam	20
Preparation of the report	20
Student workload	**Hours** 85
Number of ECTS points	**ECTS** 3

* hour means 45 minutes

Effects

Code	Content
TN_K1_K01	The graduate is ready to contact and exchange of experiences and knowledge with the experts in order to explore better solutions for particular problems connected to among others: food production, delivery chain, food storage and human nutrition
TN_K1_K02	The graduate is ready to complete professional duties in a socially responsible manner, enterprising, ethical, compatible with the public interest and also with the respect for professional tradition, and for the right to intellectual property protection
TN_K1_K03	The graduate is ready to take responsibility for the high quality and high pro-health value food production, meeting the quality standards and health safety requirements
TN_K1_K04	The graduate is ready to responsible performing of professional roles, in it: compliance with the professional ethics and exploring knowledge related to the profession
TN_K1_U01	The graduate can conduct experiments and solve practical issues in the field of basic sciences, and then implement them in activities carried out under directional issues in the field of food processing and human nutrition
TN_K1_U02	The graduate can assess the composition, energy and nutritional value of food products, determine their impact on the growth, development, functioning and health of the body, assess the diet, and nutritional status, and use the obtained results to rationalize the nutrition of individuals and different population groups
TN_K1_U03	The graduate can select methods and tools to make observations, measurements, and calculations in the field of phenomena occurring during processing, storage, research of food, human nutrition and consumer behaviour on the food market, and critically analyze and interpret the obtained data, assess the credibility of own actions
TN_K1_U04	The graduate can analyze and evaluate the existing solutions appropriate for the food economy, identify problems and opportunities for professional activity, search for new solutions, and ways of their implementation using modern tools, including experiments, analytical methods, computer simulations, information and communication techniques, and others
TN_K1_U05	The graduate can carry out activities in the field of the technological and functional design of food production and mass catering plants, taking into account the marketing strategy and in accordance with the applicable standards of good manufacturing and hygienic practice as well as food quality and safety systems
TN_K1_U06	The graduate can obtain, analyze and synthesize the obtained information and draw conclusions taking into account various conditions related to the aspects of human nutrition, food production, including regional production, food evaluation, consumer protection, intellectual property protection, legal, technological, economic, social, and sociological, cultural, ecological and ethical aspects of food production and consumption as well as quality and safety assurance in the food chain and human nutrition
TN_K1_U07	The graduate can communicate with the surrounding using specialist terminology appropriate for the field of study, including taking part in a discussion on professional issues, also using a foreign language in the field relevant to the field of study, in accordance with the requirements set out for B2 level of the European System for the Description of Education Linguistic
TN_K1_W01	The graduate knows and understands theoretical issues in the field of biological, chemical, mathematical, and related sciences, which are the basis for the description of phenomena occurring in food and the human being body, used for its description
TN_K1_W02	The graduate knows and understands processes and phenomena occurring in the human being body in the nutrition process and the influence of food ingredients on the human being body and functions, importance and influence of food ingredients and energy value on the development and functioning of the human being body and their importance in ensuring public health
TN_K1_W03	The graduate knows and understands the composition and properties of raw materials, auxiliaries, food additives, and food industry products, the possibilities and conditions of use of them in food production, taking into account the principles of sustainable development and their impact on human health
TN_K1_W04	The graduate knows and understands the theoretical basis of phenomenon and changes occurring in raw materials, semi-finished products, and food products in a natural way, and under the influence of technological processes, food storage and testing

Code	Content
TN_K1_W05	The graduate knows and understands basics of construction and operation of machines, devices, and instruments used for food processing and testing
TN_K1_W06	The graduate knows and understands methods and techniques used for food processing, preservation, storage, and testing