Ministry of Education and Science of Ukraine
Sumy National Agrarian University
Faculty of Food Technology
Food Technology Department

Syllabus of the educational component

SC 2 BASICS OF BIOPLASTICS TECHNOLOGY

Under implementation in within the educational **Food Technology** programs
by specialty **181 "Food Technologies"**
at the second (master's) level of higher education

Sumy – 2025

Developer: _____ **Dmytro BIDIUK,** Ph.D., Senior Lecturer, Food Technology Department
(signature) (surname, initials) (academic degree and title, position)

Reviewed, approved and ratified at the department meeting **food technology** (name of department)	minutes of 04.06.2025 No. 23
	Manager departments _____ (signature) Oksana MELNYK (last name, initials)

Agreed:

Guarantor educational programs Maryna SAVCHENKO
(signature) (first name LAST NAME)

Dean faculty,
where is being implemented educational program _____ Natalia BOLGOVA
(signature) (first name LAST NAME)

Review on working program (attached) provided by: _____ Oksana MELNYK
(signature) (first name LAST NAME)

_____ Serhiy BOKOVETS
(signature) (first name LAST NAME)

Methodist department qualities education,
licensing and accreditation _____ Svitlana Kozelevets
(signature) (first name LAST NAME)

Registered in electronic base: date: 21.08. 2025

Information about revision working programs (syllabus):

Educational year, in to whom are introduced changes	Application number to work program withdescription of changes	Changes considered and approved		
		Date and number protocol meeting departments	Manager departments	Guarantor educational programs

1. GENERAL INFORMATION ABOUT EDUCATIONAL COMPONENT

<table>
<tr><td>1.</td><td>Name of Educational Component</td><td colspan="4">Fundamentals of bioplastics technology</td></tr>
<tr><td>2.</td><td>Faculty / department</td><td colspan="4">Food Technology / Food Technology Department</td></tr>
<tr><td>3.</td><td>Status of Educational Component</td><td colspan="4">Selective</td></tr>
<tr><td>4.</td><td>Program / Specialty (programs) that include an educational component for</td><td colspan="4">181 «Food Technology»</td></tr>
<tr><td>5.</td><td>An educational component may be offered for</td><td colspan="4">educational program «Craft Technologies and Gastronomic Innovations»</td></tr>
<tr><td>6.</td><td>National Qualifications Framework Level</td><td colspan="4">Level 7</td></tr>
<tr><td>7.</td><td>Semester and duration study</td><td colspan="4">Full-time – 3rd semester
Study duration – 15 weeks</td></tr>
<tr><td>8.</td><td>Number loans ECTS</td><td colspan="4">5 credits</td></tr>
<tr><td rowspan="3">9.</td><td rowspan="3">General amount of hours and their distribution</td><td colspan="3">Contact work (occupation)</td><td rowspan="2">Independent work</td></tr>
<tr><td>Lectures</td><td>Practical /seminar</td><td>Laboratory lesson</td></tr>
<tr><td>2</td><td>-</td><td>0</td><td>148</td></tr>
<tr><td>10.</td><td>Language teaching</td><td colspan="4">English</td></tr>
<tr><td>11.</td><td>Teacher / Coordinator educational component</td><td colspan="4">BIDIUK Dmytro Olegovych</td></tr>
<tr><td>11.1</td><td>Contact information</td><td colspan="4">auditorium 212 m, building №4. Tel . (050) 781-20-27, E- mail : dmytro.bidiuk@gmail.com Consultation hours: every Wednesday from 13:00 to 14:00</td></tr>
<tr><td>12.</td><td>General description educational component</td><td colspan="4">Within the framework of this educational component, the student will be introduced to the types of bioplastics , world and domestic leaders in their production. The discipline provides for the acquisition of skills in obtaining existing bioplastics , as well as the development of new ones, their use as food packaging , disposal by biological decomposition, as well as the establishment of patterns of influence of various factors on the specified stages of their life cycle.</td></tr>
<tr><td>13.</td><td>Goal educational component</td><td colspan="4">Acquisition, systematization and consolidation of theoretical knowledge regarding the global bioplastics market as the basis of modern packaging materials, their types and production technologies, processing methods, commercial applications and mechanisms of biological decomposition</td></tr>
<tr><td>14.</td><td>Prerequisites for studying the educational component, connection with other educational components of the educational program</td><td colspan="4">The educational component is related to other educational components: "Food Chemistry", "Food and Dietary Supplements", "Theoretical Foundations of Food Production", "Research and Development", "Food Quality and Safety Management"</td></tr>
<tr><td>15.</td><td>Policy academic virtue</td><td colspan="4">If plagiarism is detected during the creation of reports based on the results of laboratory work, the student's work is canceled and re-done.</td></tr>
<tr><td>16.</td><td>Link for the course in the system Moodle</td><td colspan="4">https://cdn.snau.edu.ua/moodle/course/view.php?id=4563</td></tr>
<tr><td>17.</td><td>Keywords</td><td colspan="4">Packaging industry, biodegradability , composting, biopolymers, packaging</td></tr>
</table>

2. LEARNING OUTCOMES BY EDUCATIONAL COMPONENT AND THEIR RELATIONSHIP WITH PROGRAM LEARNING OUTCOMES

Learning outcomes for the educational component: After studying the educational component, the student is expected to be able to…»	Program learning outcomes						How is academic discipline assessed??
	Learning Outcome 3	Learning Outcome 6	Learning Outcome 8	Learning Outcome 15	Learning Outcome 17	Learning Outcome 18	
1. demonstrate knowledge of global trends in the bioplastics market as the basis of modern packaging materials for food products, prospects and forecasts for their further development ;					X	X	*Knowledge assessment by checking the processing of the reference notes o lectures and laboratory classe* *Differential credi* *Computer-based testing (certification)*
2. demonstrate knowledge of the composition, properties of biodegradable polymers, main types of bioplastics , technological features of their production and processing methods ;	X		X				
3. demonstrate knowledge of the regulatory framework and methods for studying their properties, a list of basic equipment for this ;		X					
4. demonstrate knowledge of ways to use bioplastics as a packaging base for food products and types of packaging , as well as methods of their disposal, biodegradation mechanisms and the processes that occur in this process ;					X	X	
5. demonstrate the ability to plan and conduct research, as well as calculate the results obtained from assessing the properties of bioplastics and packaging materials based on them using modern methods;	X			X			
6. demonstrate the ability to generate ideas and show ingenuity when developing new types of bioplastics using food waste and by-products of the food industry, and provide recommendations for their application;	X				X	X	
7. demonstrate the ability to improve food production technologies using biodegradable packaging as an innovative technological solution for optimizing the storage stage, taking into account technical, commercial, legal and environmental issues, which contributes to the development of new knowledge in the field of food technology;			X		X	X	
8. demonstrate the ability to prepare scientific publications based on the results of scientific activities, present and discuss the results obtained, including in a foreign language, at scientific seminars and conferences on the development of food technologies;				X			

3. CONTENT OF THE EDUCATIONAL COMPONENT (CURRICULUM)

Topic. List of questions to be asked considered within topics	Distribution in within general budget time			Recommended literature
	Auditorium study		Independent study	
	Lectures	Lab. lesson		
Topic 1. Bioplastics . Current trends and development prospects . 1. The problem of plastic pollution. 2. General information about biodegradable materials. 3. EU Strategy on Plastics. Independent study 1. Global bioplastics market . Current trends and development prospects. Laboratory lesson 1. Study of the technological foundations of bioplastics production	2	-	22	[1-4]
Topic 2. Types of biodegradable polymers as the basis of bioplastics . 1. Biodegradable polymers from biomass. 2. Biodegradable polymers synthesized microbiologically . Independent study 2. Biodegradable polymers synthesized by biotechnology . Biodegradable polymers derived from petroleum. Laboratory lesson 2. Study of the influence of formulation composition and technological regime on the properties of bioplastics	-	-	26	[1-4]
Topic 3. Types of bioplastics and technologies for their production. 1. Technologies of biodegradable polymers from biomass. 2. Technologies of biodegradable polymers synthesized microbiologically . Independent study 3. Technologies of biodegradable polymers synthesized biotechnologically . Technologies of biodegradable polymers obtained from oil.	-	-	12	[1-4]
Topic 4. Methods of processing bioplastics . 1. Injection molding. 2. Extrusion. 3. Blow molding . Independent study 4. Thermoforming . Vacuum forming . Compression molding . Laboratory lesson 3. Use of food waste and food industry by-products in bioplastics technology	-	-	25	[1-4]
Topic 5. Commercial application of bioplastics . 1. Use in the food industry. 2. Containers and packaging products. 3. Use in agriculture. 4. The use of bioplastics in the restaurant industry: new generation materials and their applications Independent study 5. Use in medicine. Use in the pharmaceutical industry. Use in other industries. Laboratory lesson 4. Manufacture of edible utensils, packaging and coatings	-	-	25	[1-4]
Topic 6. Degradation mechanisms of commercially available and promising types of bioplastics . 1. Biodegradation of polymers from biomass. 2. Biodegradation microbiologically synthesized polymers. Independent study 6. Biodegradation biotechnologically synthesized polymers. Biodegradation of petroleum polymers.	-	-	15	[1-4]
Topic 7. Latest bioplastics technologies . Bioplastics technologies using new non-traditional raw materials. Independent study 7. Promising bioplastics technologies . Bioplastics of the future. bioplastics technologies and provision of recommendations for their application	-	-	23	[1-4]
Total	**2**	**-**	**148**	

4. TEACHING AND LEARNING METHODS

Learning outcomes by educational component	**Teaching methods** (work to be carried out teacher during classroom lessons , consultations)	**Number hours [6]**	**Teaching methods** (what types educational activities have to perform student independently)	**Number[7] hours**
1. demonstrate knowledge of global trends in the bioplastics market as the basis of modern packaging materials for food products, prospects and forecasts for their further development ;	Lecture session (teaching lecture material, discussion, demonstration of graphic material)	7	Familiarization with lecture material, preparation of a basic lecture outline. Presentation of decisions made and preparation of abstracts, reports with visual support	14
2. demonstrate knowledge of the composition, properties of biodegradable polymers, main types of bioplastics , technological features of their production and processing methods ;	Laboratory session (consideration of technological situations with the provision of recommendations for solving technological production problems)	7	Presentation of laboratory results, report writing	14
3. demonstrate knowledge of the regulatory framework and methods for studying their properties, a list of basic equipment for this ;	Lecture session (teaching lecture material, discussion, demonstration of graphic material)	6	Familiarization with lecture material, preparation of a basic lecture outline. Presentation of decisions made and preparation of abstracts, reports with visual support	12
4. demonstrate knowledge of ways to use bioplastics as a packaging base for food products and types of packaging , as well as methods of their disposal, biodegradation mechanisms and the processes that occur in this process ;	Lecture session (teaching lecture material, discussion, demonstration of graphic material)	6	Familiarization with lecture material, preparation of a basic lecture outline. Presentation of decisions made and preparation of abstracts, reports with visual support	12
5. demonstrate the ability to plan and conduct research, as well as calculate the results obtained from assessing the properties of bioplastics and packaging materials based on them using modern methods;	Laboratory session (consideration of technological situations with the provision of recommendations for solving technological production problems)	6	Presentation of laboratory results, report preparation	12
6. demonstrate the ability to generate ideas and show ingenuity when developing new types of bioplastics using food waste and by-products of the food industry, and provide recommendations for their application;	Laboratory session (consideration of technological situations with the provision of recommendations for solving technological production problems)	6	laboratory results , report writing	12

7. demonstrate the ability to improve food production technologies using biodegradable packaging as an innovative technological solution for optimizing the storage stage, taking into account technical, commercial, legal and environmental issues, which contributes to the development of new knowledge in the field of food technology;	Laboratory session (consideration of technological situations with the provision of recommendations for solving technological production problems)	6	Presentation of laboratory results, report writing	12
8. demonstrate the ability to prepare scientific publications based on the results of scientific activities, present and discuss the results obtained, including in a foreign language, at scientific seminars and conferences on the development of food technologies;	Laboratory session (consideration of technological situations with the provision of recommendations for solving technological production problems)	6	Presentation of laboratory results, report preparation	12

5. EVALUATION BY EDUCATIONAL COMPONENT

5.1 . Summative evaluation

5.1.1. For evaluation expected results teaching provided

No.	Methods summative evaluation	Points / Weightin generalassessment	Date drafting
Module 1 (50 points)			
1.	Midterm testing (multiple choice test)	*50 points / 50%*	Modular week 1
Module 2 (50 points)			
1.	Midterm testing (multiple choice test)	*50 points / 50%*	Modular week 2

5.1.2. Criteria evaluation

Component [8]	**Evaluation**
Midterm testing – multiple choice test	*The test includes 25 questions, each of which is worth 2 points.*

5.2. Formative evaluation:

For evaluation current progress in training and understanding directions further improvement provided

No.	**Elements formative evaluation**	**Date**
1	Oral survey after studying the topics	After the lesson
2	Feedback from the teacher in the form of a discussion of midterm testing	According to schedule

6. EDUCATIONAL RESOURCE (LITERATURE)

6.1. Basic sources

1. Bioplastics for Sustainable Development / Edited by Mohammed Kuddus. – 2nd Edition. – Springer, 2021. – 744 P.

2. Handbook of Bioplastics and Biocomposites Engineering Applications / Edited by Inamuddin Inamuddin and Tariq Altalhi – 1st Edition. – Wiley, 2022. – 688 P.

3. Applied Biopolymer Technology and Bioplastics. Sustainable Development by Green Engineering Materials / Edited by Neha Kanwar Rawat, Tatiana G. Volova, A. K. Haghi. – 1st Edition. – CRC Press, 2021. – 292 P.

4. Bioplastics. Synthesis, Characterization, and Applications / Edited by Krushna Prasad Shadangi, Prakash Kumar Sarangi. - CRC Press, 2025. – 358 P.

6.2 Additional sources

5. Plastic pollution [Electronic resource] / Access mode: https://ourworldindata.org/plastic-pollution

6. Single-use plastics [Electronic resource] / Access mode: https://ec.europa.eu/environment/topics/plastics/single-use-plastics_en

7. European Strategy for Plastics in a Circular Economy [Electronic resource] / Access mode: https://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf

8. European Association of Bioplastics Manufacturers [Electronic resource] / Access mode: https://www.european-bioplastics.org/

9. Plastic Processing Techniques explained with the help of interesting GIFs [Electronic resource] / access mode: https://www.docsity.com/en/news/education-2/plastic-processing-techniques-explained-interesting-gifs/

10. New advancements of bioplastics in medical applications [Electronic resource] / access mode: https://ijpsr.com/bft-article/new-advancements-of-bioplastics-in-medical-applications/?view=fulltext

11. Utilization of Bioplastics for Food Packaging Industry [Electronic resource] / access mode: https://www.sciencedirect.com/science/article/pii/B9780123946010000151

12. Green plastic : a new plastic for packaging [Electronic resource] / access mode: https://zenodo.org/record/61482/files/22.pdf?download=1

13. Biodegradation behavior of thermoplastic starch (TPS) and thermoplastic dialdehyde starch (TPDAS) under controlled composting conditions [Electronic resource] / access mode: https://www.sciencedirect.com/science/article/abs/pii/S0142941808001293

14. Properties and Biodegradation Nature of Thermoplastic Starch [Electronic resource] / access mode: https://www.researchgate.net/publication/224829331_Properties_and_Biodegradation_Nature_of_Thermoplastic_Starch

15. Properties and Biodegradability of Thermoplastic Starch Obtained from Granular Starches Grafted with Polycaprolactone [Electronic resource] / access mode: https://core.ac.uk/ download / pdf /206396769.pdf

16. New advances in the biodegradation of Poly (lactic) acid [Electronic resource] / access mode: https://www.researchgate.net/publication/312454875_New_advances_in_the_biodegradation_of_Polylactic_acid

17. An overview on synthesis , properties and applications of poly (butylene-adipate- *co* -tere [Electronic resource] / access mode: https://www.sciencedirect.com/science/article/pii/S2542504820300014phthalate)–PBAT

18. Degradation and Recycling of Films Based on Biodegradable Polymers : A Short Review [Electronic resource] / access mode: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6523205/

19. Degradation of Polyhydroxyalkanoate (PHA): a Review [Electronic resource] / access mode: https://core.ac.uk/download/pdf/84936249.pdf

20. Review of recent advances in the biodegradability of polyhydroxyalkanoate (PHA) bioplastics and their composites [Electronic resource] / access mode: https://pubs.rsc.org/en/content/articlehtml/2020/gc/d0gc01647k

21. Bacterial polyhydroxyalkanoates-eco-friendly next generation plastic : Production , biocompatibility , biodegradation , physical properties and applications [Electronic resource] / access mode: https://www.tandfonline.com/doi/full/10.1080/17518253.2015.1109715

22. Polyethylene Furanoate (PEF) - The Rising Star Amongst Today's Bioplastics [Electronic resource] / access mode: https://omnexus.specialchem.com/selection-guide/polyethylene-furanoate-pef-bioplastic

23. PEF plastic synthesized from industrial carbon dioxide and biowaste [Electronic resource] / access mode: https://www.nature.com/articles/s41893-020-0549-y

Appendix 1

Review on working program (syllabus)

Parameter, by which is being evaluated working program (syllabus) of an educational component by a guarantor or memberproject group	**Yes**	**No**	**Comment**
The learning outcomes for the educational component are aligned with the National Qualifications Framework			
The learning outcomes for the educational component correspond to the intended program learning outcomes (for mandatory educational components)			
Results teaching by educational component give the opportunity to measure and to evaluate level their achievement			

Member of the educational program
project team "Food Technologies" Oksana MELNYK _____
(name) (full name) (signature)

Parameter by which the work program is evaluated(syllabus) of the educational component by the teacher of the relevant department	**Yes**	**No**	**Comment**
General information about educational component there are sufficient			
The learning outcomes for the educational component are aligned with the National Qualifications Framework			
Results teaching by educational component give the opportunity to measure and to evaluate level their achievement			
Results teaching relate to students competencies, and not content disciplines (contain knowledge, skills,skills, and not topics educational programs disciplines)			
The content of the educational component is formed in accordance with the structural and logical scheme			
Educational activity (teaching and learning methods) gives opportunity students achieve expected results training			
The educational component involves learning through research, What there are appropriate and sufficient for relevantequal higher education			
Strategy assessment within educational component corresponds politics University/Faculty			
The provided assessment methods allow assessing the degree of achievement of learning outcomes by educational component.			
Load students there are adequate volume educational component			
The recommended learning resources are sufficient to achieve results teaching			
Literature there are relevant			
The list of learning resources contains the necessary software products to achieve learning outcomes for the educational component			

Reviewer (teacher departments) food technology Serhiy BOKOVETS _____
(name) (position, Full name) (signature)