UNIVERSITATEA DE ȘTIINȚE AGRICOLE ȘI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
Facultatea de Agricultură
Calea Mănăștur 3-5, 400372, Cluj-Napoca, România
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No._____of _____

**USAMV form 0101020105 (discipline code)**

# SUBJECT OUTLINE

## 1. Information on the programme

| | |
|---|---|
| **1.1. Higher education institution** | **University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca** |
| **1.2. Faculty** | **Agriculture** |
| **1.3. Department** | Crop Plant |
| **1.4. Field of study** | Agronomy |
| **1.5. Cycle of study[1]** | Bachelor |
| **1.6. Specialization/ Study programme** | **Agriculture** |
| **1.7. Form of education** | Full time |

## 2. Information on the discipline

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|---|---|---|---|---|---|---|---|---|
| 2.1. Discipline name | **GENETICS 2** | | | | | | | |
| 2.2. Course coordinator | | | | Lecturer PhD Ioana Virginia Berindean | | | | |
| 2.3. Seminar/ laboratory/ project coordinator | | | | Biologist PhD. Ionuț RACZ | | | | |
| 2.4. Year of study | II | 2.5. Semester | II | 2.6. Evaluation type | summative | 2.7. Discipline status | Content[2] | DF |
| | | | | | | | Compulsoriness[3] | DI |

## 3. Total estimated time (teaching hours per semester)

| | | | | | |
|---|---|---|---|---|---|
| **3.1. Hours per week – full time programme** | **4** | **out of which: 3.2. lecture** | **2** | **3.3. seminar/ laboratory/ project** | **2** |
| **3.4.Total number of hours in the curriculum** | **56** | **out of which: 3.5. lecture** | **28** | **3.6. seminar/laboratory** | **28** |

| Distribution of the time allotted | **hours** |
|---|---|
| 3.4.1. Study based on books, textbooks, bibliography and notes | **20** |
| 3.4.2. Additional documentation in the library, electronic platforms and field experiences | **15** |
| 3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays | **15** |
| 3.4.4. Tutorials | **4** |
| 3.4.5. Examinations | **10** |
| 3.4.6. Other activities | |

| | |
|---|---|
| 3.7. Total hours of individual study | **64** |
| 3.8. Total hours per semester | **120** |
| 3.9. Number of credits[4] | **4** |

## 4. Prerequisites (if applicable)

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|---|---|
| 4.1. curriculum-related | Botany, Biochemistry |
| 4.2. skills-related | |

## 5. Conditions (if applicable)

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|---|---|
| 5.1. for the course | The course is interactive, students can ask questions about the content of the exhibition. The university discipline requires the observance of the start and end time of the course. No other activities are tolerated during the lecture, mobile phones should be closed. Delay of students to the course and laboratory will not be tolerated as this proves disruptive to the educational process. |
| 5.2. for the seminar/ laboratory/ project | In the practical works it is compulsory the presence each student, they will carry out individual activities with the laboratory materials made available and described previously by the teacher. The academic discipline is required during the entire duration of the work. |

## 6. Cumulated specific competences

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|---|---|
| Professional competences | - To know the terminology used in Genetics<br>- To demonstrate the ability to properly use the notions, concepts and legacies specific to the molecular and cellular levels of organization and functioning of living matter.<br>- To acquire the use of knowledge about heredity at the molecular and cellular level, in scientific and technological applications.<br>- Have the ability to critically evaluate interventions on the molecular and cellular basis of heredity, including from the perspective of bioethics principles. |
| Transversal competences | - To show concern for professional development by training the skills of a researcher;<br>- To participate in the research activities of the discipline laboratories;<br>- To demonstrate the involvement in scientific activities, such as the elaboration of articles and specialized studies;<br>- To participate in projects of a scientific nature, compatible with the requirements of integration in European education. |

## 7. Discipline objectives (based on the cumulated specific competences)

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|---|---|
| 7.1. General objective | - To learn the mechanisms underlying the hereditary phenomenon and the causes that determine the variability of living organisms. |
| 7.2. Specific objectives | - To understand the material basis of heredity and variability at the cellular and molecular level;<br>- To understand the evolution process in the relation of organisms with the environment;<br>- To be able to apply the theoretical notions of genetics in the practical activities of creating new varieties of plants, able to make better use of technological and environmental conditions in order to obtain high quality and high yields |

## 8. Content

| **8.1. COURSE**<br>**Number of hours –28** | Teaching methods | Observation (1 lecture = 2 hours) |
|---|---|---|
| **Molecular organization of genetic material**<br>Evidence regarding the genetic role of nucleic acids<br>Primary and secondary DNA structure<br>DNA replicative biosynthesis<br>Ribonucleic acid | Lecture | 3 lectures |
| **Expression of genetic material**<br>The genetic code<br>Protein biosynthesis<br>Formation of functional proteins | Lecture | 1 lecture |
| **Quantitative control of genetic material expression**<br>Quantitative control of expression of genetic material in prokaryotes<br>Quantitative control of the expression of genetic material in eukaryotes<br>Gene, subunit of organization and functioning of genetic material<br>Transposable genetic elements | Lecture | 1 lecture |
| **Genetic engineering and methodology for obtaining transgenic plants**<br>Transgenesis by direct and indirect methods; applications and achievements<br>Cell hybridization and hybridization<br>Somaclonal variability<br>Haploidia through andro- and gynogenesis<br>Genetic markers and moolecular markers | Lecture | 2 lectures |
| **Modification of genetic material through mutation**<br>Mutation- definition, classification<br>Gene mutation - molecular and biochemical mechanism of production<br>Induced mutagenesis, practical importance<br>Chromosomal structural mutations<br>Genomic mutations | Lecture | 2 lectures |
| **The inheritance of reproduction**<br>Asexual reproduction<br>Sexual reproduction; types of sexuality in animals and mechanisms of sex determination; heredity of characters associated with sex<br>Types of sexuality in plants; genetic mechanisms for determining sex in plants; heredity at sexual reproduction<br>Self-incompatibility | Lecture | 2 lectures |

| | | |
|---|---|---|
| **Extrachromosomal inheritance**<br>Extrachromosomal inheritance within the cellular genetic system and the importance of extrachromosomal inheritance<br>The inheritance of male sterility; androsterility types | Lecture | 1 lecture |
| **Population genetics and evolution**<br>Genetic structure of allogamous and autogamous populations and factors that can modify their genetic structure<br>Inbreeding - phenotypic effects, genetic consequences and use of the inbreeding phenomenon<br>Phenotypic heterosis-expression; genetic mechanisms, the duration of heterozygosity and the maintenance of hybrid vigor | Lecture | 2 lectures |

| **8.2. PRACTICAL WORKS**<br>**Number of hours – 28** | Teaching methods | Observation<br>1 lab work (2 hours/work) |
|---|---|---|
| Plants biometrics | Preparation of biological material | 1 lab work |
| Determination of arithmetic mean, variance, standard deviation and standard deviation of the arithmetic mean. | Problems of applied genetics and biostatistics | 1 lab work |
| Normal distribution curve | Problems of applied genetics and biostatistics | 1 lab work |
| Determination of arithmetic mean, variance, standard deviation and standard deviation of the arithmetic mean. | Problems of applied genetics and biostatistics | 1 lab work |
| Normal distribution curve | Problems of applied genetics and biostatistics | 1 lab work |
| Calculation and interpretation of the regression coefficient | Problems of applied genetics and biostatistics | 1 lab work |
| Calculation and interpretation of the correlation coefficient | Elements of quantitative genetics | 1 lab work |
| Analysis of the genetic variance in the families of half-brothers and good brothers | Elements of quantitative genetics | 2 lab work |
| Calculation of the coefficient of heritability | Elements of quantitative genetics | 1 lab work |
| Computer methods for the statistical analysis of quantitative characters | Elements of quantitative and molecular genetics | 2 lab work |
| Statistical methods for the analysis of genetic diversity (calculation of genetic distances) | Elements of quantitative and molecular genetics | 1 lab work |
| Verification of knowledge | | 1 lab work |

*Compulsory bibliography:*

1. Course notes
2. BOTEZ, C., ELENA TĂMAȘ, 2001, Genetica, Ed.Academic Pres, Cluj-Napoca;
3. ELENA TĂMAȘ, C. BOTEZ, 2012, Genetics, Academic Pres Ed., Cluj-Napoca;

*Optional bibliography:*

*1. BOTEZ C., 1991, Genetics, Tipo Agronomy, Cluj Napoca*
*2. GALLIA BUTNARU, I.NICOLAE, ELENA, TĂMAȘ, 1999, Genetics, Mirton Ed., Timisoara*
*3. CHRISTMAS, T Luana JENSEN, 2004, Genetics and the future of humanity. Albatros Publishing House*

**9. Corroborating the discipline content with the expectations of the epistemic community representatives, of the professional associations and of the relevant employers in the corresponding field**

In order to identify ways of modernizing and continuously improving the teaching and the content of the courses, with the most current topics and practical problems, the teachers participate in sessions of scientific communications and specialized congresses as well as in meetings with the specialists in the field of genetics and plant improvement. .

**10. Evaluation**

| Type of activity | 10.1. Evaluation criteria | 10.2. Evaluation type | 10.3. Percentage of the final grade |
|---|---|---|---|
| **10.4. Course** | - Knowledge of the terminology used in genetics<br>- Capacity for proper use of the concepts of molecular genetics<br>- Understanding the sources of natural and induced variability by classical and genetic engineering methods | Continuous (VP) | 70% |

| | | | |
|---|---|---|---|
| | - Knowledge related to breeding genetics and extrachromosomal heredity<br>- Population genetics issues | | |
| **10.5. Seminar/Laboratory** | - Acquisition of the problem treated at the course and the practical works<br>- Ability to solve problems of biostatistics and applied genetics<br>- The use of computer methods for the statistical analysis of quantitative characters<br>- Analysis of genetic diversity (calculation of genetic distances) by statistical and molecular methods | Continuous (VP) | 30% |
| **10.6. Minimum performance standards** | | | |
| Knowledge of scientific information transmitted through lectures and practical papers at an acceptable level. Obtaining the passing grade for the on-the-spot checks for practical and colloquial works is a condition of promotability.. | | | |

[1] Cycle of studies - choose one of the three options: Bachelor/Master/Ph.D.

[2] according to the educational plan

[3] Discipline status (compulsoriness) - choose one of the options – **DI** (compulsory discipline) **DO** (optional discipline) **DFac** (facultative discipline).

[4] One credit is equivalent to 25-30 hours of study (teaching activities and individual study).

Filled in on 04.09.2019

Course coordinator
Lecturer PhD. Ioana Virginia BERINDEAN

Laboratory work/seminar coordinator
Biologist PhD. Ionuț RACZ

Approved by the department on 05.092019

Head of the Department
Prof.dr. Marcel DUDA