Subject name	Forest Genetics and Tree Breeding	
Subject code		
Department	Department of Genetics and Forest Tree Breeding, Institute of Ecology and Silviculture	
Faculty	Faculty of Forestry	
Subject supervisor/Lecturer	Marta Kempf, Ph.D.	
General information	Teaching period	2
	ECTS credit	3
	Lectures total	14
	Classes	10
	Field training	6
Objective and general description	The objective of the course is to provide an overview of fundamental and advanced genetics and tree breeding principles. The course includes selected topics from population genetics of forest trees, application of biochemical and molecular techniques in forestry research. It presents recent national and international research results in this field. The impact of silviculture techniques and climate change on the genetic structure of forest tree populations are shown. The techniques of forest tree breeding and development of breeding programmes for selected tree species are included. The course concerns the development of local races of the forest trees and their significance in forestry. Additionally some issues of genetic engineering of forest trees are included.	
Lectures 7 x 2 hours	1. Introduction, history of genetics, definitions. Basic principles in quantitative and population genetics. 2. Population genetics. Hardy-Weinberg equilibrium. Mutations, recombination, random genetic drift, gene flow, inbreeding, mating system, effective population size. 3. Genetic markers in forestry – review and comparison. Molecular genetics of trees. 4. Quantitative genetics. Metric traits. Phenotypic expression. Heritability. Genetic gain. Genetic and breeding value. 5. Plasticity, adaptative potential. Selection in the silvicultural practice. Human impact on genetic structure. 6. Filogeography. Glacial and post glacial history. Genetic variation and fitness of provenances. **7.** Biotechnology in forestry. The role and implications of biotechnological tools in forestry. GMO/GMT. Genetic transformation.	
Classes 5 x 2 hours	1. Classical genetics - Mendelian inheritance. 2. Proteins (allozyme markers) as useful tools for genetic information – tissue extraction, starch electrophoresis. 3. DNA markers – isolation of DNA, PCR reaction, agarose electrophoresis. 4. Assessment of genetic structure of *Fagus silvatica* – allele frequencies, heterozygosity (observed and expected), Hardy – Weinberg Equilibrium, F statistics. 5. Methods of assessment of genetic variability, genetic gain evaluation.	
Field training	The visit to Kostrzyca Gene Bank or Carpathian Gene Bank in Wisla Forest District.	
Literature	White T.L., Adams W. T., Neale D.B., 2009. Forest Genetics. CABI Publishing, 682 s. ,Eriksson, G., 2008. *Picea abies* – Recent Genetic Research. Uppsala, 192 s., Eriksson, G., Ekberg, I., Clapham, D., 2006. An Introduction to Forest Genetics. Uppsala, 186 s., Lowe A., Harris S., Ashton P. 2007. Ecological Genetics. Blackwell Publishing, 326 s., Brown T.A. 2006. Genomes. Garland Science; 3 edition, 736 s., Freeland, J.R., H. Kirk, S. Petersen. 2011. Molecular Ecology, 2nd edition. John Wiley & Sons, Chichester.	

Assessment method	classes – written test, field studies - report, final mark - examination