|  |  |  |
| --- | --- | --- |
| **STUDY PROGRAMME:** | **Professional Undergraduate Study Programme *Agriculture***  Specific field of study: Plant production | |
| **Course:** | **PRINCIPLES OF GENETICS AND PLANT BREEDING** | |
| **Course code:** 192568  **Course status**: compulsory | **Semestar**: V | **ECTS credit: 3** |
| **Course holder:** | **Dijana Horvat,** Ph.D., professor of professional studies | |
| **Course associates:** | **Vesna Samobor**, Ph.D., professor of professional studies | |
| **Modes of delivery:** | **Number of hours** | |
| Lectures | 30 | |
| Excersises, | 3 | |
| Seminars | 12 | |

**COURSE OBJECTIVES:** To acquaint students with the basic laws of inheritance and methods of breeding plants with the aim of achieving improved qualitative and quantitative properties of cultivated plants.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Course units** | **Modes of delivery:** | | | **Places of delivery** |
| **L** | **E** | **S** |  |
|  | **Basics of genetics** |  |  |  |  |
| 1. | Introduction to genetics, significance of genetics | 1 | - | - | Lecture hall |
| 2. | Cell structure and division, micro and macrosporogenesis, double fertilization, life cycles of plants | 2 | - | - | Lecture hall |
| 3. | Molecular basis of inheritance, structure and role of nucleic acids, structure of chromosomes, protein synthesis | 2 | - | - | Lecture hall |
| 4. | Laws of inheritance: inheritance of traits according to Mendel's laws - monohybrid, dihybrid, trihybrid inheritance, backcrossing | 2 | 3 |  | Lecture hall |
| 5. | Gene interactions and multiple alleles  Sex inheritance and sex-linked genes | 2 | - | - | Lecture hall |
| 6. | Mutations of genes and chromosomes | 2 | - | - | Lecture hall |
| 7. | Qualitative and quantitative properties, minor and major genes  Population genetics | 2 | - | - | Lecture hall |
| 8. | Cloning of plants and animals  Genetic engineering - techniques of genetic engineering | - | - | 4 | Lecture hall |
| Knowledge test 1 – Fundamentals of genetics | | | | | |
|  | **Basics of plant breeding** |  |  |  |  |
| 9. | Introduction to plant breeding, goals of plant breeding  breeding programs in the Republic of Croatia | 2 | - | - | Lecture hall |
| 10. | Origin of cultivated plants, domestication, introduction, gene centers of diversity of cultivated plants | 2 | - | 2 | Lecture hall |
| 11. | Morphological, physiological and genetic systems of fertilization regulation - self-incompatibility and male sterility - application in plant breeding | 2 | - | - | Lecture hall |
| 12. | Transgression, heritability, inbreeding, heterosis - application in plant breeding | 2 | - |  | Lecture hall |
| 13. | Sources of genetic variation – hybridization, polyploidy | 2 | - | - | Lecture hall |
| 14. | Types of plant cultivars | 1 | - | - | Lecture hall |
| 15. | Breeding methods of self-pollinated and out-pollinated plants | 4 |  | 4 | Lecture hall |
| 16. | Registration of varieties on the variety list, VCU test, DUS test, variety recognition, variety lists | 2 | - | 2 | Lecture hall |
| Knowledge test 2 - Basics of plant breeding | | | | | |
| . | **In total** | **30** | **3** | **12** |  |

L=Lectures, E=Excersises, S=Seminars

**Learning outcomes (LO)**

After passing the exam, the student will be able to:

LO 1. Show the structure of nucleic acids and their role in the process of inheritance

LO 2. Compare the laws of inheritance in solving tasks

LO 3. Evaluate the positive and negative effects of cloning and genetic engineering

LO 4. Justify the significance of the application of male sterility, trangression and heterosis in plant breeding

LO 5. Recommend a breeding method depending on the reproductive system of the species and the goal of breeding

Course holder:

Dijana Horvat, Ph.D., professor of professional studies

Križevci, July 2024