

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY NATIONAL AGRARIAN UNIVERSITY
Faculty of Engineering and Technology
Department of Agroengineering

Working Program (Syllabus) of the Educational Component

**EC 12. FUELS, LUBRICANTS AND
OPERATING MATERIALS AND
FILTRATION SYSTEMS**
(COMPULSORY)

Implemented within the educational program
“Agroengineering”

under specialty H7 “Agroengineering”

at the first (Bachelor’s) level of higher education

Sumy – 2026

Developer: _____
(signature)

Mykola SHELEST _____
(first name SURNAME)

Assistant _____
(academic degree and title, position)

Reviewed, approved and endorsed at the meeting of the Department of Agroengineering Agroengineering	Minutes No. 16 dated 05 June 2026		
	of the Department	_____ (signature)	<u>Mykhailo SHULIAK</u> (first name SURNAME)

Developer:

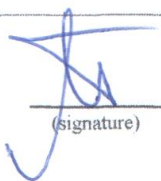

(signature)

Mykola SHELEST

(first name SURNAME)

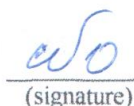
Assistant

(academic degree and title, position)

Reviewed, approved and endorsed at the meeting of the Department of Agroengineering Agroengineering	Minutes No. 16 dated 05 June 2026		
	of the Department	 (signature)	Mykhailo SHULIAK (first name SURNAME)

Agreed:

Guarantor of the Educational Program:


(signature)

Bohdan SARZHANOV
(first name SURNAME)

Dean of the faculty where the educational program is implemented


(signature)

Svitlana KHURSENKO
(first name SURNAME)

Review of the working program (attached) provided by:

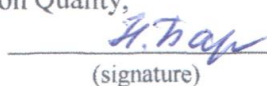


Oleksii KALNAHUZ
(first name SURNAME)



Bohdan SARZHANOV
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Methodologist of the Department of Education Quality,
Licensing and Accreditation


(signature)

(M. Baran)
(first name SURNAME)

Registered in the electronic database: date: 28.08. 2026 year

SNAY, 2026

Information on revision of the working program (syllabus):

Academic year in which changes are introduced	Appendix number to the working program describing the changes	Changes reviewed and approved		
		Date and number of the minutes of the department meeting	Head of the Department	Guarantor of the Educational Program

1. GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT

1.	Name of the EC	FUELS, LUBRICANTS AND OPERATING MATERIALS AND FILTRATION SYSTEMS							
2.	Faculty/Department	Engineering and Technology / Agroengineering							
3.	EC Status	Compulsory							
4.	Program/Specialty (programs) of which the EC is a component (for compulsory ECs)	“Agroengineering”/ H7 “Agroengineering”							
5.	The EC may be offered for (for elective ECs)	-							
6.	NQF level	6							
7.	Semester and duration of study	Full-time: Year 1, Semester 2, Weeks 1–15 Part-time: Year 1							
8.	Number of ECTS credits	5,0							
9.	Total number of hours and their distribution	Contact work (classes)						Independent work	
		Lectures		Practical classes		Lab		Full-time	Part-time
		Full-time	Part-time			Full-time	Part-time		
	150 hours, credit	30	-	-	-	30		90	
	150 hours, credit	-	4	-	-	-	6	-	140
10.	Language of instruction	Ukrainian							
11.	Lecturer/Coordinator of the Educational Component	Lecturer – Assistant of the Department of Agroengineering Mykola Serhiiovych SHELEST							
11.1	Contact information	Room 216m Faculty of Engineering and Technology, Building No. 4, koladj1992@gmail.com,							
12.	General description of the educational component	Mastering the discipline should enable students to make decisions regarding the selection of fuels and lubricants and to assess their quality and efficiency of use, taking into account economic and environmental factors; determine directions and assess the efficiency of using fuels and lubricants; apply methods for evaluating the quality of petroleum products; understand the specific features of storing and transporting petroleum products; and determine fuel and lubricant consumption rates.							
13.	Purpose of the educational component	<i>The purpose of the educational component is to acquire knowledge of the properties of fuels, lubricants, special fluids, and repair and maintenance materials; their impact on the technical and economic performance of agricultural machinery; and skills in determining key quality indicators and selecting appropriate grades and brands of fuels, lubricants, special fluids, and repair and maintenance materials for machinery in operation.</i>							
14.	Prerequisites for studying the EC and its links with other educational components of the educational program	The competencies developed in the educational component are necessary for forming in higher education students a system of knowledge and skills that reveals the interrelationship and interdependence of the set of regularities explaining the main phenomena and processes occurring in machines. 1. The educational component is based on: EC 10 «Materials Science and Forming Technologies» 2. The educational component provides a basis for: EC 14 «Tractors and Automobiles» and EC 15 «Agricultural Machinery», EC 16 «Mechanics of Materials and Structures».							
15.	Academic Integrity Policy	The system of requirements imposed on higher education students while studying the educational component:							

		- completion of assessment stages by higher education students within the established deadlines; - completion and defense of laboratory and practical works within the established deadlines; - must comply with the policies and procedures for ensuring education quality (https://surl.li/uoffns).
16.	Link to the course in the Moodle system	https://cdn.snau.edu.ua/moodle/course/view.php?id=4958
17.	Keywords	Fuel, lubricants, gasoline, diesel fuel, engine oils, transmission oils, greases, viscosity, octane number, cetane number, flash point, pour point, additives, operating properties, storage of fuels and lubricants.

2. LEARNING OUTCOMES OF THE EDUCATIONAL COMPONENT AND THEIR RELATIONSHIP WITH PROGRAM LEARNING OUTCOMES

Learning outcomes for the EC: “After completing the educational component, the student is expected to be able to”	Program learning outcomes to which the EC contributes (indicate the number according to the numbering)				How the learning outcome is assessed
	PLO7. Solve complex engineering and technical problems related to the operation of agricultural machinery and technological processes of production, storage, processing, and transportation of agricultural products.	PLO 16. Understand the operating principles of machines and systems, and the thermal operating modes of machinery and equipment used in agricultural production. Determine the operating parameters of hydraulic systems and thermal power installations for agricultural purposes.	PLO 21. Determine the composition and scope of mechanized operations and the need for fuels, lubricants, and spare parts.	PLO 24. Organize the production process of units responsible for technical support of agro- industrial production.	
ECLO 1. Understand the classification, composition, physicochemical and operating properties of fuels and lubricants and special technical fluids, their labeling, purpose, and specific features of application in engines, transmissions, hydraulic systems, and other units of agricultural machinery.		+			Final modular assessments 1 and 2; completion and defense of laboratory works, multiple-choice test on the Moodle platform
ECLO 2. Analyze and evaluate the quality indicators and operating properties of fuels, oils, greases, and technical fluids and materials prior to		+			
ECLO 3. Apply fuels and lubricants, special technical fluids, and filtration materials in engines, transmissions, hydraulic systems, and filtration systems of agricultural machines, taking into account their operating conditions.	+		+		Final modular assessments 1 and 2; completion and defense of laboratory works, multiple-choice test on the Moodle platform
ECLO 4. Implement modern methods of rational, efficient, and safe use of fuels and lubricants, control filtration, storage, and operation; substantiate ways to improve fuels and lubricants, increase machinery service life, reduce fuel and energy resource consumption, and minimize negative environmental impacts.	+			+	

3. CONTENT OF THE EDUCATIONAL COMPONENT (COURSE PROGRAM)

Topic. List of questions to be considered within the topic	Distribution within the total time budget, hours			Independent work	Recommended literature
	Classroom work				
	Lectures	Practical classes	Laboratory classes		
Topic 1. Introduction. General information about fuels and lubricants for agricultural machinery. General information about fuels, lubricants, and other operating materials. Importance of the quality of fuels and lubricants when used in machinery. Rational use of fuel and energy resources.	2		-	6/10	1-6, 12
Topic 2. Basic modern scientific concepts and interpretation of the laws of chemistry. Basic concepts atomic-molecular theory: atom, molecule, chemical element, simple and compound substance, atomic and molecular masses, mole, molar volume, valence and equivalent. Basic laws of chemistry. Role of chemistry in intensifying agro-industrial production (AIP).	-		-	6/10	1-6
Topic 3. Types of fuels, their properties, and combustion. General characteristics and role of fuel and energy resources in agriculture. Purpose, classification, properties, and general composition of fuels. Fuel mixture formation and combustion processes and composition of combustion products.	2		2	6/10	1-6, 12 14
Topic 4. General information on obtaining liquid fuels and oils from crude oil. Crude oil is the main raw material for producing liquid fuels and oils. Modern methods of petroleum product production. Modern methods of purifying fuels and oils. Characteristics of the general physicochemical indicators of	2		2	6/10	1-6, 12
Topic 5. Operating properties and use of fuels for spark-ignition engines Operating properties, labeling, and use of gasoline. Determination and evaluation of the fractional composition of gasoline. Determination of the low-temperature properties of diesel fuel.	2/2		2	6/10	1-6, 11 14
Topic 6. Operating properties and use of compressed and liquefied gases 1. Operating properties, labeling, and use of compressed and liquefied gases.	2		-	6/10	1-6, 12
Topic 7. Operating properties and use of biogas 1. Operating properties and applications of biogas.	2		-	6/10	1-6, 12, 13

Topic 8. Operating properties and use of diesel fuel Conditions of use and requirements for diesel fuels. Physicochemical properties of diesel fuels. Standard indicators of diesel fuels and their evaluation. Operating properties of alternative fuels for diesel engines. Determination of adsorption characteristics of adsorbents used in systems for capturing volatile fractions of petroleum products Determination of the filterability coefficient of diesel fuel.	2/2		4	6/10	1-6, 12, 15
Topic 9. Operating properties and use of engine, transmission, and hydraulic oils. 1. Operating properties, labeling, and use of engine oils. 2. Operating properties, labeling and use transmission oils. 3. Operating properties, labeling and use hydraulic oils. Lab. Determination and evaluation of the main properties of brake fluids.	4		2/2	6/10	1-6, 12, 13
Topic 10. Operating properties and use of greases. 1. Operating properties, labeling and use of greases. Lab. Determination and evaluation of the main properties of greases. Lab. Determination of the content of mechanical impurities in petroleum products	2		4/2	6/10	1-6, 12
Topic 11. Operating properties and use of special technical fluids. Operating properties, composition, and labeling of coolants for internal combustion engines. Operating properties, composition, and labeling of brake fluids. Operating properties, composition, and use of starting fluids and shock absorber fluids. Lab. Determination and evaluation of the operating properties of antifreezes. Lab. Determination of water hardness and water softening. Lab. Determination and evaluation of the main properties of brake fluids.	2		6/2	6/10	1-6, 12
Topic 12. Air filtration systems. Pre-filters. Main filters. Lab. Study of the structure of filtration elements for air filtration in internal combustion engines.	2		2	8/10	1-6, 12
Topic 13. Fuel and oil filtration systems. Fuel filtration systems. Oil filtration systems. Lab. Study of the structure of filtration elements for fuel filtration in internal combustion engines. Lab. Study of the structure of filtration elements for oil filtration in internal combustion engines.	4		4	8/10	1-6, 12
Topic 14. Main directions for improving fuels and lubricants. Fundamentals of their rational and safe use. Ways to improve fuels and lubricants. Modern methods of rational use of fuels and lubricants Fundamentals of safe use of fuels and lubricants Lab. Study of the effect of water on fuel filtration.	2		2	8/10	1-6, 11 15
TOTAL	30/4		30/6	90/140	

4. TEACHING AND LEARNING METHODS

ECLO	Teaching methods (activities conducted by the teacher during classroom sessions and consultations)	Number of hours		Learning methods (types of learning activities to be completed independently by the student)	Number of hours	
		Full-time	Part-time		Full-time	Part-time
1	Explanatory lecture, illustration, presentation lecture with demonstrations and multimedia technologies, exercises and calculations, oral questioning, laboratory works.	15	2	Careful reading and study of lecture notes and consideration of problematic lecture issues, solving tasks; keeping notes and summaries; discussion of learning material with other students without teacher participation; testing	20	35
2	Explanatory lecture, illustration, presentation lecture with demonstrations and multimedia technologies, oral questioning, exercises and calculations, practical works, laboratory works.	15	2	Careful reading and study of lecture notes and consideration of problematic lecture issues, solving tasks; keeping notes and summaries; discussion of learning material with other students without teacher participation, testing.	20	35
3	Explanatory lecture, illustration, presentation lecture with demonstrations and multimedia technologies, exercises and calculations, oral questioning, laboratory works.	15	3	Testing, problem solving, keeping notes and summaries; discussion of learning material with other students without teacher participation;	20	35
4	Exercises and calculations, oral questioning, laboratory works.	15	3	Questioning, careful reading of lecture notes and consideration of problematic lecture issues, problem solving; discussion of learning material with other students without teacher participation;	10	35
TOTAL		60	10		90	140

5. ASSESSMENT OF THE EDUCATIONAL COMPONENT

1. Diagnostic assessment (if necessary)

2. Summative assessment

4.2.1. The following is provided for assessing the expected learning outcomes

<i>Nº</i>	<i>Summative assessment methods</i>	<i>Points / Weight in the overall grade</i>	<i>Assessment date (indicate the week number when assessment will be conducted)</i>
1.	Module 1 (multiple-choice test)	30 points / 30%	Week 7
2.	Completion and defense of laboratory works	20 points / 20%	Weeks 1–7
3.	Module 2 (multiple-choice test)	30 points / 30%	Week 15
4.	Completion and defense of laboratory works	20 points / 20%	Weeks 8–15

4.2.2. Assessment criteria

Component	Not passed	Passed (E, D)	Passed (C)	Passed (A)
Module 1 (multiple-choice test)	<18 points	18...21 points	22...26 points	27...30 points
	Number of points for tests less than 12 out of 20	Number of points for tests 12–14 out of 20	Number of points for tests 15–17 out of 20	Number of points for tests 18–20 out of 20
Completion and defense of laboratory works	<12 points	12–14 points	15–17 points	18–20 points
	The task requirements have not been met	Most requirements have been met, but some components are missing or insufficiently covered	All task requirements have been met, but there are minor comments regarding the task completion	All task requirements have been met, and an original solution has been proposed
Module 2 (multiple-choice test)	<18 points	18...21 points	22...26 points	27...30 points
	Number of points for tests less than 12 out of 20	Number of points for tests 12–14 out of 20	Number of points for tests 15–17 out of 20	Number of points for tests 18–20 out of 20
Completion and defense laboratory works	<12 points	12–14 points	15–17 points	18–20 points
	The task requirements have not been met	Most requirements have been met, but some components are missing or insufficiently covered	All task requirements have been met, but there are minor comments regarding the task completion	All task requirements have been met, and an original solution has been proposed

Formative assessment:

For assessing current learning progress and understanding directions for further improvement, the following is provided

№	Formative assessment elements	Date
1.	Oral questioning after studying each topic	After completing the topic
2.	Preparation for testing and modular assessment with feedback from the teacher	According to the academic schedule
3.	Oral feedback from the teacher during laboratory work in class	Throughout the semester
4.	Preparation for the defense of laboratory works	Throughout the semester

Self-assessment may be used as an element of both summative and formative assessment.

6. LEARNING RESOURCES (LITERATURE)

6.1. Main sources.

1. Fuels, lubricants, technical fluids, and their supply systems: (2022) textbook / V. Ya. Chabannyi, M. I. Chernovol, Ye. K. Solovykh [et al.] ; ed. V. Ya. Chabannyi. - Kropyvnytskyi : Central Ukrainian National Technical University (CNTU). - 486 pp.
2. V. V. Tkachuk, P. I. Topilnytskyi (2023) Commodity Science of Fuels and Lubricants [Text] : textbook /Lutsk National Technical University. - Lutsk : Vezha-Druk. - 370 pp.
3. Locomotive Operating Materials: (2022) textbook Part 2. Oils and Lubricants / D. S. Zhalkin, S. H. Zhalkin, V. H. Puzyr, O. O. Anatskyi. – Kharkiv: Ukrainian State University of Railway Transport, – 135 pp., fig. 18, tables 17.
4. S. M. Didur (2023) Fuels, Lubricants and Technical Fluids: textbook. Lviv : Lviv Polytechnic Publishing House. 256 pp.

6.2. Methodological support.

5. S. P. Sokolik, M. L. Shuliak, L. M. Batiuk Scientific and methodological support of the educational process : Fuels and Lubricants and operating materials and filtration systems. Lecture notes (Part 1) for higher education students of specialty 208 “Agroengineering” at the first (Bachelor’s) level of higher education – Sumy: SNAU, 2024. – 80 pp.
6. S. P. Sokolik, M. L. Shuliak, L. M. Batiuk Scientific and methodological support of the educational process : Fuels and Lubricants and operating materials and filtration systems. Lecture notes (Part 2) for higher education students of specialty 208 “Agroengineering” at the first (Bachelor’s) level of higher education – Sumy: SNAU, 2024. – 102 pp.

6.3. Information resources.

7. <https://library.snau.edu.ua/>.
8. <http://repo.snau.edu.ua/>.
9. <https://dspace.kntu.kr.ua/items/4d7afa06-8968-4adf-bcfd-538285ee1e69>
10. https://akademperiodyka.org.ua/wp-content/uploads/08-Palyvno-mastylni_mat_optim.pdf
11. <https://repo.btu.kharkiv.ua/server/api/core/bitstreams/bf9223df-c857-40e7-b4e7-89f21d23b767/content>
12. <https://elartu.tntu.edu.ua/bitstream/123456789/18165/1/mater.pdf>

6.4. Additional sources.

13. V. V. Tkachuk, O. Yu. Povstianoi (2022) Mechanisms for improving the environmental performance of motor fuels : monograph. Lutsk : Lutsk National Technical University, 220 pp.
14. Boichenko S., Yakovlieva A., Zaporozhets O., Karakoc T. H., Shkilniuk I. (2022) Chemmotological Aspects of Sustainable Development of Transport. Springer, 293 p.
15. Elvers B., Schütze A. (eds.) (2021). Handbook of Fuels: Energy Sources for Transportation. 2nd ed. Wiley-VCH,. DOI: 10.1002/9783527813490.
16. Kalnes T. N., Marker T. L. (2022). Transportation Fuels: Chemistry and Technology. CRC Press, 296 p.
17. Mikulski M. (2023).Advanced Fuels for Sustainable Mobility. Springer, 281 p.