Ministry of Education and Science of Ukraine
Sumy National Agrarian University
Faculty of Agricultural Technologies and Environmental Management
Department of Plant Breeding and Seed Production nam
Prof. M. D. Goncharov

**Work program (syllabus) of the educational component**

# BREEDING AND SEED PRODUCTION RESEARCH METHODS IN AGRONOMY

(title)

*(compulsory)*

| | |
|---|---|
| **Specialty** | **201** Agronomy / H1 Agronomy |
| **Educational and scientific program** | Agronomy |
| **Level of higher education** | Third (educational and scientific) |

Sumy -2025

**Developer:** _____ **Onyshchko V. I.**, Candidate of Agricultural Sciences, Associate Professor, Associate Professor of the Department of **Breeding and Seed Production**)

**Approved:**
Guarantor of the Educational Program  **A. V. Melnyk**

## 1. GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT

<table>
<tr><td>1.</td><td>Name of EC</td><td colspan="8">Selection and seed production research methods in agronomy</td></tr>
<tr><td>2</td><td>Faculty/Department</td><td colspan="8">FATP, Department of Selection and Seed Production named after Prof. M.D. Goncharov</td></tr>
<tr><td>3.</td><td>Status EC</td><td colspan="8">Mandatory</td></tr>
<tr><td>4.</td><td>Program/Specialty (programs), component of which EC is a component for</td><td colspan="8">ESP "Agronomy" of the third educational and scientific level of higher education in the specialty H1 "Agronomy"</td></tr>
<tr><td>5.</td><td>EC may be proposed for</td><td colspan="8"></td></tr>
<tr><td>6.</td><td>Level of NQF</td><td colspan="8">8</td></tr>
<tr><td>7.</td><td>Semester and duration of study</td><td colspan="8">3 semesters, weeks 1-10</td></tr>
<tr><td>8.</td><td>Number of credits ECTS</td><td colspan="8">3 ECTS credits</td></tr>
<tr><td rowspan="4">9.</td><td rowspan="3">Total number of hours and their distribution</td><td colspan="6">Contact work (classes)</td><td colspan="2">Independent work</td></tr>
<tr><td colspan="2">Lectures</td><td colspan="2">Practical / seminars</td><td colspan="2">Laboratory</td><td colspan="2"></td></tr>
<tr><td>Full-time</td><td>Part-time</td><td>Full-time</td><td>Part-time</td><td>Full-time</td><td>Part-time</td><td>Full-time</td><td>Part-time</td></tr>
<tr><td>90</td><td>20</td><td></td><td>20</td><td></td><td></td><td></td><td>50</td><td></td></tr>
<tr><td>10</td><td>Type of assessment</td><td colspan="8">Exam</td></tr>
<tr><td>11</td><td>Language of instruction</td><td colspan="8">Ukrainian</td></tr>
<tr><td>12</td><td>Teacher/Coordinator of the educational component</td><td colspan="8">V.I. Onychko, Ph.D. in Agricultural Sciences, Associate Professor</td></tr>
<tr><td>12.</td><td>Contact</td><td colspan="8">Onichko Viktor Ivanovich, Associate Professor of the Department of Selection and Seed Production named after Prof. M.D. Goncharov, room 2 of the greenhouse complex. e-mail:onichko@gmail.com . Phone: (099)9062263<br>Consultation hours: Wednesdays from 2:00 p.m. to 3:00 p.m.</td></tr>
<tr><td>13.</td><td>General description of the educational component</td><td colspan="8">The discipline is based on the tasks and principles defined by the laws of Ukraine "On Seeds and Planting Material" (https://zakon.rada.gov.ua/rada/show/411-15#Text; "On Protectionplant variety rights" (https://zakon.rada.gov.ua/rada/show/3116-12#Text), and approaches that combine theoretical training and practical skills. Given the great importance of the agricultural sector for Ukraine's economy, the stabilization of the socio-economic situation, and the growth of the export potential of food and feed grain, the main focus of this discipline will be on the study of methods creating high-yielding varieties and hybrids, the organization and methodology of variety testing; the organization of field crop seed production; the introduction of the latest technologies for seed production, its processing, and servicing service for seed market participants.</td></tr>
<tr><td>14.</td><td>The goal of the educational component</td><td colspan="8">Training postgraduate students who have knowledge of the essence of the breeding process, breeding methods and their use for creating highly productive varieties and hybrids, the organization and methodology of variety testing, the organization and technology of field crop seed production.</td></tr>
<tr><td>15.</td><td>Prerequisites for studying EC, connection with other educational components of OP</td><td colspan="8">1. The educational component is based on the program outcomes of master's degree students in terms of analyzing and interpreting knowledge from general and specialized professional training<br>2. The educational component is the basis for the formation of a dissertation.</td></tr>
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| | | |
|---|---|---|
| 16. | Policy academic integrity | Compliance with the principles of academic integrity by higher education students includes: independent completion of educational tasks and assignments for current and final assessment of learning outcomes; proper referencing of information sources when using ideas, statements, or data; compliance with copyright legislation; and provision of reliable information about the results of one's own educational or scientific activities.<br>Violations of academic integrity in the course "Selection and Seed Research Methods in Agronomy" include: academic plagiarism, academic fraud (cheating, deception, submitting someone else's work as one's own), and the use of electronic devices during the final knowledge assessment.<br>For violations of academic integrity, students may be subject to the following academic sanctions:<br>Academic plagiarism – assignment is cancelled and must be redone; the student receives a grade of 0.<br>Academic fraud (cheating, deception, submitting another person's work as one's own) – cancellation of earned points, reassessment, and mandatory resubmission of work that was not completed independently.<br>Use of electronic devices during the final knowledge assessment – removal from the assessment, grade of 0, and retaking of the final assessment. |
| 17. | Keywords | Selection, seed production, variety, hybrid, adaptive potential, yield, productivity, sowing qualities, varietal reaction, seed productivity, seed material |
| 18. | Links to course in Moodle system | https://cdn.snau.edu.ua/moodle/course/view.php?id=5895 |

## 2. LEARNING OUTCOMES FOR THE EDUCATIONAL COMPONENT AND THEIR RELATIONSHIP TO THE PROGRAMME LEARNING OUTCOMES

| Programme Learning Outcomes<br>After studying the educational component, the student is expected to be able to... | Program learning outcomes that the EC is aimed at achieving (indicate the number according to the numbering given in the OP) | | | | How the RND is assessed |
|---|---|---|---|---|---|
| | RH1 | RH3 | RH5 | RH7 | |
| PLO 1. Demonstrate knowledge of the historical development of plant breeding and seed production, as well as the formation of breeding as a scientific discipline. Possess knowledge of the main directions and tasks of breeding and seed production of major field crops under different soil and climatic conditions of Ukraine. Be able to use source material in breeding and understand the methods of its creation. Know the classification of varieties according to their origin and methods of development, as well as the production requirements for crop varieties. | X | | X | X | Tests |
| **PLO 2.** Demonstrate knowledge of modern breeding methods used in the development of varieties and hybrids of field crops, including intraspecific and distant hybridization, polyploidy, aneuploidy, haploidy, experimental mutagenesis, and heterosis. | | X | X | | Multiple-choice tests, individual assignments |
| **PLO 3.** Understand analytical methods of plant breeding and the organization of the breeding process, including the principles of organizing breeding work and breeding schemes for self-pollinated, cross-pollinated, and vegetatively propagated crops | X | X | | | Multiple choice tests |
| **PLO 4.** Be able to organize industrial seed production of field crops, plan and implement technological processes for producing high-quality seed material of varieties and hybrids, and understand methods of field and laboratory variety control. | | | X | X | Multiple choice tests, individual assignment |

## Programme Learning Outcome (PLO)

RN1. Apply advanced conceptual and methodological knowledge in the philosophy of science, agronomy, and related fields, as well as research skills to plan and conduct relevant applied scientific research.

RN3. Plan and carry out theoretical and experimental research in agronomy and related scientific fields using modern methods, technologies, and tools, critically analyze the results of their own research and the results of other researchers in the context of the entire body of modern knowledge on the problem under study.

RN5. Freely present and discuss with specialists and non-specialists the results of research, scientific and applied problems of agronomy in the state and foreign languages, competently reflect the results of research in scientific publications in leading international scientific journals.

RN7. Have a deep understanding of the general principles and methods of agricultural sciences, as well as the methodology of scientific research, and apply them in their own research in the field of agronomy and teaching practice.

## 3. CONTENTS EDUCATIONAL COMPONENT (PROGRAM OF THE ACADEMIC DISCIPLINE)

**4.**

| Topic.<br>List of issues to be covered within the topic | Distribution within the overall budget time (full-time/part-time) | | | | Recommended reading |
|---|---|---|---|---|---|
| | Classroom work | | | Independent work | |
| | Lk | P.z/semz | Lab. | | |
| **Topic 1.** The emergence and development of breeding. Historical development of breeding. Development and achievements of breeding in Ukraine. Directions and tasks of breeding of major field crops in different soil and climatic conditions zones Ukraine. Breeding centers. Current status and achievements of breeding in foreign countries. | 2 | 2 | - | 4 | 1, 3, 4, 6, 7, 10, 11 |
| **Topic 2. Source material in plant breeding. The study of varieties.**<br>The role of source material in plant breeding. Introductions in breeding. Classification of varieties by origin and methods of creation. Variety as an element of intensive technology cultivation Requirements for varieties. | 2 | 2 | - | 6 | 1, 3, 4, 5, 6, 7, 10, 11 |
| **Topic 3. Hybridization in plant breeding**<br>Hybridization as the main method of creating source material in modern breeding. Selection of parent pairs for crossing. Types of crosses.<br>Methods and techniques of crossing. Difficulties in crossing different species and genera.<br>Inheritance of and properties in distant hybridization. Methods for overcoming non-crossability. | 2 | 2 | - | 6 | 1, 3, 4, 5, 6, 7, 10, 11 |
| **Topic 4. The use of experimental mutagenesis in plant breeding**<br>Mutational variability and its significance for breeding. Different types of mutations, their manifestation and significance as source material in the breeding process. Methods of working with mutant populations. Methods of obtaining polyploid forms. Haploidy, its significance in breeding. Aneuploidy, its significance, use in plant breeding. | 2 | 2 | - | 6 | 1, 3, 4, 5, 6, 7, 10, 11 |
| **Topic 5. Heterosis and its use in breeding**<br>The concept of heterosis. Types of heterosis. The importance of heterosis in breeding and its use. The use of inbreeding in breeding for heterosis. Methods for obtaining self-pollinating lines. Selection for combinatorial ability. | 2 | 2 | - | 4 | 1, 3, 4, 5, 6, 7, 10, 11 |

| | | | | | |
|---|---|---|---|---|---|
| **Topic 6. Analytical methods of selection.** Selection as the main method of plant breeding. Classification of selection methods. The essence of the concepts of morphological and economically valuable traits, their stability, and their significance for breeding. Selection based on individual traits and their combinations. Types of selection: mass and individual selection; single and multiple (continuous) selection; family-group and individual-family selection. | 2 | 2 | - | 4 | 1, 3, 4, 5, 6, 7, 10, 11 |
| **Topic 7. Organization and techniques of the breeding process.** Principles of organizing the breeding process. Breeding process scheme. Breeding nurseries and their purpose. Schemes of breeding work with self-pollinated and cross-pollinated crops. Breeding of vegetatively propagated crops. Organization and implementation of state variety testing. | 2 | 2 | - | 6 | 1, 3, 4, 5, 6, 7, 10, 11 |
| **Topic 8. Theoretical foundations of seed production** Concepts of varietal and sowing qualities of seeds and seed productivity. Reasons for the deterioration of varietal seed quality during reproduction. Measures to preserve varietal purity and improve the quality of seeds and planting material. Ecological principles of seed production. | 2 | 2 | - | 4 | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 |
| **Topic 9. Organization of industrial seed production** Principles of organizing industrial seed production. The concept of reserve (insurance) and transitional seed funds. Technologies for producing high-quality seeds. Post-harvest seed processing. International experience in organizing industrial seed production. | 2 | 2 | - | 4 | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 |
| **Topic 10. Features of seed production of individual crops** Seed production of self-pollinated crops. Features of seed production of cross-pollinated crops. Production of hybrid seeds of different types of hybrids. Methods of field and laboratory variety control, their purpose and objectives. Control methods for compliance with seed storage parameters. | 2 | 2 | - | 6 | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 |
| **Total** | **20** | **20** | | **50** | |

## 5. TEACHING AND LEARNING METHODS

| PLO | **Teaching methods** (work to be done by the teacher during classroom sessions, consultations) | Number of hours | **Learning methods** (what types of learning activities should be performed by the student independently) | Number of hours |
|---|---|---|---|---|
| **1.** Know the peculiarities of the historical development of breeding and seed production, the formation of breeding as a science. Have knowledge of the directions and tasks of breeding and seed production of | Lecture (story, explanation, demonstration), Practical class (explanation, demonstration) | 8 | Working with lecture notes, working with regulatory acts, summarizing, systematizing, deepening the material | 10 |

| | | | | |
|---|---|---|---|---|
| major field crops in different soil and climatic zones of Ukraine. Be able to use source material in breeding and know the methods of its creation. Know the classification of varieties by origin and methods creation, production requirements for the variety. | | | | |
| **2.** Possess knowledge of the use of modern Selection methods for creating varieties and hybrids of field crops crops: intraspecific and distanthybridization, polyploidy,aneuploidy, haploidy, experimental mutagenesis, heterosis. | Educational lecture (narrative, explanation, | 12 | Working with lecture notes, | 16 |
| | **Teaching methods** (work to be done by the teacher during classroom sessions, consultations) | Number of hours | **Teaching methods** (what types of educational activities should be performed by the student independently) | Number of hours |
| | demonstration), Practical class (explanation, demonstration) | | generalization, systematization, deepening of material | |
| **DRN 3.** Understand analytical methods selection and organization of the selection process. Principles of the selection process, selection work schemes for self-pollinated, cross-pollinated and vegetatively propagated crops. | Lecture (story, explanation, demonstration), Practical class (explanation, demonstration) | 8 | Working with lecture notes, summarizing, systematizing, deepening the material | 10 |
| **DRN 4.** Organize industrial seed production of field crops, plan and implement technological processescultivation of high-quality seed material of varieties and hybrids, understanding methods of conducting soil and laboratory variety control. | Lecture (story, explanation, demonstration), Practical class (explanation, demonstration) | 12 | Working with lecture notes, summarizing, systematizing, deepening the material | 14 |
| **Total** | | **40** | | **50** |

## 6. ASSESSMENT BY EDUCATIONAL COMPONENT

### 6.1. Summative assessment

6.1.1 The following is provided for assessing the expected learning outcomes:

| No | Methods of summative assessment | Points / Weight in overall assessment | Date of compilation |
|---|---|---|---|
| 1. | Testing 1 (multiple-choice tests multiple choice, open-ended) | 25/25 | 4 weeks |
| 2. | Testing 2 (multiple-choice tests multiple choice, open | 25/25% | 8 weeks |
| 3. | INDZ | 20/20 | Week 10 |
| 4. | Exam | 30/30 | Week 12 |

6.1.2 Assessment criteria

| **Component** | **Unsatisfactory** | **Satisfactory** | **Good** | **Excellent** |
|---|---|---|---|---|
| Testing 1 | *<15 points* | *15-17 points* | *18-21 points* | *22-25 points* |
| | provided correct | given correct answer | correct | given correct answer |
| | Answer less than 60% tasks | 60% -74% of tasks | Answer to 75%-89% tasks | on 90% and more tasks |
| Testing 2 | *<15 points* | *15-17 points* | *18-21 points* | *22-25 points* |

| | | | | |
|---|---|---|---|---|
| | Less than 60% of answers are correct tasks | 60%–74% of tasks answered correctly | 75%–89% of tasks answered correctly tasks | 90% or more of the tasks were answered correctly |
| INDZ | *<12 points* | *13-14 points* | *16 points* | *18-20 points* |
| | Requirements for the task not met | Most requirements have been met, but some components are missing or insufficiently developed | All requirements of the task have been fulfilled | All requirements of the task have been fulfilled, results presented as part of a general discussion |

### 6.2. Formative assessment

6.2.1 To assess current progress in learning and understand areas for further improvement, the following is provided

| No | **Elements of formative assessment** | **Date** |
|---|---|---|
| 1 | Taking a modular control test with feedback feedback from the instructor | Accordingly to the schedule the educational process |
| 2. | Oral feedback from the teacher during classes | during classes |
| 3. | Verbal feedback from the teacher and students after presentations with reports | Week 5 |
| 4. | Consultations, verbal feedback from the teacher during working on individual assignments | during classes |
| 5. | Verbal feedback between the teacher and the graduate student on the results of the individual assignment | 8-10 weeks |

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

### 5.3 Total number of points for EC and assessment scale

The total number of points for the educational component is 100 points.

5.3.1 The assessment scale used at the University:

| Total points for all types of educational activities | Assessment according to the national scale | |
|---|---|---|
| | For exams, course projects (papers), practicum, qualification work | for credit |
| 90 – 100 | excellent | pass |
| 82 | good | |
| 75 | | |
| 69-74 | satisfactory | |
| 60-68 | | |
| 35-59 | unsatisfactory with the possibility of re-take the exam again | not counted with the possibility of retake |
| 0-34 | unsatisfactory with mandatory retake of the course | not credited with mandatory retaking of the course the discipline |

## 7. EDUCATIONAL RESOURCES (LITERATURE)

### 7.1. Main sources

#### 6.1.1. Textbooks and manuals

1. Vasylkivsky S. P., Kochmarsky V. S. Selection and seed production of field crops: textbook. PrJSC "Myronivska Printing House", 2016. 376 p.

2. Makrushyn M. M., Makrushyna Ye. M. Seed Production (Methodology, Theory, Practice): Textbook. 2nd ed. supplemented and revised. Simferopol: VD "Arial," 2012. 536 p.

3. Onichko V. I. Selection and seed production of field crops: *Lecture course*. Sumy, 2025.168 p.

**6.1.2 Methodological support**

4. Onychko V. I. Electronic course on the discipline "Selection and seed production methods Research in agronomy" in the https://cdn.snau.edu.ua/moodle/course/view.php?id=5895.

5. Selection and seed production research methods in agronomy: *methodological guidelines for practical training* / compiled by V. I. Onychko. Sumy, 2025. – 36 p.

6. Selection and seed production research methods in agronomy: *methodological guidelines for independent work* / compiled by: V. I. Onychko. Sumy, 2025. – 62 p.

**6.1.3. Other sources**

7. Molotsky M. Ya., Vasylkivsky S. P., Knyazuk V. I. Selection and seed production of field crops: practical guide. 2nd ed., revised and supplemented. Bila Tserkva: Bila Tserkva National Agrarian University, 2008. 192 p.

8. Seed Production and Seed Science of Grain Crops / Ed. by M. O. Kindruk. Kyiv: Agrarian Science, 2003. 235 p.

9. Sokolov V. M., Vyshnevsky V. V., Kindruk M. O. et al. Methods for inspecting seed crops of grain crops. Odessa-Kyiv, 2010. 35 p.

10. Special Selection and Seed Production of Field Crops: Textbook / Edited by V. V. Kyrychenko. Kharkiv: V. Ya. Yuriev Institute of Plant Breeding and Seed Production of the National Academy of Agrarian Sciences of Ukraine, 2010. 462 p.

11. Chekalin M. M., Tishchenko V. M., Batashova M. E. Selection and genetics of individual crops: textbook. Poltava: FOP Govorov S.V., 2008. 368 p.

**7.2. Additional sources**

12. State Register of Plant Varieties Suitable for Distribution in Ukraine [Electronic resource]. – Access mode: . http://sops.gov.ua/derzavnij-reestr.

13. Seed production and seedling cultivation in Ukraine [Electronic resource]. – Access mode: http://www.naukr.org.ua.

14. Onichko V. I., Onichko T. O. The influence of laboratory germination on the yield and sowing qualities of winter wheat. *Bulletin of Sumy National Agrarian University. Series "Agronomy and Biology." 2021. Issue 2 (44).* P. 46-50. https://doi.org/10.32845/agrobio.2021.2

15. Kovalenko I., Vereshchahin I., Butenko Ye., Kandyba N., Onychko V., Bakumenko O., Kovalenko V., Klochkova T. (2022) Rapd-Analysis of Flax Varieties of the Ukrainian National Collection Ecological *Engineering and Environmental Technology*, 23 (3), pp.1-6. https://doi.org/ 10.12912/27197050/146384.

16. Kovalenko V., Dolia M., Tonkha O., Butenko A., Onychko V., Masyk I., Onychko T., Radchenko M., Kokovikhin S. (2023) Adaptation potential of alfalfa among other crops with resource-saving technologies while preserving ecological biodiversity. *Modern phytomorphology*.

V. 17. pp. 57-65.

17. Vereshchagin I. V., *Onychko V. I.*, Kandyba N. M. Assessment of the condition of flax DNA preparations during long-term storage. *Bulletin of Sumy National Agrarian University. Series "Agronomy and Biology."* 2022. Issue 2 (48). Pp. 31-35. https://doi.org/10.32845/agrobio.2022.2.5.

18. Pankova O. V., Syrovitsky K. G., Kharchenko S. O., Onichko V. I., Tirelnyk B. V., Dumanchuk M. Yu. Preparation of corn seed material by electromagnetic radiation in different modes as a way to increase yield. *Bulletin of Sumy National Agrarian University. Series "Mechanization and automation of production processes."* 2022. 48 (2). P. 50-55. https://doi.org/10.32845/msnau.2022.2.7.

**6.3 Software**

19. Moodle 3.11 distance learning system software – for organizing distance learning for students (access to teaching materials, communication with teachers, various types of assessment).

20. Zoom Video Communications, Inc. v. 5.6.1 software – for organizing training via video conferencing (if necessary).