



BSc Programme – Forestry

FOR 131 Forest Genetics and Tree Breeding

Compulsory subject – in 6th /summer/ semester for Bulgarian students

ECTS credits – **6.5** Ability to teach a foreign language – **English**

Syllabus in brief

I. Lectures:

A. Principles of genetics

- 1. Introduction to the principles of genetics.** Forest genetics – specific issues.
- 2. Cytological basis of heredity.** Chromosome cytology. Karyotype. Mitosis and meiosis. Chromosome aberrations. The genetic role of cell organelles.
- 3. Sporogenesis and gametogenesis in plants.** Development of egg cells and sperm cells.
- 4. Mendel laws.** Locus, genes, alleles, homozygosity, heterozygosity, minant and recessive traits.
- 5. DNA, genes, molecular evolution.** DNA structure. DNA replication. Mutations - changes in DNA. What is a gene? Protein synthesis. The genetic code.
- 6. Genetic variation and phenotypic variation.** Genetics of the individual development and genetics of sex.
- 7. Population genetics.** Hardy-Weinberg law. The sources of variation and the factors of evolution. Population genetic structure. Methods for studying the genetic variation in populations. Genetic markers – molecular, biochemical and morphological markers.
- 8. Quantitative genetics** – inheritance and evolution of quantitative traits.

B. Tree breeding

- 9. Principles of tree breeding.** Artificial selection. Artificial hybridization.
- 10. Geographic variation.** Races, clines and ecotypes. Breeding zones.
- 11. Phenotypic selection.** Selection of plus trees and plus-tree stands.
- 12. Provenance and progeny testing.**
- 13. Seed orchards.**
- 14. Biotechnology in forest genetics**
- 15. Clonal forestry**
- 16. Tree improvement programs** – structure, concept and importance
- 17. Gene conservation.** European cooperation in the field of gene conservation.

II. Laboratory classes:

- 1. Cytological methods**
- 2. Testing of pollen viability**
- 3. Isozyme analysis and its applications**
- 4. DNA isolation, PCR-techniques and electrophoresis**
- 5. Measurement of field trials. Data analysis – statistical methods.**
- 6. Biotechnologies in forestry. Plant tissue cultures.**
- 7. Seminar – practical gene conservation. Examples from the respective country.**

III. Practical training:

Field trips – visits of natural seed stands, provenance and progeny tests and seed orchards. Discussions about the advantages and practical importance of the tests and seed orchards.

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