MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY NATIONAL AGRICULTURAL UNIVERSITY

Department of Occupational Safety and Physics

Work program (syllabus) of the educational component

Physics of processes and mathematical methods of scientific research
(compulsory)

Implemented within the educational program: **Agricultural Engineering**
specialty: 208 Agricultural engineering

at the second (master's) level of higher education

Sumy – 2023

Developer: _____ Khursenko S.M., Associate Professor of Occupational Safety and Physics Department, Ph.D., Associate Professor

Consideredoved and approved at the meeting of the Department of Occupational Safety and Physics	protocol of June 5, 2023, №10 Head of Department _____ **Khursenko S.M.**

Agreed:

Guarantor of the educational program _____ Khvorost T.V.

Dean of the faculty where the educational program is implemented _____ Zubko V.M.

A review of the work program has been provided: _____ Khvorost T.V.

_____ Loboda V.B.

Methodist of the Department of Education Quality, Licensing and Accreditation _____ Baranik N.M.

Registered in the electronic database: date: 12.09. 2023

Information on viewing the work program (syllabus):

The academic year in which the changes are made	The number of the annex to the work program with a description of the changes	The changes were reviewed and approved		
		Date and number of the protocol of the meeting of the department	Head of Department	Guarantor of the educational program

1. GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT

<table>
<tr><td>1.</td><td>The name of the EC</td><td colspan="4">Physics of processes and mathematical methods of scientific research</td></tr>
<tr><td>2.</td><td>Faculty/department</td><td colspan="4">Faculty of Engineering and Technology / Department of Occupational Safety and Physics</td></tr>
<tr><td>3.</td><td>Status of the EC</td><td colspan="4">compulsory</td></tr>
<tr><td>4.</td><td>Program/Specialty (programs), the component of which is EC</td><td colspan="4">Educational program: Agricultural Engineering
Specialty: 208 Agricultural engineering</td></tr>
<tr><td>5.</td><td>EC can be offered for</td><td colspan="4"></td></tr>
<tr><td>6.</td><td>Level of the NQF</td><td colspan="4">7 (master)</td></tr>
<tr><td>7.</td><td>Semester and duration of study</td><td colspan="4">fall semester, 15 weeks</td></tr>
<tr><td>8.</td><td>Number of ECTS credits</td><td colspan="4">5 credits (150 hours)</td></tr>
<tr><td rowspan="2">9.</td><td rowspan="2">The total number of hours and their distribution</td><td colspan="3">Contact work (class)</td><td rowspan="2">Independent work</td></tr>
<tr><td>Lectures</td><td>Practical</td><td>Laboratory</td></tr>
<tr><td></td><td></td><td>14</td><td>30</td><td>-</td><td>106</td></tr>
<tr><td>10.</td><td>Language of education</td><td colspan="4">English</td></tr>
<tr><td>11.</td><td>Teacher/Coordinator of the EC</td><td colspan="4">Khursenko Svitlana Mykolayivna</td></tr>
<tr><td>11.1</td><td>Contact Information</td><td colspan="4">Associate Professor of Occupational Safety and Physics Department, Ph.D., Associate Professor
e-mail: khursenkosvetlana@gmail.com</td></tr>
<tr><td>12.</td><td>General description of the educational component</td><td colspan="4">Today's scientific activity in higher educational institutions is an integral part of the educational process. It should contribute to the deepening of scientific knowledge among students and form in them the desire to engage in scientific activity not only within the framework of educational activities, but also further professional activity and postgraduate and doctoral studies.</td></tr>
<tr><td>13.</td><td>The aim of the educational component</td><td colspan="4">Familiarizing students with current problems of modern scientific research in the field of international relations, providing them with knowledge of the basics of complex scientific research, as well as forming in them the skills of collecting and processing various scientific information.</td></tr>
<tr><td>14.</td><td>Prerequisites for studying EC, connection with other educational components of EP</td><td colspan="4">1. The educational component is based on the study of such disciplines: Management, marketing and intellectual property.
2. The educational component is the basis for such disciplines: Reasoning of engineering and technological solutions.</td></tr>
<tr><td>15.</td><td>Policy of academic integrity</td><td colspan="4">When performing independent work, writing modular and certification papers, the student must adhere to the rules of academic integrity. Violations of academic integrity: academic plagiarism, fabrication, plagiarism, falsification, deception, bribery, biased evaluation. If facts of academic dishonesty are discovered, the work done by the student is canceled. In case of two or more identical works, all works are canceled in the same way.</td></tr>
<tr><td>16.</td><td>Link to course in Moodle</td><td colspan="4">http://cdn.snau.edu.ua/moodle/course/view.php?id=5584</td></tr>
</table>

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

Study results for EC: After studying the educational component, the student is expected to be able to..."	Program learning outcomes, to be achieved by the EC (indicate the number according to the numbering given in the EP)			How Disciplinary Learning Outcome is evaluated
DLO 1. analyze the main provisions of scientific theory, apply the acquired knowledge in practice				Written control, multiple choice test
DLO 2. correctly master scientific methods and research methods				Written control, multiple choice test
DLO 3. use various scientific methods and methods of processing primary information				Written control, multiple choice test

3. CONTENTS OF THE EDUCATIONAL COMPONENT (COURSE PROGRAM)

Topic. List of issues to be considered within the topic	Distribution within the general time budget				Recommended literature
	Auditory work			Independent work	
	Lectures	Practical	Laboratory		
Topic 1. General characteristics of scientific research methods. Methods of empirical scientific research. Methods of experimental and theoretical scientific research. Methods of theoretical scientific research. System analysis method.	2	4		15	[1-5]
Topic 2. Concept, classification and tasks of the experiment. The main purpose of the experiment. Design and organization of the experiment. Classification of the experiment. Methodology of the experiment.	2	4		15	[1-5]
Topic 3. General principles of organization and planning of the experiment. Mathematical theory of the experiment. Mathematical methods of experiment planning. Theory and practice of computing experiment.	2	4		15	[1-5]
Topic 4. Metrological support of experimental studies. Main categories of metrology. Standards and exemplary means of measurement. Measurement methods. Measuring devices and installations. Measurement errors.	2	4		15	[1-5]
Topic 5. Experiment planning methods. Mathematical model of the research object. Optimization parameters. Factors of the planned experiment.	2	4		15	[1-5]
Topic 6. Methods of processing the results of the experiment. Methods of graphic processing of experimental results. Methods of selection of empirical formulas. Basics of regression and correlation analysis.	2	4		15	[1-5]
Topic 7. Methods of theoretical scientific research. The goal and tasks of theoretical scientific research. Structural components and stages of theoretical scientific research. Mathematical methods and mathematical models in theoretical scientific research.	2	6		16	[1-5]
In total	14	30		106	

4. TEACHING AND LEARNING METHODS

Disciplinary Learning Outcome	**Teaching methods** (work to be carried out by the teacher during classroom classes, consultations)	Number of hours	**Learning methods** (what types of learning activities should be performed by the student independently)	Number of hours
DLO 1. analyze the main provisions of scientific theory, apply the acquired knowledge in practice	conducting lectures and practical classes on each topic	44	- processing unfamiliar (new) terms; - additional processing of lecture material; - solving tasks of independent work on certain topics	106
DLO 2. correctly master scientific methods and research methods				
DLO 3. use various scientific methods and methods of processing primary information				
Hours in general		**44**		**106**

5. ASSESSMENT BY EDUCATIONAL COMPONENT

5.1. Summative assessment

5.1.1. To assess the expected learning outcomes, it is provided

№	Methods of summative assessment	Points / Weight in the overall assessment	Compilation date
1	Module 1 (multiple choice test)	40 points / 40%	According to the schedule of the educational process
2	Attestation (multiple choice test)	15 points / 15%	
3	Module 2 (multiple choice test)	45 балів / 45%	

5.1.2. Assessment criteria

Component	**Unsatisfactory**	**Satisfactory**	**Good**	**Excellent**
Module 1 (multiple choice test)	*0-23 points*	*24-29 points*	*30-35 points*	*36-40 points*
	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test
Attestation (multiple choice test)	0-3 *points*	3-7 *points*	*7-13 points*	*14-15 points*
	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test
Module 2 (multiple choice test)	*0-26 points*	*27-33 points*	*34-40 points*	*41-45 points*
	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test

5.2. Formative assessment:

№	Elements of formative assessment	Date
1	Oral survey after studying each topic	After completing the topic study
2	Passing the certification test and module control with feedback from the teacher	According to the schedule of the educational process
3	Passing tests after studying each topic for independent control of knowledge	Regulated by the student independently
4	Verbal feedback between the teacher and students while working on practical works during classes	During the semester

6. EDUCATIONAL RESOURCES (LITERATURE)

1. Cantrell C.D. Modern Mathematical Methods for Physicists and Engineers. – University of Texas, Dallas. – 2000. – 784 p.
2. Nye M.J. The Cambridge History of Science, Volume 5: The Modern Physical and Mathematical Sciences – Cambridge University Press, 2002. – 708 p.
3. Athanassios S. Fokas, Efthimios Kaxiras. Modern Mathematical Methods for Scientists and Engineers. – World Scientific Publishing Company, 2022. – 512 p.
4. Jean-Francois Pommaret. New Mathematical Methods for Physics. – Nova, 2018. – 197 p.
5. Robert Nola, Howard Sankey. Theories of Scientific Method. – Routledge, 2007. – 240 p.