

# GENETICS (II<sup>nd</sup> YEAR OF STUDY, III<sup>rd</sup> + IV<sup>th</sup> SEMESTER)

Credit value (ECTS) 5 + 4

## Course category

Domain (Imposed)

## Course holder:

PhD Prof. Gheorghe Țirdea

## Discipline objectives (course and practical works)

- appropriation of the mainly cytogenetics, classic and molecular genetics;
- knowledge of the heredity laws and principles used in different crossing programmes and for seed production;
- illustration of the molecular mechanism of heredity substratum;
- properly usage of physical, chemical and biological mutagen agents for organisms variability creation;
- utilization of the recombinant DNA technology and genetic engineering for genetic material handling to obtain new organisms or new products for agriculture, medicine, environment protection.

## Contents (syllabus)

Course content
<b>Genetics – Science of Heredity</b> ; research methods in genetics; biological materials for genetics studies; short history of genetics
<b>Genes and Chromosomes</b> – the stability of chromosomes complements, mitosis; meiosis; chromosomes and heredity; probability in genetic prediction and analysis of genetic data; the molecular organization of chromosomes
<b>The Chemical Nature and Replication of the Genetic Material</b> – the importance of Bacteria and Viruses in genetics; evidences that the genetic material is DNA; chemical composition of DNA; physical structure of DNA; the replication of DNA; DNA synthesis; discontinuos replication; determination of the sequence of bases in DNA
<b>Gene Expression</b> – proteins and amino acids; relations between genes and polypeptides; transcription; translation; the genetic code; overlapping genes; polypeptides synthesis; complex translation units; regulation of gene activity
<b>Elements of Heredity and Variation</b> – Mendel and his experiments; mendelian inheritance and probability; variation from simple patterns of dominance; the absence of dominance of some alleles; codominance and multiple allelism
<b>Gene Linkage and Chromosomes Mapping</b> – linkage and recombination of genes in a chromosome; gene mapping from three point testcrosses; mapping by tetrad analysis; mitotic recombination; complementation
<b>Cytoplasmic Inheritance</b> – recognition of cytoplasmic inheritance; organelle heredity; cytoplasmic transmission of symbionts; male sterility in plants
<b>Mutation and Mutagenesis</b> – general properties of mutations; the biochemical basis of mutation; induced mutations (base-analogue mutagens, chemical agents that modify DNA, ultraviolet irradiation, ionizing radiation); revers mutations and suppressor mutations
<b>Genetic Engineering</b> – isolation and characterization of particular DNA fragments vectors; detection of recombinant molecules; screening for particular recombinants; applications of genetic engineering (commercial possibilities, uses in research, production of eukaryotic proteins, diagnosis of hereditary diseases)

Applied laboratory works content
Pre-treatment and hypotonic treatment. Microscopy
Mitosis
Meiosis
Study of plant chromosomes
Heterochromatic patterns identification techniques
Sporogenesis and gametogenesis – pollen germination; fecundation ( <i>Zea mays</i> , <i>Vicia faba</i> )
Polyploidy (producing and determination methods) – direct methods to determine the polyploidy degree at the genus <i>Triticum</i> ; doubling the chromosomes by means of meristem culture on a medium supplemented with colchicine; chloroplasts number determination in stomata protecting cells; numbering methods of stomata in plant epidermis cells
Mutagenesis – abnormalities in chromosome structure (deletions, duplications, inversions, translocations)

## Bibliography

1. Țirdea, Gh., 2002 – Genetica vegetală, Editura “Ion Ionescu de la Brad”, Iași
2. Țirdea, Gh., Leonte, C., 2002 – Citogenetică vegetală, Editura “Ion Ionescu de la Brad”, Iași
3. Crăciun, T. și colab., 1978 - Genetica, Editura Didactică și Pedagogică, București
4. Crăciun, T., 1981 - Genetica plantelor horticole, Editura Ceres, București.
5. Raicu, P., 1980 - Genetica, Editura Didactică și Pedagogică, București
6. Raicu, P., 1997 - Genetică generală și umană, Editura Humanitas
7. Antohi, St., Gavrilă, L., 1981 - Progrese în genetica moleculară, Editura științifică și enciclopedică, București
8. Țirdea, Gh., Crețu, L., 1998 - Genetica, lucrări practice, U.S.A.M.V. Iași

## Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Exam	Oral and writing examination	50%
Appreciation of the activity during the semester	Oral assessment during the semester, verification tests and final laboratory colloquium.	50%

## Contact

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