

Study Programme : BSc in Biology			
Degree level: Bachelor degree			
Course Title: Molecular Evolution			
Professor: Dr Jasmina Ludoški			
Required/Elective Course: Elective			
Number of ECTS: 5			
Prerequisites: -			
Course Objective: The Molecular evolution course introduces the students to the dynamics of evolutionary change at the molecular level, the driving forces behind the evolutionary process, novel evolutionary phenomena revealed by molecular data, the effects of various molecular mechanisms on the structure of genes and genomes, and the methodology involved in the statistical analysis of molecular data from an evolutionary perspective. The course provides basic knowledge of evolutionary change in nucleotide sequences, molecular phylogenetics (methods and examples), rates and patterns of nucleotide substitution, molecular clocks and DNA polymorphism in populations.			
Course Outcome: This course is designed to provide the student with a basic knowledge of factors and mechanisms of molecular evolution.			
Course Content:			
<i>Theoretical part</i>			
Dynamics of genes in populations: Codominant and overdominant mode of selection, Extinction of an allele under mutation pressure, Genetic polymorphism; Gene structure, genetic codes and mutation: Rates of substitution at 1st, 2nd, and 3rd position in codon, Evolutionary and taxonomic importance of substitutions, DNA barcode; Evolutionary change in nucleotide sequences; Estimating the number of nucleotide substitutions between sequences; Molecular phylogenetics: methods, Phylogenetic trees, Gene trees and species trees; Rates and patterns of nucleotide substitution; Molecular clock; DNA polymorphism in populations; Developmental evolution; Gene organisation and evolution; Roles of mutation and selection in molecular evolution.			
<i>Practical part</i>			
Models of nucleotide substitution; Divergence between DNA sequences; Nonuniform rates among nucleotide sites; Estimating the number of nucleotide substitutions between sequences: noncoding sequences, protein-coding sequences, sequences alignment; Molecular phylogenetics: methods; Measure of DNA polymorphism; Gene genealogy and Coalescent theory.			
Reading List:			
Li, W.-H. (1997) Molecular evolution. Sinauer Associates, Inc. Pub. USA			
Total hours:			
Lectures: 2	Practicals: 2	Other: -	Student research work: -
Methods of instruction:			
Video beam and overhead presentation			
Assessment (maximum number of points 100)			
Requirements	points	Final exam	points
Active participation in lectures	10	Practical exam	
Active participation in practicals		Oral exam	70
Test(s) or			
Pre-exam testing	20		