

<b>Study Programme : BSc in Biology</b>			
<b>Degree level:</b> Bachelor degree			
<b>Course Title:</b> Molecular Evolution			
<b>Professor:</b> Dr Jasmina Ludoški			
<b>Required/Elective Course:</b> Elective			
<b>Number of ECTS:</b> 6			
<b>Prerequisites:</b> -			
<b>Course Objective:</b> 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.			
<b>Course Outcome:</b> This course is designed to provide the student with a basic knowledge of factors and mechanisms of molecular evolution.			
<b>Course Content:</b>			
<i>Theoretical part</i>			
Dynamics of genes in populations: Genetic polymorphism, Roles of mutation and selection in molecular evolution, Codominant, dominant, recessive and overdominant mode of selection; DNA and amino acid sequence evolution: Models of nucleotide substitution, DNA sequence divergence; Rates and patterns of nucleotide substitution, Nonrandom usage of synonymous codons, Molecular clock; Molecular phylogenetics: Phylogenetic trees, Types of data, Methods of tree reconstruction, Gene trees and species trees; Reticulate evolution and phylogenetic networks; Divergent evolution of duplicated genes, Concerted evolution, Molecular tinkering; Evolution by transposition, Horizontal gene transfer; Gene organisation and evolution.			
<i>Practical part</i>			
Alignment of nucleotide and amino acid sequence, Divergence between DNA sequences, Estimating the number of nucleotide substitutions between sequences: noncoding sequences, protein-coding sequences, amino acid sequences; Nonuniform rates of nucleotide changes; Molecular phylogenetics: tree construction, topological comparisons, assessing tree reliability.			
<b>Reading List:</b>			
Graur, D. (2016) Molecular and genome evolution. Sinauer Associates, Inc. Pub. USA Milankov, V. (2007) Biološka evolucija. Prirodno-matematički fakultet, Novi Sad. scientific papers			
<b>Total hours:</b>			
Lectures: 2	Practicals: 2 + 0 + 0		
<b>Methods of instruction:</b>			
video beam, oral presentation, study of scientific papers			
<b>Assessment (maximum number of points 100)</b>			
<b>Requirements</b>	<b>points</b>	<b>Final exam</b>	<b>points</b>
Active participation in lectures		Practical exam	
Active participation in practicals		Oral exam	70
Seminar	30		