Appendix No. 1.5 to the Resolution No. 61/2025
of the Rector of the University of Rzeszów

SYLLABUS

REGARDING THE QUALIFICATION CYCLE FROM 2026/2027 TO – 2027/2028
ACADEMIC YEAR 2027/2028

1. BASIC COURSE/MODULE INFORMATION

Course/Module title	**Genetics**
Course/Module code *	
Faculty (name of the unit offering the field of study)	Faculty of Technology and Life Sciences
Name of the unit running the course	Institute of Agricultural Sciences, Environmental Protection and Environmental Management; Department of Plant Physiology and Biotechnology
Field of study	Agriculture
Qualification level	First-cycle studies
Profile	General academic
Study mode	Full-time
Year and semester of studies	Year I, Semester 2
Course type	Basic
Language of instruction	English
Coordinator	Aleksandra Siekierzyńska, PhD
Course instructor	Wojciech Litwińczuk, DSc, Prof. UR (lectures); Aleksandra Siekierzyńska, PhD (lectures, laboratory classes); Marzena Mazurek, PhD (laboratory classes)

* - as agreed at the faculty

1.1. Learning format – number of hours and ECTS credits

Semester (no.)	Lectures	Classes	Laboratories	Seminars	Practical classes	Internships	others	**ECTS credits**
2	15		30					3

1.2. Course delivery methods
x- conducted in a traditional way
- involving distance education methods and techniques

1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)
pass with a grade

2. PREREQUISITES

Fundamentals of Agricultural Sciences, General and Inorganic Chemistry, Mathematical Statistics.

3. OBJECTIVES, LEARNING OUTCOMES, COURSE CONTENT, AND INSTRUCTIONAL METHODS

3.1. Course/Module objectives

O1	Students acquire knowledge of the fundamental processes underlying heredity and genetic variation in living organisms, with particular emphasis on crop plants and livestock species.

3.2. COURSE/MODULE LEARNING OUTCOMES

Learning Outcome	The description of the learning outcome defined for the course/module	Relation to the degree programme outcomes
LO_01	The student knows and understands the fundamental concepts and phenomena of classical and molecular genetics	K_W01
LO_02	The student explains differences in trait inheritance among haploid, diploid, and polyploid organisms, as well as self-pollinating and cross-pollinating species, and understands their practical applications in agriculture and environmental protection	K_W02
LO_03	The student is able to analyze the results of genetic crosses and karyotypes and identify the likely genetic basis and mode of inheritance of the traits under study	K_U02
LO_04	The student is able to use acquired and self-directed knowledge to support decision-making and problem-solving in agricultural practice and in environmental protection and management	K_K01

3.3. Course content

A. Lectures

Content outline
1. Introduction to Genetics. Life Cycles of Eukaryotic Organisms
2. Sructure of Prokaryotic and Eukaryotic Cells. Structure and Functions of Chromosomes. Cell Divisions and Their Genetic Consequences
3. Mendel's Laws. Inheritance of Qualitative and Quantitative Traits. Sex Determination. Sex-Linked Inheritance. Pleiotropy. Lethal Genes. Cytoplasmic and Nuclear Inheritance. Inheritance in Polyploids
4. Nucleic Acids: Structure and Functions. Replication, Transcription, and Translation. Regulation of Gene Expression. Genome Structure. Fundamentals of Genetic Engineering
5. Definition, Types, and Applications of Mutations. Mutagenic Factors
6. Sources and Types of Genetic Variation in Prokaryotic and Eukaryotic Organisms

B. Laboratories

Content outline
1. Cytogenetic Analyses. Identification of the Stages of Cell Division. Determination of Chromosome Numbers and Types
2. Relationship Between Cell Division and Mendel's Laws of Inheritance
3. Interaction of Allelic Genes. Gene and Trait Recombination. Calculation of the Frequencies of Selected Genotypes and Phenotypes in the Progeny
4. Interaction of Non-Allelic Genes. Pleiotropy
5. Gene Linkage. Crossing-Over. Classical Chromosome Mapping. Application of the Chi-Square (χ^2) Test
6. Sex determination. Sex-linked inheritance. Lethal genes. Cytoplasmic inheritance
7. Gene Additivity. Inheritance of Quantitative Traits. Trait Transgression
8. Types of Gene and Chromosomal Mutations
9. Determination of Organ Size and Pollen Viability in Diploid and Polyploid Plants
10. Isolation of Genetic Material from Plants. Methods for Assessing the Quality of the Isolate.
11. Population Genetics. Johannsen's Laws and the Hardy-Weinberg Principle. Comparison of Self-Pollinating and Cross-Pollinating Plant Populations. Phenomena Altering the Gene Pool of a Population
12. DNA Isolation from Plants. Assessment of DNA Quality. Demonstration of PCR, RT-PCR, and Electrophoretic Separation Techniques

3.4. Methods of Instruction

Lectures: lectures with multimedia presentations
Laboratory classes: performance of laboratory experiments and collaborative work in small groups.

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

Learning outcome	Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes)	Learning format (lectures, classes…)
LO-01	written test, test with open-ended questions	Lab.cl., lect.
LO-02	written test, test with open-ended questions	Lab.cl., lect.
LO-03	written test, continuous assessment during classes, assessment of practical task performance	Lab.cl.
LO-04	continuous assessment during classes	Lab.cl.

4.2 Course assessment criteria

Laboratory classes: completion of laboratory experiments and presentation of results; in-class test; final written test.

Lectures: Written test with open-ended questions.

To pass the course, students must achieve all prescribed learning outcomes
The final course grade is determined based on the following components:
lecture assessment (written test): 50%, Laboratory assessment (in-class test): 40%, class participation: 10%.

Grades:
51%-60%-3.0
61%-70%-3.5
71%-80%-4.0
81%-90%-4.5
91%-100% 5.0

5. Total student workload needed to achieve the intended learning outcomes – number of hours and ECTS credits

Activity	Number of hours
Course hours	**45**
Other contact hours involving the teacher (consultation hours, examinations)	**12**
Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.)	**20**
Total number of hours	**77**
Total number of ECTS credits	**3**

* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

Number of hours	
Internship regulations and procedures	

7. Instructional materials

Compulsory literature: materials provided by the teacher and online resources on the topics covered
Complementary literature: online resources on the topics covered

Approved by the Head of the Department or an authorised person